

Understanding the Usage of Mental Health Apps among Post-Secondary Students

by

Sharveena Karunakaran

A thesis submitted to the
School of Graduate and Postdoctoral Studies in partial
fulfillment of the requirements for the degree of

Master of Health Science in Health Informatics

Faculty of Health Sciences

University of Ontario Institute of Technology (Ontario Tech University)

Oshawa, Ontario, Canada

December 2023

© Sharveena Karunakaran, 2023

THESIS EXAMINATION INFORMATION

Submitted by: **Sharveena Karunakaran**

Master of Health Sciences in Health Informatics

Thesis title: Understanding the usage of mental health apps among post-secondary students

An oral defense of this thesis took place on November 29, 2023, in front of the following examining committee:

Examining Committee:

Chair of Examining Committee	Otto Sanchez
Research Supervisor	Manon Lemonde
Research Co-supervisor	Winnie Sun
External Examiner	Lynn Zhu

The above committee determined that the thesis is acceptable in form and content and that a satisfactory knowledge of the field covered by the thesis was demonstrated by the candidate during an oral examination. A signed copy of the Certificate of Approval is available from the School of Graduate and Postdoctoral Studies.

ABSTRACT

University is a period where adolescents are exposed to novel stressors such as extensive academic overwork, familial pressure, financial concerns, and substantial studying, which can lead to psychological disorders such as anxiety and depression. It is well documented that ethnic and racial students experience a high prevalence of mental disorders yet underutilize health services. Culturally relevant mental health apps that incorporate insights from the targeted population can possibly reduce the mental health disparities that exist among marginalized groups. The study uses a semi-structured interview to explore the experiences of three female Sri Lankan students with mental health apps. The main themes that emerged from the study results included: perceived severity of mental illness; cues to action using the mental health app; self-efficacy and coping strategies; barriers to using mental health apps; benefits of using mental health apps; and recommendations for improving the engagement of mental health apps.

Keywords: mHealth; eHealth; mental health; apps; technology

AUTHOR'S DECLARATION

I hereby declare that this thesis consists of original work of which I have authored. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I authorize the University of Ontario Institute of Technology (Ontario Tech University) to lend this thesis to other institutions or individuals for the purpose of scholarly research. I further authorize University of Ontario Institute of Technology (Ontario Tech University) to reproduce this thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research. I understand that my thesis will be made electronically available to the public.

The research work in this thesis that was performed in compliance with the regulations of Research Ethics Board/Animal Care Committee under **REB Certificate number 17159**.

Sharveena Karunakaran

STATEMENT OF CONTRIBUTIONS

I hereby certify that I am the sole author of this thesis and that no part of this thesis has been published or submitted for publication. I have used standard referencing practices to acknowledge ideas, research techniques, or other materials that belong to others. Furthermore, I hereby certify that I am the sole source of the creative works and/or inventive knowledge described in this thesis.

ACKNOWLEDGEMENTS

I would like to express my deepest appreciation to my supervisor, Dr. Lemonde, for her invaluable feedback and patience throughout my research and writing process. Your insights on scholarly research and academic writing helped strengthen my thesis. Writing has never been my asset. However, your dedication helped me improve my writing, whether it's through rounds of revisions or consultation, was significant in refining and strengthening my thesis.

I also want to express my sincere gratitude to my former supervisor, Dr. Stanyon, for her intangible support throughout this academic process. The knowledge and expertise you shared helped lay the foundations for my thesis.

I would also like to express my sincere gratitude to Dr. Sun for her invaluable feedback and positive encouragement. Your suggestions were crucial in elevating and getting to the essence of my research.

Thank you to all the participants for taking time out of their schedule to participate in this study. Your valuable insights will help contribute to the research of mHealth.

Lastly, I want to thank my mother and aunt for providing me with the emotional support that I need through this intense but rewarding journey. Without you, I wouldn't have the strength to complete my thesis.

CONTENTS

Thesis Examination Information	ii
Abstract	iii
Author's Declaration	iv
Statement of Contributions.....	v
Acknowledgements	vi
Table of Contents	vii
List of Tables	xi
List of Figures.....	xvi
List of Abbreviations and Symbols	xxvi
Chapter 1: Introduction.....	1
1.1 Overview.....	1
1.2 Purpose of Study	8
1.3 Significance	9
Chapter 2: Literature Review	10
2.1 Introduction.....	10
2.2 Mental health of Post-Secondary Students.....	11
2.3 Consequences of a Mental Disorder on Post-Secondary Students	13
2.4 South Asians and Mental Health Outcomes	15
2.5 Sri Lankan and Mental Health Outcomes	18
2.6 Barriers and Underutilization of Mental Health Services among South Asians.....	21
2.7 Coping Strategies and Resilience.....	23
2.8 Sources of Support for Post-Secondary Students	27
2.8.1 Traditional In-Person Mental Health Support	27
2.8.2 Non-Traditional Mental Health Services	30
2.8.3 Digital Health Interventions among South Asians	33
2.8.4 Mobile Apps as a Coping Strategy and Their Impact on Mental Health Outcomes	35
2.8.5 Pitfall of Mobile Apps.....	40
2.8.6 Research Question	43

Chapter 3: Methodology.....	45
3.1 Overview.....	45
3.2 Ethical considerations	45
3.3 Study Design and Method	45
3.4 Population under study and sampling	46
3.5 Recruitment Process	48
3.7 Data Analysis	50
3.8 Methodological Rigor.....	52
3.9 Researcher Reflexivity	53
Chapter 4: Study Findings.....	56
4.1 Chapter overview	56
4.2 Demographic Information of Participants	56
4.3 Findings	57
4.4 Summary of the Findings	78
Chapter 5: Discussion	81
5.1 Discussion of Results	81
5.2 Recommendations for Future Research, Practice, and Policy	94
5.3 Strengths	96
5.4 Limitations	97
References	101
Appendices	137
Appendix A.....	137
Letter of Approval from Ontario Tech University Research Ethics Board.....	137
Appendix B.....	139
Interview Guide	139
Socio-Demographic Questionnaire	139

LIST OF TABLES

CHAPTER 4

Table 1: Descriptive Demographic Information for Each of the Participants from the Study's Interview

..... 57

Table 2: Overview of the major themes and sub-themes

..... 57

LIST OF ABBREVIATIONS AND SYMBOLS

TAM	Technology Acceptance Model
HBM	Health Belief Model
mHealth	Mobile Health
eHealth	Electronic Health

Chapter 1: Introduction

1.1 Overview

The high prevalence of mental illness among post-secondary students was a public health concern, with one in five post-secondary students experiencing a decline in their mental health and 11% of post-secondary students reporting suicidal idealization (Wiens et al., 2020). Anxiety and depression were six to seven times higher among post-secondary students than the general population, making this a mental health crisis (Cuijpers et al., 2021).

Stress coincided with anxiety and depression, with 60% of students reporting above-average stress (Linden, 2021). Stressors experienced during adolescence can affect the trajectory of neural and brain structural maturation, contributing to the rise of psychological morbidities such as anxiety and depression among post-secondary students (Page & Coutellier, 2018). Academic and non-academic stressors can significantly impact the emotional well-being of post-secondary students. The academic stressors include overwork, insufficient time to complete an academic task, exam preparation, and the expectation to perform well at school (Freire et al., 2020). Non-academic stressors such as moving away from friends and families, maintaining a social life, money worries, and concerns about future work can impact the mental health of post-secondary students (Freire et al., 2020). These stressors can affect the academic performance of post-secondary students by reducing their ability to pay attention during class, reducing their dedication to study, and increasing their absence (Freire et al., 2020). Furthermore, these stressors can manifest into negative behaviours such as drug and alcohol dependence, insomnia, and physical and emotional exhaustion (Freire et al., 2020). A study conducted

by Mereu et al. (2021) found that first-year university students consume significantly more alcohol units than mature students due to social pressure and to alleviate stress.

First-year university students experienced unique stressors due to the emotional challenges of transitioning from high school to university (Kwan et al., 2021). First-year university students must separate from family and take on additional responsibilities while their brains are undergoing growth and are susceptible to stress (Fruehwirth et al., 2021). This transition also coincided with the peak period for the onset of mental illness. A longitudinal cohort study was conducted by Goodday et al. (2019) to examine the mental health status of 1686 first-year undergraduate students attending Queen's University and the University of Toronto. The findings of the study suggested that a third of first-year university students developed moderate-to-severe mental illnesses (Goodday et al., 2019). Another study by Lorga et al. (2018) stated that first-year university students experienced higher levels of stress and depression, while third-year university students were the least stressed and depressed.

Although a mental health crisis may affect post-secondary students regardless of their background, ethnic and gender minorities have disproportionately higher rates of mental illness (Lin et al., 2023). Ethnic minorities experienced a high prevalence of mental disorders and underutilization of mental health services compared to Caucasian people (Breslau et al., 2017). Factors driving these mental health disparities included unequal access to mental health providers, time and transportation obstacles, the scarcity of culturally robust services, and cultural stigma (Ramos et al., 2021).

There was limited research on the utilization of mental health services among ethnic post-secondary students (Ramos et al., 2021). However, one study conducted by

Chiu et al. (2018) examined ethnic minorities' utilization of mental health services. The study found that South Asians were least likely to utilize mental health services but reported poorer self-assessed mental health compared to Caucasian people. Culturally linked stigma was a barrier to the utilization of mental health services among South Asians (Karasz et al., 2019).

South Asian women were more vulnerable to culture-linked stigma compared to South Asian men (Karasz et al., 2019). This was related to worries in regard to marriage prospects and perceptions of being judged (Goel et al., 2023). Conservative gender norms associated with South Asian women, such as submission and obedience to males and elders, upholding the family's prestige and honour through correct behaviours, and placing family values and interests over theirs, can cause females to internalize problems, causing psychological problems and making them reluctant to seek help (Karaz et al. 2019). Discriminatory gender norms among female South Asians manifested as a higher prevalence of neuroses, affective disorders, and organic psychoses than South Asians male (Mahapatra & Murugan, 2023).

Minority groups, such as South Asians, are treated as homogenous; however, South Asian countries are diverse in terms of culture, linguistics, and contextual factors (Islam et al., 2023). By homogenizing South Asians as a single entity, it would lead to inappropriate generalizations and unmet needs (Islam et al., 2023).

Sri Lanka, a country in South Asia, is characterized by sectarian violence, political instability, and natural disasters such as the tsunami experienced in 2004 (Thurston et al., 2021). These external stressors impacted the psychological well-being of Sri Lankans (Thurston et al., 2021).

A study conducted by Bell et al. (2012) found that sectarian violence was highly associated with depression and anxiety-related symptoms. Sectarian violence had imposed hardship on Sri Lankan women in the form of bereavement, displacement, and vulnerability to sexual violence (Thurston et al., 2021). A high proportion of Sri Lankan women suffered from gender-based violence, discrimination, and inequality (Thurston et al., 2021). A study conducted by Augustine (2023) found that Sri Lankan women who experienced gender-based violence, discrimination, and inequality had a high prevalence of bipolar disorder, depression, post-traumatic stress disorder, and suicidal ideation.

Despite the high prevalence of mental disorders within this group, 92% of Sri Lankans felt the organizations had not provided adequate support and that universities offered limited sessions for mental health services (Augustine, 2023; Shanmuganandapala, 2020). It becomes evident that there is an unmet mental health need among Sri Lankan women in relation to support from organizations and universities. Considering these findings, this study aims to shift focus specifically to female Sri Lankan post-secondary students living in Ontario.

Coping Strategies

The solution to managing mental illness among post-secondary students is building resilience through positive coping strategies (Freire et al., 2020). According to Monaghan et al. (2021), a student's ability to use positive coping mechanisms resulted in positive mental health outcomes.

Coping involves using thoughts and behaviours to manage internal and external stressful situations (Algorani & Gupta, 2022). Examples of coping strategies included

humour, emotional support, active coping, acceptance, and religion, which were significantly associated with positive health outcomes (Saxon et al., 2017). Skinner and Zimmer-Gembeck (2016) categorized coping strategies as evasive or active. Evasive strategies involved taking steps to avoid the stressor, which could manifest as denial, distraction, or wishful thinking (Freire et al., 2020). Meanwhile, active strategies involved taking proactive steps such as changing one's response to the stressor, directly changing the problem, or changing one's negative emotions toward the stressor (Freire et al., 2020).

While there is sparse literature on South Asian women's coping strategies, a study by Ozen-Dursan (2023) found that South Asian women used evasive strategies such as self-harm. The rates of self-harm were more prevalent among South Asian women than white women (Ozen-Dursan, 2023). Social, cultural, and psychological factors were linked to self-harm among South Asian women (Ozen-Dursan, 2023). Resilience was inversely associated with self-harm strategies, and thus developing active strategies helped South Asian students develop resilience and empowered them to bounce back despite changes, challenges, and setbacks (Ozen-Dursan, 2023; Wu et al., 2020a).

Defining Resilience

Resilience occurs because of action (ex., active coping strategies) in response to a stressful situation (Compas et al., 2017). Wu et al. (2020a) stated that resilience was positively associated with positive indicators of mental health, such as life satisfaction, subjective well-being, and positive emotions. The American Psychological Association (2014) defined resilience as the ability to adapt well amidst adversity, trauma, tragedy, threats, or the significance of stress. However, over the years, the definition has changed

to reflect the complexity of resilience. The determinants of resilience included psychological, social, environmental, and cultural factors that interact with each other to determine how one would respond in a stressful situation (Southwick et al., 2014). Post-secondary students learned resilience through effective problem-solving and coping strategies to combat adversity (Wu et al., 2020a).

The university helps build resilience in post-secondary students by offering counselling and support programs. However, data showed that 25% to 84% of post-secondary students have not sought counselling for their mental health (Doan et al., 2020). A study conducted by Kodish et al. (2022) examined the utilization of university counselling services among African American, Asian American, Caucasian, and Latino students. The findings of the study suggested Caucasian people had a higher utilization of counselling services than minorities. Factors such as mental health services not meeting their needs, beliefs that counselling might not be helpful for severe forms of emotional disorders, counsellors untrained in culturally sensitive topics, and a lack of representation of ethnic therapists prevent minority students from seeking counselling (Fante-Coleman, 2020).

A potential solution to these problems is the utilization of eHealth. eHealth reinforces positive coping mechanisms by enabling post-secondary students to self-monitor and manage their mental health illnesses (Monaghan et al., 2021). Due to the emergence of the personal computer, the term eHealth became popular (Monaghan et al., 2021). According to Da Fonseca (2021), eHealth are healthcare services and health information provided or obtained using the internet, mobile devices, computers, and information technology. Moreover, eHealth involves the application of digital solutions

for healthcare, thus facilitating patient care in a more convenient way (Da Fonseca, 2020).

EHealth enabled patients to be more of a protagonist in their healthcare area (Barello et al., 2016). Patients who are actively and effectively managing their health show more positive clinical outcomes than patients who are disengaged and passive (Barello et al., 2016). As a result of eHealth, there is greater access to medical information, peer support, and open access to clinical studies (Barello et al., 2016). Thus, eHealth does not only lead to higher quality and quantity of information obtained but also the opportunity for self-care (Barello et al., 2016). In the traditional mode of health care, patients are not involved in the decision-making process about their health and disease management (Vahdat et al., 2014). The medical care professional must take on all the burdens and responsibilities concerning medical decisions and consequences (Vadhat et al., 2014). Insecurity and a lack of control in making health decisions are the driving factors for incorporating disruptive technologies such as mental health apps into the market (Barello et al., 2016).

Mobile health is a sub-category of eHealth. Mobile health is the utilization of mobile apps and other wireless devices that can be applied to psychiatric and mental health practices (Chan et al., 2014). Mobile health apps can reduce the barriers to receiving a diagnosis or treatment (Kruse et al., 2019). Given the high prevalence of smartphones and mental disorders among post-secondary students, mobile health can improve accessibility to mental health care (Lui et al., 2017). Post-secondary students may benefit in the short term from improved psychological well-being, and this will result in a long-term impact on work productivity and academic performance (Chan et al.,

2014). Mobile apps do not require users to disclose their identities to make an appointment or to obtain a referral before receiving assistance, thus enabling users to overcome the barriers that hinder them from accessing mental health care (Kruse et al., 2019). In addition, mental health apps enable post-secondary students to discover they may need care or an increase in clinical assistance (Kruse et al., 2019).

Mental health apps are mobile technology applications that can be used for clinical or nonclinical purposes to support mental health (Chandrashekar, 2018). Mental health apps can be categorized based on functionality: self-management, cognition improvement, skills training, social support, symptom tracking, and passive data collection (Chandrashekar, 2018). The penetration of mental health apps had grown rapidly in the market, with 29% of apps focused on mental health diagnosis, treatment, or support (Chandrashekar, 2018).

Although mental health apps have the potential to help post-secondary students manage their mental health symptoms, students' engagement with these apps remains low. Chiauuzzi and Newell (2019) found that 23% of users abandoned mental health apps after one use. The low retention rate prevents the app's ability to deliver a positive outcome and to understand its long-term efficiency (Baumel et al., 2019).

1.2 Purpose of Study

South Asian students have a high prevalence of mental disorders, yet they underutilize mental health services. Digital health interventions, such as mental health apps, can minimize health inequality and improve the mental health status of South Asian students. However, South Asian students are underrepresented in digital health literature. In particular, there is no research completed on the experiences of female Sri Lankan

students with mental health apps. A lack of understanding of how female Sri Lankan students view or perceive the use of mental health apps can affect the engagement, acceptability, and effectiveness of mental health apps. Hence, the purpose of this study is to explore the experiences of female Sri Lankan students' usage of mental health apps.

1.3 Significance

The treatment gap is broadened among marginalized groups as racial and ethnic minorities experience elevated depression, stress, anxiety, and suicide compared to Caucasian people (Ramos et al., 2021). The high prevalence of mental disorders and lack of access to care among ethnic minorities is alarming. Factors such as not meeting mental health needs, a lack of cultural competency, and attitudinal stigma such as cultural stigma cause disparities in mental health outcomes and underutilization of services among marginalized populations (Ramos et al., 2021).

The tendency to homogenize ethnic minorities while ignoring the diversity of religious, linguistic, and cultural differences limits the understanding of the specific mental health needs required for each subgroup. Sri Lanka has a history of sectarian violence, ongoing political instability, and gender discrimination, which predisposes them to trauma, PTSD, depression, and suicidal ideation (Shanmuganandapala, 2020). Mental health apps can help address the treatment gap among female Sri Lankans. People in this marginalized group are dependent on their phones and use their phones to access health-related materials (Karasz et al., 2019). The familiarity of smartphones makes users have a positive attitude towards and willingness to use apps (Karasz et al., 2019).

The findings of the study can help app developers and healthcare professionals develop mental health apps that consumers want to use, improving retention rates.

Chapter 2: Literature Review

2.1 Introduction

The literature review will discuss the search strategy and criteria to identify the articles relevant to the study question: "What are the barriers and facilitators to the usage of mental health apps among female Sri Lankan students?"

Search Engine and Criteria

The PubMed database, Springer Link, Taylor and Francis Online, and Elsevier were used to search for academic journals that were pre-reviewed and available online. The keywords used to conduct the literature review were mental health; apps; anxiety; stress; depression; mHealth; technology; privacy; engagement; safety; coping; resilience; Technology Acceptance Model; Health Belief Model; post-secondary students; Sri Lankans and South Asians; and Canadians. Boolean operators were used alongside keywords such as "M-health" or "Mobile Health," "Mobile Health" or "Apps," "M-health" and "Post-secondary Students," "Apps" and "Coping Strategies," "South Asians" and "Mental Health," and "Sri Lankan" and "Mental Health" to find the most relevant results and sources. The inclusion criteria were articles from peer-reviewed journals published between 2010 and 2023 to ensure relevance and currency and written in English for comprehension; the articles must be quantitative, qualitative, or mixed-design. The inclusion of publications published in 2010 is justified because mental health apps were established in 2010 and major research on mental health apps was published in 2010. The exclusion criteria are studies not written in English, published before 2010, or about fitness apps.

The reference list of the 84 relevant pieces of literature valued towards the research question were reviewed to identify further suitable support. Additional grey literature was searched for relevant information.

The literature review will discuss the following topics: 1) mental health of post-secondary students; 2) consequences of a mental disorder on post-secondary students; 3) South Asians and mental health outcomes; 4) Sri Lankans and mental health outcomes 5) barriers and underutilization of mental health services among South Asians; 6) coping strategies and resilience; 7) sources of support for post-secondary students (traditional in-person mental health support and non-traditional mental health services); 8) digital health interventions among South Asians; 9) mobile apps as a coping strategy and 10) impact on mental health outcomes; and the pitfall of mobile apps.

2.2 Mental health of Post-Secondary Students

This topic provides an analysis of the trends in post-secondary students' mental health, with a focus on mental health stressors and outcomes such as anxiety, stress, depression, and suicide.

Post-secondary students are acknowledged as a group at risk for poor mental health due to a high rate of psychological distress and suicidal ideation (Moghimi et al., 2023). Mental illnesses such as anxiety, depression, and substance use disorders are significantly associated with an increased risk of suicide among post-secondary students (Bradvik, 2018). Casey et al. (2022) conducted a cross-sectional study of 38,757 university students between 2019 and 2021 to assess the mental health status of university students. Their study suggested students with severe symptoms of depression

and anxiety were more likely to attempt non-suicidal self-injury and have suicidal ideation (Casey et al., 2022).

Worku et al. (2020) conducted a cross-sectional design to assess perceived stress and depression among 5076 health science undergraduate students. A self-administered questionnaire of the Perceived Stress Scale (PSS-14) item and Beck Depression Inventory 21 items was used to assess stress and depression. The findings of the study stated that the perceived stress among students was 63.5%, and the prevalence of depression was 4.4%.

According to a meta-analysis conducted by Solmi et al. (2021), common mental illnesses such as anxiety-related disorders and stress-related disorders peaked during young adulthood. This period came at a time of acceleration in brain, intellectual, and psychological development. In addition, during this phase, students encountered external stressors such as academic, social, lifestyle, and financial (Solmi et al., 2021). These external stressors manifested as stress, anxiety, and depression among post-secondary students (Solmi et al., 2021). Although Solmi et al. (2021) examined the young adult experience of mental health, there was a limited understanding of post-secondary students' experiences of mental health.

The 2019 National College Health Assessment surveyed the mental health of 55,284 Canadian post-secondary students (Linden et al., 2021). The survey indicated that 51.6% of students were too depressed to function, 68.9% were anxious, and 45.6% were more stressed than average (Linden et al., 2021). Linden et al. (2021) suggested stress was a normal physiological and mental response to demanding circumstances. Social desirability bias and non-response bias can distort the validity of the survey results. A

limitation of the study is that Linden et al. (2021) investigates the impact of students' mental health on the national level; however, each institution needs to research their students' mental health since the demographics of students' profiles vary by institution.

According to Konstantopoulos et al. (2020), excessive or prolonged stressful situations, as well as a person's maladaptive responses, could cause exhaustion or mental disorders among post-secondary students. Chronic stress increased the risk of anxiety and depression among post-secondary students (Konstantopoulos et al., 2020). The consequences of these common mental illnesses resulted in negative behaviours such as relationship difficulties, unemployment, suicide, substance use, and poor academic performance (Konstantopoulos et al., 2020).

Although Linden (2021) and Solmi (2021) emphasize post-secondary students' mental health trends, this research reveals a gap in how socioeconomic factors such as race and gender influence health inequities.

2.3 Consequences of a Mental Disorder on Post-Secondary Students

This topic analyzes the negative impact of mental illness on the academic performance of post-secondary students and how substances are used to maladaptively cope with their mental distress.

Students with mental illnesses such as anxiety and depression are significantly associated with low Grade Point Average (GPA) and academic failure (Dong et al., 2021). A cross-sectional study on the prevalence of mental disorders among 750 medical students found 21.5% had anxiety symptoms and 3.7% had depression symptoms (Moreira de Sousa et al., 2018). The findings suggested medical students with depression

symptoms performed poorly in academics (Moreira de Sousa et al., 2018). A limitation of the study is that the researchers investigated Portuguese students' experiences of mental health. However, attitudes and behaviours toward mental health differ by culture.

According to Moran et al. (2016), people who suffered from clinical depression and anxiety had similar levels of worry. Students who suffered from high levels of worry suffered in terms of their working memory capacity (Moran et al., 2016). Working memory is the limited-resource cognitive system used to actively maintain information in the face of ongoing processing or distraction (Moran et al., 2016). Anxiety and depression had indirectly influenced academic performance through working memory capacity, which led to low GPA scores and academic failure (Moran et al., 2016). These reinforced perceptions of hopelessness and inadequacy, and in most cases, students sustained feelings of anxiety and depression in a vicious cycle (Moran et al., 2016).

Students will turn to substance use, such as alcohol, drugs, and tobacco, to cope with their mental distress (Esmaeelzadeh et al., 2018). Esmaeelzadeh et al. (2018) were the first to examine the association between depression, substance use, and anxiety among post-secondary students in Canada. The findings of the study suggested a significant correlation between depression and tobacco and cannabis use.

Students engaged in substance use as a maladaptive response to cope with stressors and relieve symptoms of their mental illness (Tembo et al., 2017). Tembo et al. (2017) stated that students who consumed alcohol at hazardous levels were 1.2 times more likely to report psychological distress and scored lower GPAs. They were more likely to be late for class or miss class, not concentrate, and cannot complete an assignment (Tembo et al., 2017). Mekonen et al. (2017) conducted a cross-sectional study

to assess the proportion and associated factors of alcohol use among university students. The study selected 725 university students from November to December 2015. A self-administered questionnaire was administered to assess alcohol use among postsecondary students. The findings of the study suggested that 28.6% of students who used substances had a lower GPA. Thus, students' poor academic performance was an indirect consequence of their substance use (Mekonen et al., 2017).

Although Moreira de Sousa (2021), Tembo (2017), and Mekonen (2017) highlight the consequences of mental illness, most of the population is Caucasian. The literature highlights a gap in investigating the negative consequences of mental health outcomes on academic performance for ethnic minority students.

2.4 South Asians and Mental Health Outcomes

This topic examines the cultural risk factors that predispose South Asian women to mental health disorders.

Grace et al. (2016) conducted a cross-sectional analysis of the Ontario Pilot Test study examining the mental health status of White, South Asian, East Asian, Southeast Asian, Black, and Aboriginal people living in Ontario. The study used the Centre for Epidemiological Studies Depressive Symptoms Scale (CED-S) to assess depression symptoms, the General Anxiety Disorder Scale (GAD-7) to assess anxiety, and the Lubben Social Network Scale (LSNS-6) to assess social support received by friends and families. The findings of the study showed that South Asians had a higher prevalence of anxiety and an underutilization of mental health services compared to other ethnic groups. The study was significant as previous literature homogenized racial groups as White vs. non-White; however, mental health status differed among ethnic groups.

A study conducted by Rahman and Rollock (2011) examined 199 South Asian students' acculturation experiences and psychological adjustment in the United States. The study used the Minority-Majority Relations Survey (MMRS) to measure multidimensional acculturation. Cultural Adjustment Difficulties Checklist (CADC) to measure the majority-minority conflict related to interpersonal problems, alienation towards one's culture reference group, and issues of self-efficacy in a white-dominant social context. Lastly, the Centre for Epidemiological Studies-Depression Scale (CES-D) was used to measure the frequency and duration of depression symptoms.

The findings of the study suggested higher levels of depression were predicted by higher perceived prejudice and lower self-reported competence in work, personal/social efficacy, and intracultural behaviour. The study was significant as it showed that while university was a stressful time for all races, marginalized students experienced additional stressors, such as acculturation stressors, which predisposed them to depression.

A qualitative study conducted by Islam et al. (2017) explored the mental health status of 10 South Asian youths living in the Peel regions of Toronto, Ontario. As aforementioned in Rahman and Rollock's (2011) study, acculturation stressors led to poor mental health outcomes among South Asian youths. Conflicts with parents in relation to resettlement and balancing two different cultures (Western and Eastern) created family conflicts. In addition, intergenerational stressors, academic pressure, relationship stress, and family dynamics contributed to mental health challenges such as depression and anxiety. South Asian youths reported using drugs such as marijuana, alcohol, and cigarettes to maladaptively cope with their mental distress.

Ozen-Dursan et al. (2023) conducted a systematic review that examined the self-harm and suicidal behaviours among South Asian communities in the UK. Cultural risk factors such as gender inequality, family honour, forced marriage, and being controlled by family members can perpetuate self-harm and suicidal behaviours among South Asian women. South Asian women had high expectations for upholding family honour and prestige through "correct" behaviour and academic achievements. Failure to meet cultural expectations resulted in community grapevines, leaving the affected individuals isolated from the community.

Tabassum (2017) conducted a systematic review investigated the impact of gender inequality on the mental health status of women in South Asian countries. South Asian females are deemed to have inferior status than men in terms of social, cultural, and economic facets. As a result of females being viewed as inferior in South Asia, they are not involved in decision-making, their movements are monitored, they are victims of domestic abuse, and they have inadequate access to mental health resources. Gender inequality is manifested in South Asian countries through matrimonial disputes, workplace discrimination, and poor psychological health. The findings of the systematic review suggested a difference in the prevalence of mental health issues in South Asia between females and males. Depression and anxiety were more prevalent in South Asian women than in men. South Asian women were more likely to be two or three times more likely to be diagnosed with Post Traumatic Stress Disorder (PTSD) and to have a standalone mental health diagnosis or comorbidity.

Karaz et al.'s (2019) systematic review of South Asian women's mental health found that South Asian women believe that anxiety, depression, or exhaustion are normal

social responses to problems such as family conflict, marital problems, loneliness, and family ties. The study found that people were less likely to attribute anxiety, depression, and stress to psychological or neurological disorders. The tendency to normalize mental health problems can result in underutilization of mental health services among South Asian women.

The study identifies a gap in understanding the mental health needs of South Asian students in Canada. Existing literature is outdated and is conducted in the United States and the United Kingdom, which have different health care systems than Canada.

Current research tends to homogenize South Asia; however, South Asia is diverse linguistically, religiously, and culturally. By homogenizing South Asia as a single subgroup, we disregard the mental health needs and treatments that vary within countries in South Asia.

2.5 Sri Lankan and Mental Health Outcomes

This topic examined the impact of the civil war on the mental health outcomes of Sri Lankans and how gender discrimination and social stigma prevent Sri Lankans from seeking mental health care.

The Sri Lankan demographic is distinct from other South Asian countries with a history of displacement, genocide, intergenerational trauma, homeland politics, and sectarian violence, which continue to oppress the Tamil community (Wijayarante et al., 2020). Shoib et al. (2022) examined the association between civil violence and the prevalence of mental health issues in Sri Lanka. According to the study's findings, Sri

Lankans who experienced sectarian violence had the highest prevalence ratios of mental disorders.

A narrative study was conducted between a post-secondary instructor and a Tamil-origin university student and explored post-secondary student experiences with mental health (Shanmuganandapala & Khanlou, 2019). The study discussed the cultural factors that influenced the mental health of the Tamil subgroup in Sri Lanka. The findings of the study suggested a need to emphasize access to mental health resources and services rather than mental illness. The study identified a gap in system-competent cultural care and found that there needed to be empathetic, trauma-informed care, specifically for those who experienced intergenerational trauma because of the civil war.

Shanmuganandapala (2020) conducted a mixed-methods study to explore the mental health and wellbeing of 13 Tamil youths and Sri Lankans living in Toronto. The findings of the study found that 38% believed there was a lack of knowledge and stigma related to mental health. Stigma was the result of Sri Lankan's parents' myths about mental health, which were taught to their kids. Ninety-two percent did not believe the organization provided the necessary support for Sri Lankan youths. More than half of the participants believed that mental health services are not accessible, and 69% of the participants have not utilized mental health support. Eighty-five percent identified shame and stigma as key factors in not seeking support. Fifty-four percent reported judgment and stigma as barriers to seeking mental health support. Judgement and stigma held by family and not openly discussing mental health prevent youths from reaching out for help. One participant stated they would not seek mental health support due to friends or families finding out, being judged, or fear related to confidential issues.

A narrative qualitative study was conducted to examine the intergenerational trauma experienced by 23 immigrants and first-generation Sri Lankan women in Canada (Augustine, 2023). The findings suggest Sri Lankan women experienced sexual, gender, and domestic violence, which contributed to their mental illness. They reported that gender norms and expectations, such as being a “nallu ponnu” (a good girl), are attributed to behaviours such as being obedient, engaging in respectful conduct, and having a modest demeanor. They reported feeling pressure to uphold the family’s honour and respect.

All the participants in Augustine’s study (2023) had reported depression and anxiety, and a few of them had experienced post traumatic stress disorder (PTSD), complex PTSD, suicidal ideation, and attempted suicide in the past. The participants mentioned barriers to mental health services, which include students having limited sessions with mental health professionals or that the health care professionals were inexperienced dealing with trauma or were unhelpful. First-generation Sri Lankan Canadians felt that Sri Lankan physicians were dismissive when they shared mental health concerns; they noted that their health care professionals also had mental health stigma as a result of being from a generation where there is a negative preconceived notion of mental health, and they had the fear that their confidentiality would be breached if the health care professional shared it with family members with the same health care professional. The findings highlight the intergenerational trauma experienced among Sri Lankan women.

The literature review highlights a comprehensive gap in the mental health status of Sri Lankans, despite Sri Lankans being a prominent subgroup in Canada with a high prevalence of mental disorders and underutilization of mental health services.

2.6 Barriers and Underutilization of Mental Health Services among South Asians

This topic provides an overview of the barriers leading to the underutilization of mental health services among South Asians.

Islam et al. (2023) explored the barriers to mental health services experienced by the South Asian youth population in the Peel region of Toronto. A semi-structured interview was conducted among 22 mental health providers that worked with South Asian youths. The findings suggest a scarcity of South Asian counsellors, a lack of South Asian representatives in health care promotion, long wait times, prohibitive fees for services not covered in Ontario, a lack of professionals specializing in youth's issues, treating mental health through psychotropic medication, and a lack of cultural and religious integration in health approaches as barriers to accessing mental health services.

Basri et al. (2022) conducted a qualitative study to explore 14 South Asian post-secondary students' attitudes and behaviours towards seeking professional help for their mental health. Fifty percent of South Asian students reported that stigma associated with mental health problems within family and community services was a barrier to seeking mental health therapy. South Asian students reported that counselling services offered at universities lack a cultural connection and lack mental health resources for South Asian students. Additionally, the limited number of counselling sessions offered at the university and affordability were also barriers to seeking professional help.

Arora and Algios (2019) conducted a quantitative study examining the roles of perceived and personal stigma on attitudes towards seeking professional psychological help among 160 South Asian students. The study used the Perceptions of Stigma by Others for Seeking Help (PSOSH) scale to measure perceived stigma. The Social Distance Scale (SDS) was used to measure personal stigma. The attitude toward seeking professional psychological help (ATSPPH-SF) was used to assess attitudes towards professional mental health. The findings of the study suggest higher levels of personal stigma were associated with an increasingly negative attitude towards seeking professional psychological help. Additionally, beliefs about the need to distance themselves from individuals with mental illness are negatively associated with attitudes towards professional psychological help.

Chaudhry et al. (2019) investigated the endorsement of stigmatizing beliefs and attitudes towards mental illness (onset and courtesy stigma) among 168 South Asians, East Asians, and Caucasians. Onset responsibility is the blame placed on the individual for contacting the illness, and courtesy stigma is the negative characterization as a result of a mental health diagnosis or being associated with individuals with mental health issues. The findings of this study stated that South Asians had a greater endorsement of courtesy stigma than Americans, while onset courtesy did not vary across the ethnic groups.

Birtel and Mitchell (2023) conducted a cross-sectional study that explored the stigma associated with depression and the cultural difference between 137 South Asians and White British. The findings of the study suggested that South Asians attributed mental illness to supernatural and moral causes. The White British attributed mental

illness to biological causes. South Asians had a lower level of willingness associated with individuals with mental illness and a greater desire for social distance towards people with depression in general than White British.

Birtel and Mitchell (2023), Basri et al. (2022), Arora and Algois (2019), and Chaudry (2019) studies highlights the need for research to investigate cultural contextual factors leading to the utilization of health services, as each ethnicity has a different experience and view on mental health that can affect the utilization of mental health services.

The literature review identifies a comprehensive gap in understanding how South Asian Canadians experience accessing mental health services. Current literature discusses South Asian Americans and South Asians' British perspectives on mental health services. America and the United Kingdom have a different health care system than Canada, and therefore more research needs to be conducted on the perspective of South Asian Canadians' mental health service utilization.

2.7 Coping Strategies and Resilience

This topic provides an overview of the research conducted on coping strategies and resilience and its impact on mental health outcomes such as stress, anxiety, depression, insomnia, post-traumatic stress disorder, self-harm, substance abuse, and disordered eating.

Coping strategies are efforts used to regulate emotions, behaviours, cognitions, and environmental aspects in response to the stress of everyday events (Morales-

Rodriguez & Perez-Marmol, 2019). Coping strategies are classified as either evasive or active (Stanislawski, 2019).

An evasive strategy involves diversion from the stressor or associated emotions (Stanislawski, 2019). Individuals who use evasive strategies may engage in risky behaviours such as substance abuse, self-harm, and disordered eating (Stanislawski, 2019). When evaluating the effects of coping strategies on the mental health of individuals during COVID, Budimir et al.'s (2021) findings showed that evasive strategies such as alcohol and cigarette consumption were a negative predictor of life quality and a positive predictor of stress, anxiety, depression, and insomnia. The findings of the study supported the hypothesis that post-secondary students who used evasive strategies had increased stress, anxiety, and depression (Budimir et al., 2021).

Active coping is when an individual takes proactive action by facing the stressor or related emotions (Stanislawski, 2019). Active coping, such as positive thinking and faith, is a positive predictor of psychological life quality and well-being and a negative predictor of anxiety, stress, depression, and insomnia (Budimir et al., 2021). Gustems-Carnicer and Calderon (2013) examined the relationship between coping strategies and the psychological well-being of 98 undergraduates. The findings were consistent with previous studies that showed students who used active strategies had beneficial effects on depression, phobic anxiety, and overall levels of psychological distress (Gustems-Carnicer & Calderon, 2013). The findings of the study supported the idea that post-secondary students who utilized active coping strategies such as mental health apps had beneficial effects on depression, anxiety, and overall levels of psychological distress (Gustems-Carnicer & Calderon, 2013).

A study by Dijkstra and Homan (2016) suggested that perceived self-control was associated with lower levels of psychological distress. People who actively dealt with stressful situations were more likely to feel in control and make proactive decisions (Dijkstra & Homan, 2016). Self-control is important for the development of resilience and the reduction of psychological distress. (Dijkstra & Homan, 2016). Arthuch-Grande et al. (2017) suggested that individuals who had established self-control during childhood became resilient to adversity later in life. Individuals with high self-control were more resilient to adversity because they could effectively use active coping strategies to reframe a threatening situation into a less threatening one (Arthuch-Garde et al., 2017). Thus, both studies suggest that students who possess self-control are more likely to take a proactive approach to managing their psychological distress.

According to Mai et al. (2021), many students experienced mental distress, yet their mental outcomes differed. Mai et al. (2021) suggested that resilience played a vital role in the variation of mental illness among the student population. A study by Russo et al. (2012) defined resilience as an innate trait. The study defined resilience as a collection of biological, genetic, and environmental factors that make up a resilient individual (Russo et al., 2012). Russo et al. (2012) suggested that a range of human genes and polymorphisms, such as NPY, the HPA axis, and noradrenergic, have been linked to a resilient phenotype. However, attributing resilience to an innate trait could imply that individuals who don't have those traits would fail in life. Wu et al. (2013) filled this gap by defining resilience as a dynamic process encompassing positive adaptation within the context of serious adversity. This positive adaptation could imply employing ongoing, active coping strategies to overcome adversity. (Wu et al., 2013).

Although resilience and coping strategies are related constructs, they are both distinct from each other (Zhao et al., 2021). Coping requires a skill set and a purposeful response to stress (Wu et al., 2020b). Meanwhile, resilience is a set of protective factors (ex., close relationships with family and community, an optimistic outlook, and embracing changes) that enable an individual to have a positive outlook on an adverse situation (Thompson et al., 2018). On the other hand, coping strategies may yield either positive or negative results (Thompson et al., 2018; Wu et al., 2013). Therefore, resilience can be attributed to the outcome of the successful adaptation of healthy coping skills (Wu et al., 2013).

Enhancing psychological resiliency using an active coping technique could reduce post-secondary students' negative feelings of stress, anxiety, and depression (Wu et al., 2020b). Zhao et al. (2021) investigated the role of coping strategies as a mediator between resilience and depression among medical students. The findings indicated that coping style had a slight mediating effect between depression and resilience among medical students (Zhao et al., 2021). This study suggested that students who adopt active coping strategies were more likely to perceive a stressful situation as manageable and therefore reduce their risk of mental illness (Zhao et al., 2021). These students had better control of their emotions and can take proactive actions to remove or eliminate the stressor rather than taking no action (Zhao et al., 2021). The findings of this study highlight that coping strategies have the potential to improve psychological resilience among post-secondary students.

Resilience training apps with active coping strategies improved mental health (Voth et al., 2022). The current literature on resilience apps had focused on adults with

specific professions (Nicolaidou et al., 2022). For example, recent bodies of work focused on resilience apps that targeted the mental health of healthcare professionals during COVID and burnout (Nicolaidou et al., 2022). Other studies focused on military professionals and public safety personnel (Voth et al., 2022). There were only two apps identified in the literature that focused on youth. A study by Bucci et al. (2022) focused on youths who were sexually abused and had an adverse childhood. The other study focused on military students with PTSD (Nicolaidou et al., 2022). The evidence leads to a gap in investigating the effects of resilience and apps that integrate coping strategies among post-secondary students.

2.8 Sources of Support for Post-Secondary Students

2.8.1 Traditional In-Person Mental Health Support

This topic covers the effects of counselling and group therapy on mental health outcomes, as well as the barriers to accessing mental health services.

Versteeg and Kappe (2021) found that resilience and university support mediated the predictive effect on academic success and depression among post-secondary students. Counselling and group therapy were protective factors that helped students develop resilience (Locher et al., 2019). These services are classified as psychotherapy and are the most widely used method for mental health management (Locher et al., 2019). Psychotherapy could help clients by changing the meaning of their problems and symptoms while inducing therapeutic change (Locher et al., 2019). Psychotherapy sessions reduced anxiety and depression while also improving overall well-being (Versteeg et al., 2021).

Fawcet et al. (2019) conducted a randomized control trial to examine the effects of group and one-on-one therapy among forty-one post-secondary students experiencing moderate to severe symptoms of anxiety or depression. The findings indicated group and one-on-one therapy reduced anxiety and depression among post-secondary students (Fawcet et al., 2019). However, the study used a small sample size, which could lead to inconclusive results. Similarly, Monti et al. (2013) conducted a study to assess the effectiveness of the psychotherapies delivered by university counselling centres. The study evaluated the effectiveness of counselling therapy among 226 post-secondary students. The symptom questionnaire was assessed prior to the intervention and post-intervention. The findings indicate students utilizing university counselling found a significant increase in their level of well-being and a reduction in their level of distress (Monti et al., 2013). However, the study results may be influenced by cognitive bias. The study result could have been influenced by the therapist who administered the questionnaires during the first and last sessions (Monti et al., 2013).

Counselling is an activity that uses interpersonal relationships to help people develop self-awareness and make positive life changes (Devi et al., 2013). Self-reported data from 571 counselling centres indicated 66% of post-secondary students found mental health counselling improved their academic performance, and 63% found counselling improved student retention (Kivlighan et al., 2021). However, self-reported data can be affected by an external bias, such as social desirability, even where respondents remain anonymous (Kivlighan et al., 2021). Some surveys use single-item questionnaires with inconsistent terminology, which can lead to ambiguous results (Kivlighan et al., 2021).

Although traditional mental health services such as counselling and group therapy are available to students, two-thirds of college students with mental health conditions, including those at risk of suicide and depression, did not seek professional help (Nash et al., 2017).

Several barriers prevent students from accessing professional help. One of the barriers is social stigma, which is the fear of being negatively judged when seeking professional help (Vidourek et al., 2014). The fear of how mental health professionals will view and treat them, the fear of being vulnerable, the fear of self-disclosure, and the notion that perceived risks outweigh perceived benefits have been barriers to seeking professional help (Vidourek et al., 2014). Furthermore, structural barriers such as long wait times and a shortage of providers impede access to mental health care (Vidourek et al., 2014).

However, despite these results, empirical research on the effectiveness of university counselling is both mixed and limited. There is limited knowledge of the adequacy, accessibility, and adherence to best practices of traditional mental health resources among the student population (Kivlighan et al., 2021). Current research on counselling focuses on students' utilization of counselling services instead of the effect of counselling on students' mental health and academic success (Kivlighan et al., 2021).

2.8.2 Non-Traditional Mental Health Services

The topic examines the adoption of mental health applications and how the Technology Acceptance Model and Health Belief Model can influence mental health app uptake.

Many post-secondary students who require mental health services do not seek such services (Tran & Slivestri-Elmore, 2021). Students have low-level help-seeking behaviour and preferred informal offers of support to professional support (Babbage et al., 2018).

The limitations of conventional mental health support could be minimized by mobile apps (Babbage et al., 2018). Post-secondary students were accepting mental health apps as additional support (Kern et al., 2018). A survey on students' usage of mental health apps showed that 25% of college students preferred to use apps to support their mental health challenges (Kern et al., 2018). Nine percent of students preferred mental health apps instead of seeking professional help (Kern et al., 2018). A limitation of the Kern et al. (2018) study is that it uses a survey to collect data on the usage of mental health apps, whereas qualitative research can give a deeper understanding of users' perspectives on mental health apps.

Traditional mental health care has its share of concerns, ranging from limited sessions to long wait times and shortages of staff (Moroz et al., 2020). However, mobile apps offer a timely and cost-effective tool for users to support their mental wellbeing and manage their mental health challenges (Moroz et al., 2020). Students can overcome the barriers associated with traditional mental health concerns, such as long waitlists,

restricted clinic hours, and geographical distance (Koh et al., 2022). The average wait time for counselling and therapy is about 6 months to one year (Moroz et al., 2020). However, students can find relevant information in a timely manner with a mental health app (Koh et al., 2022). Traditional mental health services, such as one-on-one counselling, require users to identify themselves; however, mobile apps allow users to remain anonymous (Koh et al., 2022).

Anderson et al. (2016) used the Technology Acceptance Model as the theoretical framework to explore how consumers use the apps, the perceived benefits from the apps, and suggestions for improvement. The Technology Acceptance Model was derived from the Theory of Reasoned Attention, which stated the person's intention to engage in the behaviour was the best predictor of whether the person would engage in the behaviour. This study used a single, semi-structured interview that incorporated constructs from the Technology Acceptance Model. These constructs are perceived usefulness and perceived ease of use. The study identified automation, convenience, and health literacy as factors that affected the utilization of apps. For example, users found the automation of in-app functions such as reminders useful. Additionally, convenience also impacted the utilization of the app. A participant stated they kept track of their blood sugar levels, meals, time goals, and food intake with a built-in planner app. The significance of the study (Anderson et al., 2016) was that it provided the relevant framework for qualitative research to explore consumer experiences with mobile apps. While Anderson et al. (2016) used the Technology Acceptance Model to explore consumers' usage of self-care apps, the study focuses on a broad range of health topics, including blood pressure, self-care, mental health, medication, etc. Future studies should focus on a specific group of

people (post-secondary students) and a specific health condition, such as mental illness. This enables the researchers to draw effective conclusions about post-secondary students' usage of mental health apps.

A study conducted by Alharbi et al. (2022) used the Health Belief Model as a theoretical framework to understand the participants' usage of mobile apps. The Health Belief Model described two cognitive processes that determine how an individual behaves in response to a threat: 1) how the individual views the severity of the threat, and 2) their perception of how efficient and resilient they are to the disease. The study concluded that perceived benefits and self-efficacy were the pivotal predictors for the adoption of mental health apps. A limitation of the study was that the data were cross-sectional, and therefore biases could result from self-reported and non-response data.

Ahadzadeh et al. (2015) used the integration of the Technology Acceptance Model and Health Belief Model as theoretical frameworks to research internet usage intended for health-related purposes. The study was significant as it stated that, individually, both models cannot explain the cognitive and related mechanisms associated with internet use. Ahadezadeh et al. (2015) stated that while the Technology Acceptance Model could explain user acceptance of technology, the model is inadequate as it relies on only two factors: perceived usefulness and perceived ease of use. Meanwhile, the Health Belief Model could explain the factors that influence health-based behaviour but not the mechanisms that led to those behaviours. Hence, this study proposes a model that incorporates constructs from the Technology Acceptance Model and Health Belief Model (perceived health risk and consciousness of health). The model proposed that perceived usefulness and attitude towards internet use for health mediate

the relationship between health risk, health consciousness, and health-related internet use behaviour. The study showed that perceived health risks and health consciousness had a positive impact on internet use. The study also showed that the perceived usefulness of the internet and attitudes toward health-related purposes mediate the influence of health-related consciousness. Although the study did not directly discuss mental health apps, it found that integrating the Technology Acceptance Model and the Health Belief Model could explain cognitive and related mechanisms associated with eHealth.

Current bodies of work focus on using surveys to collect data on the usage of mobile apps among post-secondary students; more in-depth interviews that use a theoretical framework can contribute to understanding students' perceptions and usage of mobile apps. While Anderson et al. (2016), Alharbi et al. (2022), and Ahadzadeh et al. (2015) use a theoretical framework to explore the usage of mental health apps, the demographics of the study population were evaluated based on the majority of the population, whose demographic characteristics differ from those of female Sri Lankan students. It is important to consider how socio-economic factors such as gender and ethnicity, which are sparse in digital health research, can influence the uptake of mental health apps.

2.8.3 Digital Health Interventions among South Asians

This topic provides an in-depth analysis of the factors influencing the uptake of digital health interventions among South Asians.

Hoque and Souwar (2017) explored the adoption of mental health apps in Bangladesh by using the theoretical framework of the Technology Acceptance Model and

empirically testing it for the key factors influencing the adoption of mental health apps. A structured questionnaire was collected among 350 participants in Dhaka, the city of Bangladesh. The findings of the study suggest that perceived usefulness, perceived ease, and trust had a significant effect on the intention to use e-Health and that perceived ease of use is positively associated with perceived usefulness. Privacy had no significant effect on the intention to use e-health. Perceived usefulness is significantly associated with perceived usefulness.

Hyman et al. (2022) conducted a focus group to understand the barriers and facilitators of digital health tool uptake experienced by the South Asian community in Canada. The factors for using mental health apps include ease of use, convenience, enhancing awareness of health, and reducing the need for hospitalization. The barriers to using mental health apps include language barriers, gender roles (women reporting less digital health tool use because of caring and familial responsibilities), limited trust in digital health interventions, low self-efficacy, and a lack of motivation and awareness.

Sinha Deb et al. (2018) conducted a mixed-methods study to understand the health technology use, perceived needs, and accessibility of app-based interventions in patients with severe mental illness to improve illness management and reduce caregiver burden in India. The findings of the study suggest cost, unfamiliarity, and language were significant barriers to the adoption of apps. Alarms and reminders, a digital diary to monitor tasks, individualized and flexible apps, passive monitoring, motivating messages, stories, and poems to improve patients' moods, and mobile games to reduce patients' distress were facilitators for using the mental health app.

There is a lack of literature on the use of digital health interventions among Sri Lankan students. Current literature homogenizes South Asians' experience of digital health interventions; however, South Asia has diverse cultures and values that can impact the type and severity of mental illness. More research needs to focus on Sri Lankan students' experiences with mental health apps to create tailored apps and improve the retention rate of mental health apps within the Sri Lankan community.

2.8.4 Mobile Apps as a Coping Strategy and Their Impact on Mental Health Outcomes

This topic provides an in-depth analysis of emotion-focused and problem-focused coping strategies and their impact on the mental health of individuals. The reported mental health outcomes include anxiety, stress, depression, self-awareness, mania, and overall mental wellbeing. It was also determined that integrating both problem-focused and emotion-focused coping apps led to an improvement in academic performance and a higher GPA score.

Mental health apps incorporate active coping strategies and skills that facilitate resilience among post-secondary students (Chandrashekar, 2018). Individuals' psychological distress may be reduced by resilience training apps, particularly when they emphasize active coping strategies (Mozid, 2022). These apps can be divided into two categories: those that incorporate emotional regulation techniques and those that incorporate problem-solving techniques.

Meditation, relaxation, and yoga apps use emotional regulation techniques, such as deep breathing and awareness, to regulate emotions (Subic-Wrana et al., 2014).

Emotion-focused techniques regulate the emotional response to stress (Kristofferzon et

al., 2018). This method involves consciously being aware of one's emotions instead of suppressing them (Subic-Wrana et al., 2014). Apps that incorporate emotion-focused strategies have shown improvements in anxiety, stress, and depression among university students (Kristofferzon et al., 2018). For example, Huberty et al.'s (2019) study examined the effect of a meditation app called Calm among 88 undergraduate students. The study is a randomized control trial that evaluates the effects of the apps on stress levels while the control group is wait-listed. For 8 weeks, the participants were to use the app to meditate, and the findings show significant reductions in stress levels. Similarly, Orosa-Duarte et al. (2021) conducted a randomized control trial to investigate the effect of a mindfulness-based app and in-person mindfulness training among 168 healthcare students. The mindfulness app group experienced decreased anxiety levels compared to the in-person group (Orosa-Duarte et al., 2021).

Meanwhile, apps such as self-tracking, goal setting, and planning use problem-solving strategies to identify the stressor and help minimize its impact (Kristofferzon et al., 2018). MyTherapy, Moodkit, Moodtracker, and Daiylo are apps that employ self-tracking and self-monitoring strategies. These apps enable the individual to take appropriate action to adapt their behaviour and thus tackle the stressor head-on (Kristofferzon et al., 2018). Similarly, apps targeted at identifying and eliminating stressors have a positive impact on mental well-being (Kristofferzon et al., 2018). Bakker and Rickard (2019) examined the effects of a self-monitoring app called "Mood Prism" on the mental health outcomes of 234 Mood Prism app users. The findings indicated a decrease in depression and anxiety and an increase in mental well-being and self-awareness. Additionally, Faurholt-Jepen et al. (2019) examined the use of an electronic

self-monitoring system called the Pulso and Triglogis-Monsenso systems among 60 patients with bipolar disorder. The study found a reduction in depression and mania symptoms in patients with bipolar disorder. Current bodies of work focus on examining the effects of meditation apps on post-secondary students, and there are limited studies on students' usage of self-tracking apps.

According to the above results, apps that incorporate emotion-focused and problem-focused strategies improve post-secondary students' mental health. However, apps that only include one coping feature, such as self-tracking or reflection, are ineffective in reducing post-secondary students' psychological symptoms (Stallman et al., 2022).

Ponzo et al. (2020) conducted a randomized control trial with 262 undergraduate students, comparing the Biobase app to a waitlist group. The Biobase app aimed to improve individuals' well-being by integrating elements of mindfulness, biofeedback, cognitive behavioural therapy, and behavioural activation therapy. The app used a combination of emotional regulation (mindfulness) and problem-solving (cognitive-based therapy) strategies. The intervention group was encouraged to use the app daily. Ponzo et al. (2020) administered a six-item Spielberger State-Trait Anxiety, a short version of the 10-item state subscale of Spielberger State-Trait Anxiety, to evaluate anxiety levels among the undergraduate student population. The study found that after four weeks of using the Biobase app, students experienced a significant reduction in their anxiety level and improved well-being compared to the waitlist group. The study supports the idea that mental health apps have a positive impact on anxiety levels among undergraduate students.

In another randomized control study conducted by Lathinen et al. (2021), 561 university students and staff were divided into an intervention group (a mindfulness app) and an active control group (a psychoeducational content group). The study employed self-assessment tools such as the General Anxiety Disorder (GAD-7) questionnaire and the Beck Depression Inventory scale to evaluate anxiety and depression among students and staff. The study found a significant reduction in anxiety and depression levels in the intervention group compared with the control group. The study supported the view that apps that use emotion-focused coping strategies could reduce anxiety symptoms among post-secondary students. Current bodies of work focus on using randomized control trials to examine the impact of mental health apps on the anxiety levels of post-secondary students; thus, there needs to be more qualitative research to explore students' perspectives on using apps to support managing their anxiety.

A study by Harrer et al. (2018) conducted a randomized control trial to evaluate the efficiency of an app-based stress intervention among 150 post-secondary students. The app (Studi Care) incorporated mindfulness and problem-solving strategies for reducing emotional strain and improving academic success. The study used the perceived stress scale (PSS-4) to evaluate stress levels among students. The researchers found that three months of app-based stress management reduced stress and anxiety and improved GPA scores. However, a limitation of the study is that it uses self-reported data, and therefore biases such as social desirability and non-response can distort the validity of the results (Harrer et al., 2018).

Schulte and Frankenfield (2022) investigated the impact of an eight-week mindfulness app training on stress levels and life satisfaction among 64 part-time

university students. The participants in the intervention group were asked to complete one training session for 15 minutes per day. A self-reported questionnaire was assessed at baseline and after 8 weeks. The findings showed a slight reduction in stress levels and an increase in self-regulation. The study supported the idea that emotion-focused strategies, such as mindfulness, are effective in reducing stress among post-secondary students. One limitation of the study is that participants scored higher on emotional measures in order to appear socially desirable (Schulte & Frankenfield, 2022). This bias has the potential to distort the study's validity.

Ludtke et al. (2018) conducted a randomized control trial to evaluate the effectiveness of a smartphone self-help app among 90 post-secondary students. The intervention group used the self-help app "Be Good to Yourself," a cognitive-based therapy self-help app, for four weeks. The control group received the app after four weeks. The primary outcome of the study was a reduction in depression level as measured by the Patient Health Questionnaire-9 (PHQ-9), and the secondary outcomes were improvements in self-esteem (Rosenberg Self-Esteem Scale) and quality of life (WHO Quality of Life-Bref). The study supports the idea that problem-focused coping strategies, such as cognitive-based therapy, reduce depression levels among students. A limitation of the study is that participants in the intervention group were also seeing a therapist; therefore, the reduction in depression levels can also be a result of seeing a therapist (Ludtke et al., 2018).

Deady et al. (2022) conducted a randomized controlled trial to examine the effectiveness of a smartphone app in reducing depression symptoms among Australian workers. The study included 1128 workers who were assigned to use the Headgear

smartphone app, which incorporates behavioural activation and mindfulness strategies. Meanwhile, 1143 workers were assigned to a 30-day self-monitoring app. The study employed the PHQ-9 (Patient Health Questionnaire-9) to assess depression levels among Australian workers. The findings of the study found that workers had a significant reduction in depression levels when using the Headgear App. Consistent with the findings of mobile apps' effects on stress and anxiety, mobile apps have a positive effect on depression.

Current research examines post-secondary students' experiences with apps on their mental health using randomized control trials and self-reported assessments (Deady et al., 2022; Harrer et al., 2018; Lathinen et al., 2021; Ludtke et al., 2018; Ponzio et al., 2020; Schulte & Frankenfield, 2022). There needs to be more qualitative research exploring post-secondary students' experiences of using mobile apps. There is also an underrepresentation of ethnic minorities in the research on mental health apps; more research needs to be conducted on ethnic minorities. The literature review also identifies a gap in investigating the attrition rate of mobile app use among post-secondary students.

2.8.5 Pitfall of Mobile Apps

The study looks at how safety concerns, privacy and confidentiality concerns, and a lack of engagement affect the uptake of mental health apps. Although mental health apps are proliferating in the marketplace, some of these apps pose a safety concern when they contain inaccurate or untrustworthy content (Akbar et al., 2020). Apps can present a safety risk due to the absence of evidence-based content, validation tools, and medical expertise (Akbar et al., 2020). According to Marshall et al. (2019), 293 apps claimed to offer therapeutic treatment for depression and anxiety. However, of those apps, only

3.41% had published research on their effectiveness. Similarly, Drissi et al. (2021) conducted a systematic review to examine the effectiveness of eHealth in managing the mental health of healthcare workers. The findings of the study suggested that only 27% of publications included empirical evaluation and used an adequate sample size of the population (Drissi et al., 2021). Further, the mental health apps available in the marketplace lack standard validation tools, such as diagnostic, screening, and assessment tools (Akbar et al., 2020). For example, only one-third of self-management apps used validated screening measures or implemented evidence-based practices (Akbar et al., 2020).

The lack of evidence-based information found in smartphone apps could be attributed to the lack of involvement of medical experts in the development of mental health apps (Akbar et al., 2020). A systematic review showed that medical expert involvement in the development of medical apps was found in only 9–67% of assessed apps (Subhi et al., 2015). Medical experts' involvement in the development of mental health apps can help prevent the dissemination of false information (Akbar et al., 2020). Nicholas et al. (2015) found that an app intended for bipolar disorder incorrectly differentiated between bipolar I and bipolar II. Another app had falsely recommended individuals living with bipolar disorder to take a shot of hard liquor before bed (Nicholas et al., 2015). There have also been reports of apps providing incorrect instructions to their users (Akbar et al., 2020). According to reports, some apps fail to advise users to consult a mental health professional when feeling suicidal (Akbar et al., 2020).

Akbar et al.'s (2020) study indicated that although apps have the potential to improve post-secondary students' mental health, they pose a safety risk when they

contain unreliable and inaccurate information. According to Dennison et al. (2013), users who believe the apps have provided inconsistent or inaccurate advice are more likely to abandon the apps. Users are more likely to download an app if it was developed by experts than by individuals with less reputable backgrounds (Dennison et al., 2013). These studies support the notion that safety concerns pose a barrier for post-secondary students who want to use mental health apps to support and manage their mental health concerns.

A cross-sectional study conducted by Krebs and Duncan (2015) investigated the usage of mobile apps. The study stated that more than 40% of mobile users reported choosing not to download mobile apps. One of the reasons was security and privacy. According to a study conducted by Giunti (2018), consumers raise concerns about third parties having access to their data. A participant states that if a third party can access their data, they will not engage with mobile apps. Dennison et al. (2013) conducted a focus group with students and staff members at a university to investigate the challenges and opportunities of using mobile apps. The findings of the study suggested that few students are willing to use the app to assist them with behavioural change. Participants raised concerns regarding privacy and security. Students stated they are not fond of having third parties access their data. Students express concerns about app features that track their location, such as GPS, and apps that employ a context-sensitive approach to generate reminders or suggestions. The study supported the idea that privacy and security are barriers to mental health app usage among post-secondary students.

Although mental health apps have the potential to improve mental health outcomes, post-secondary students' suboptimal engagement with the app could impede its

effectiveness (Wong et al., 2021). Hence, using mobile health apps consistently can be a predictor of achieving optimal mental health outcomes. Chiauzzi and Newell (2019) found that 23% of users abandoned mental health apps after one use. Similarly, Garrido et al.'s (2019) review of 32 mental health studies found that 20% of studies reported a high retention rate for mental health apps. This shows that mental health apps have a poor engagement rate among their users. Current literature highlights a lack of direct evidence to explain the suboptimal engagement of mobile health apps among post-secondary students.

While mobile apps may address many barriers to traditional mental health, they likely have unique barriers of their own. Addressing barriers to mental health apps can help understand the quick turnover of mental health mobile apps. Moreover, qualitative research that focuses on identifying barriers to mobile apps is essential for future apps targeting mental illness, particularly for individuals facing barriers to accessing traditional mental health care (Stiles-Shields et al., 2017). When barriers are not identified, app developers must rely on intuition (Stiles-Shields et al., 2017). This raises the possibility that design decisions will result in a mismatch between user needs and perceptions of delivery mechanisms (Stiles-Shield et al., 2017).

2.8.6 Research Question

Based on the gap identified, this research aims to answer the following question: What are the barriers and facilitators to the usage of mobile mental health apps among female Sri Lankan post-secondary students? The specific objectives of the study are to 1) assess users' perceptions of mobile health apps; 2) identify barriers and facilitators associated with usage of mobile health apps; and 3) use the Health Belief Model and

Technology Acceptance Model to explore female Sri Lankan post-secondary students' experiences using mental health apps.

Chapter 3: Methodology

3.1 Overview

This chapter details the process that the study will follow. The study design to answer the research question using a qualitative descriptive approach; the population under study and sampling; the recruitment process; data collection; data analysis; and the description of the assessment of the rigour of the study.

3.2 Ethical considerations

Ethics approval for this study was granted by Ontario Tech University Research Ethics Board (REB) on February 17, 2023 (REB # 17159). See Appendix A

3.3 Study Design and Method

The study will employ a qualitative descriptive design. Qualitative descriptive research aimed to provide rich and authentic descriptions of participants' experience and perceptions of the phenomenon being investigated (Doyle et al., 2020). It provides a straightforward description of experiences and perceptions of a phenomenon in areas where little is known about the topic (Doyle et al., 2020).

A qualitative descriptive design was chosen with the aim of gaining detailed insight into female Sri Lankan post-secondary students' perceptions of mental health apps. The aim is to understand the motivation and intention as well as the challenges and barriers that female Sri Lankan post-secondary students experience while using mental health apps. Identifying these barriers is critical for the success of future iterations of apps in delivering care to racial and ethnic minorities experiencing barriers in accessing mental health services (Schulte-Frankenfeld & Trautwein, 2022).

While there is a plethora of studies on quantitative research on the effectiveness of mental health apps, there are limited studies on qualitative research on understanding the suboptimal engagement of mental health apps among post-secondary students. This qualitative descriptive approach will use open-ended questions to grasp experience, perception, and attitude, which can be difficult to capture quantitatively (Kim et al., 2022).

3.4 Population under study and sampling

The study will use purposive sampling to recruit participants. Purposive sampling enables the researcher to intentionally select participants who will provide rich textural content (Palinkas et al., 2015). Information-rich cases enable the researcher to gain in-depth insights into a phenomenon (Palinkas et al., 2015).

The saturation point is the gold standard of rigour in determining the sample size for a study (Saunders et al., 2018). Saturation is defined as the point at which gathering additional information becomes redundant, leading to no new insights into a phenomenon (Saunders et al., 2018). Vasileiou and colleagues (2018) stated that to understand a phenomenon, a small sample size is adequate to obtain empirical data.

A small sample size is further justified by Morse's (2015) claim that the sample size is determined by the quality of the data being collected. Thus, the greater the amount of usable data obtained from each person, the fewer participants are needed. Usable data refers to providing a rich and in-depth understanding of the participants' perspective of a phenomenon (Morse, 2015). The other rationale for choosing a small sample size is that the targeted sample group is homogenous, and as a result, a small sample size would be adequate to capture the significant differences and patterns within that group.

The researcher will use a small sample size of 3 participants. The researcher will use purposive sampling to recruit participants who will provide rich information in relation to the phenomenon (Palinkas et al., 2015).

The eligibility criteria for the study will include first-year undergraduate Health Science students enrolled in the programs of Human Health, Public Health, and Kinesiology; they must be age 18 or older; they must be of Sri Lankan descent; female; they have used a mental health app intended for anxiety, depression, or stress within the past six months; they have been clinically diagnosed or self-diagnosed with stress, anxiety, or depression; and they must speak and comprehend English. The study will exclude participants on the basis that they are below the age of 18; have a severe mental health disorder that interferes with their cognitive ability; or cannot read or understand English.

The demographics of our studied population are first-year female Sri Lankans enrolled in health science programs. Sri Lankan women had a high prevalence of mental disorders and an underutilization of mental health services (Shanmuganandapala, 2020). Female Sri Lankans in Ontario are underrepresented in mental health studies, and moreover, there are little to no studies investigating Sri Lankan experiences of digital health interventions (Shubhanandapala, 2020). Understanding female Sri Lankan experiences with mental health apps can help app developers create apps tailored towards them.

The study selected first-year students who had more stressful and unstable situations compared to mature students who had more consistent experiences. By targeting first-year students rather than mature students, we will get a more in-depth and

varied response, leading to valuable insights into the phenomenon under investigation and contributing to a deeper understanding of the usage of mental health apps among female Sri Lankan students.

First-year students faced difficult challenges as they adjusted to university life (Howard et al., 2022). Stress, anxiety, and depression could result from changes in the social environment as well as increased autonomy and responsibilities (Howard et al., 2022). The negative outcome of mental illness could impact other areas of life, including employment, academic performance, and relationships (Howard et al., 2022).

A longitudinal study conducted by Purthran et al. (2016) found that medical freshman university students experienced the highest rate of depression at 33.5% but significantly declined over time to 20.5% before graduation. Similarly, a study conducted by Liu et al. (2019) found that first-year university students experienced a higher prevalence of anxiety than mature students.

The researcher will recruit students from the programs in Health Sciences. A study conducted by Worku et al. (2020) shows that there is a high incidence of stress among Health Science students.

3.5 Recruitment Process

The study will use email to recruit participants enrolled in first-year undergraduate Health Sciences programs in Kinesiology, Human Health, and Public Health. We had sought approval from Ontario Tech University's Student Learning Centre's Communication to send an email to all first-year students enrolled in the

program of Health Sciences. Email was the chosen strategy because it allowed us to reach a large pool of candidates efficiently.

3.6 Data Collection

The interviews will be conducted virtually with Google Meet. The semi-structured interview is best suited for the study design because it uses open-ended questions to collect data (Dejoncheere & Vaughn, 2019). The semi-structured interview will enable the researcher to explore participants' thoughts and perceptions of a phenomenon (Dejoncheere & Vaughn, 2019). While there are studies that use quantitative research to investigate mental health apps, there are only a few studies that use qualitative, semi-structured interviews to investigate students' perceptions of mental health apps (Wong et al., 2021). Previous knowledge creates a predetermined framework for the interview (Busetto et al., 2020). As a result, the researcher will conduct a thorough literature review on post-secondary mental health app usage, and the semi-structured interview guide will include questions based on the Technology Acceptance Model and the Health Belief Model. The researcher will pilot-test the interview guide with a participant from the study population. Testing the preliminary guide will make the questions more relevant, assure their intelligibility, and elicit the participants' varied perceptions and experiences (Dejoncheere & Vaughn, 2019). Based on the respondent's responses, the interview guidelines will be reformulated to make the questions more relevant (Dejoncheere & Vaughn, 2019). Probes were added to make interview questions more applicable to the participants. The interview guide can be found in Appendix B.

3.7 Data Analysis

The researcher will use the software Otter AI to audio record the semi-structured interviews. A verbatim transcript will be produced with the software Otter AI. The researcher will review each transcript and compare it with the audio recording to check for details. Any personal identifiers, such as age, gender, or institution, which can link back to the participants will be anonymized.

The study will use a thematic analysis process based on Braun & Clarke's (2013) six phases for conducting a thematic analysis. The first phase of the data analysis will be familiarization (Braun et al., 2017). This phase involves immersing oneself in the data by re-reading or actively reading the data and searching for meanings, patterns, etc. (Braun & Clarke, 2013). As part of the familiarization phase, we assessed low self-efficacy and high self-efficacy by analyzing the language and the emotional response to using mental health. We coded data regarding low self-efficacy that uses language that demonstrates uncertainty, self-doubt, a lack of confidence, and emotional responses to challenges such as frustration or overwhelming. For high self-efficacy, we coded data that uses language where the participants expressed confidence in their skills in using mental health apps or successful adoption of the mental health apps.

The second phase will be generalizing initial codes (Braun & Clarke, 2013). Once the researcher becomes familiar with the data, the next step will be creating initial codes (Braun & Clarke, 2013). Code identifies a feature of the data that appears interesting to the analyst (Coates et al., 2021). They are often the most basic segment or element of the raw data that can be assessed meaningfully regarding the phenomenon (Coates et al., 2021). While analyzing the data, the researcher will code relevant data that applies to the

research question and the objectives. The researcher will maintain rigour in their coding by coding the data set twice with a fresh transcript (Braun et al., 2017). The researcher will have a two-week break between each coding session (Braun et al., 2017). This will allow the researcher to have a fresh perspective when coding the data.

The third phase will be searching for themes. This phase will involve sorting different codes into themes and collating all relevant code extracts within identified themes (Braun & Clarke, 2013).

The fourth phase of thematic analysis will be refinement. During this phase, the researcher will check to see whether data within themes coheres meaningfully and whether each theme is distinct from the others (Braun & Clarke, 2013). There are two levels of refinement. The first level of refinement is to read all the collated data extracts for each theme and see if they form a pattern (Braun & Clarke, 2013). The second level is deciding the validity of each individual theme in the data set (Braun & Clarke, 2013). During the second level, the researcher will check if the theme works in relation to the data set (Braun & Clarke, 2013). The researcher will code any additional data extracts within themes that were missing in the earlier coding stages.

The fifth phase of data analysis will define and name themes. During this phase, the researcher will identify the essence of what each theme is about, provide a detailed analysis of each theme, and determine the story of each theme (Braun & Clarke, 2013).

The sixth phase will involve producing a comprehensive report on the research's findings (Braun et al., 2017). During this stage, the report findings should not be a simple

description of data but an argument that is related to the research question (Braun et al., 2017).

3.8 Methodological Rigor

To address any potential bias in the data analysis, the study will implement Lincoln and Guba's four criteria for rigour. The qualitative method to assess rigour will include credibility, transferability, dependability, and confirmability strategies (Johnson et al., 2020). Lincoln and Guba defined credibility as the ability to establish that the results collected from the participants are proven to be credible, believable, and true (Forero et al., 2018). They stated that credibility is established through accurate descriptions or interpretations of phenomena (Johnson et al., 2020). Lincoln and Guba recommend "member checking" as a method to establish credibility (Forero et al., 2018). "Member checking" is the process of asking the participants to check the transcript for accuracy (Forero et al., 2018). A copy of the interview transcript was sent to each of the respective participants to review the document for the accuracy of the data.

Lincoln and Guba defined "transferability" as the extent to which the result can be generalized or transferred to another context or setting (Johnson et al., 2020). Lincoln and Guba described a "thick description" to establish rigour in the study (Forero et al., 2018). A concise description of the phenomena enables the reader to decide whether the results are transferable to other settings (Forero et al., 2018). The researcher will provide a detailed description by incorporating direct quotes that accurately characterize and capture the thoughts, perceptions, and emotions that the participants experience with mental health apps.

Another criterion for establishing rigour is dependability. Dependability is a strategy used to check if the findings are consistent and can be replicated (Johnson et al., 2020). The researcher will implement the coder-recorder method to establish dependability (Castleberry & Nolan, 2018). The researcher will code and recode their data throughout the analysis phase of the study (Castleberry & Nolan, 2018). After coding a section of the data, the researcher will wait two weeks and recode the data. The researcher will compare the two sets of coded materials (Castleberry & Nolan, 2018).

Lincoln and Guba defined confirmability as the degree of neutrality, or the extent to which the findings of the study are shaped by the respondent and not the researcher's subjectivity (Forero et al., 2018). Field notes will be used throughout the research process to capture additional contextual information and potential biases. The researcher will practice reflexivity and assess one's own thoughts, assumptions, and beliefs that could affect the subjectivity of the study results (Forero et al., 2018).

3.9 Researcher Reflexivity

Since the researcher is the instrument in this semi-structured interview, their unique experience and bias can influence the empirical materials of the study. Therefore, it is essential that I, as a researcher, disclose my position in the study to the reader to reduce potential bias. In this study, I examined female Sri Lankan post-secondary students' perspectives on using mental health apps to support and manage their mental health concerns. My personal experience working with young adults with mental health challenges shows that the asymmetrical power relations between the interviewer and the participant can pose an underlying threat to the validity of the study. In order to mitigate

any potential bias, I kept a reflective journal and noted any prejudice or subjectiveness that could distort the validity of the study.

Reflectivity is defined as examining one's conceptual lens, implicit and explicit assumptions, perceptions and their effects on the setting and people being studied, questions being asked, data being collected, and its interpretation. Thus, it is essential to examine how my personal experience, knowledge, or lack thereof can influence the transparency and rigour of the study and the credibility of the research findings. Since I am the primary instrument of the research and the data was obtained through collaboration between the researcher and the participant, it is essential to pay attention to reflexivity. Thus, in the following, I provide a brief overview of my personal experience and prior knowledge to help the readers understand how these events shaped my role in the research project.

A few years ago, while I was a freshman at the university, I faced challenges in accessing mental health support services. Coming from a Sri Lankan background, mental health has been taboo in our culture. Sri Lankans with mental health diagnoses are neglected and isolated from society, and being a female with mental health illness is deemed unmarriageable. While social stigma has been the primary barrier to accessing mental health support, there were other barriers that I faced, like waiting times and not knowing where to get help. I was looking for a solution, and then a friend introduced me to mental health apps. Although mental health apps had helped me to support my mental health challenges, some of the features of the apps were not catered to ethnic minorities. A lack of ethnic diversity represented in content creations (avatars with different skin colours) and limited language availability may not be appealing for ethnic students.

Therefore, learning from female Sri Lankan post-secondary students' experience with mental health apps can help app developers create engaging apps and increase retention rates within the targeted population group. This was the primary motive for conducting this qualitative research.

I gained firsthand experience working with young people from various social backgrounds during my employment as a mental health support worker. From my experience working with young adults, academic stress was a primary concern for their increasing psychological distress. I had listened to concerns from students expressing that their busy schedules and transportation costs were a barrier to accessing mental health support, and some students expressed paranoia about their families or friends finding out they use mental health services. I had introduced some of my clients to mental health apps as complementary therapy for traditional mental health care. Some of my clients have opted out of counselling and continue to use apps to support their mental health concerns.

I worked as a research assistant for the Centre for Addiction and Mental Health (CAMH). During my employment at CAMH, I assisted researchers in conducting a study among youth and adolescents to understand who is at highest risk of developing psychosis and the relationship between risk and psychosis. I assisted in recruiting participants, conducting interviews, and coordinating the collection of data from them.

Chapter 4: Study Findings

4.1 Chapter overview

This chapter includes a description of the participants' demographic information and the themes that emerged from the semi-structured interviews. Six major themes were identified: 1) Perceived Severity of Mental Illness; 2) Cues to Action Using the Mental Health App; 3) Self-efficacy and Coping Strategies; 4) Barriers to Using Mental Health Apps; 5) Benefits of Using Mental Health Apps; and 6) Recommendations for Improving the Engagement of Mental Health Apps. There were two sub-themes that emerged for the theme of self-efficacy and coping strategies: 1) High Self-efficacy and Problem-focused Coping Strategies; and 2) Low Self-efficacy and Emotion-focused Coping Strategies. There are seven sub-themes that emerged as barriers to using mental health apps, which are: 1) Cost; 2) Lack of Awareness; 3) Access; 4) Credibility; 5) Privacy; 6) Perceived Ease; and 7) Perceived Usefulness. There were five sub-themes that emerged for the benefits of using mental health apps, which are: 1) Perceived Ease; 2) Perceived Usefulness. 3) Access; 4) Support System; 5) Privacy

4.2 Demographic Information of Participants

Table 1 illustrates the demographic information of each of the three participants. The questionnaire consists of four questions pertaining to their age, gender, study year, and ethnicity. The demographic information was collected at the beginning of the interview. All the participants were women and Sri Lankan Canadians. The average age of the participants was 19 years old.

Table 1: Descriptive Demographic Information for Each of the Participants from the Study's Interview

Participant (P) number	Participant's gender	Participant's study year	Participant's age	Participant's ethnicity
1	Female	1	19	Sri Lankan
2	Female	1	20	Sri Lankan
3	Female	1	19	Sri Lankan

4.3 Findings

Table 2: Overview of the major themes and sub-themes

Themes	Description of Themes	Sub-themes	Meaning
Perceived Severity of Mental Illness	Participants perception of the intensity of mental illness.		The person's feelings on the seriousness of contracting an illness or disease.
Cues to Action for Using Mental Health Apps	Stimuli that trigger action toward health behavior.		Internal and external factors motivate post-secondary students to use mental health apps.
Self-efficacy and Coping Strategies	Participant perceived confidence in using problem-focused coping and emotion-focused coping	-High Self-efficacy and Problem-focused Coping Strategy	Self-efficacy is the extent or strength of one's belief in one's ability to complete a task (Subasi, 2020). Self-efficacy indirectly influences coping strategies through intrinsic motivation (Subasi, 2020). Intrinsic motivation refers to a

	to support their mental health.	- Low Self-efficacy and Emotion-focused Coping Strategy	highly desired form of incentive that stems from a person's internal desire for self-satisfaction or pleasure in performing tasks (Subasi, 2020). Students' who use problem-focused coping strategies have high self-efficacy and are more likely to feel motivated to take proactive actions in dealing with stressors and not give up when faced with setbacks, whereas students who use emotion-focused coping strategies have low self-efficacy and lose motivation when coping with challenges (Subasi, 2020).
Barriers to Using Mental Health Apps	Obstacles the participants experience when utilizing mental health apps	- Cost - Lack of Awareness - Access - Credibility - Privacy - Perceived Ease - Perceived Usefulness	Perceived risk of adhering to mental health apps.

Benefits of Using Mental Health Apps	Participants' perceived rewards from engaging with mental health apps.	<ul style="list-style-type: none"> - Perceived Ease - Perceived Usefulness - Access - Support System - Privacy 	The degree to which the person believes using a mental health app is free of effort and useful in supporting mental health needs.
Recommendations for Improving the Engagement of Mental Health Apps	Suggestions for enhancing the engagement of mental health apps.		Enhancing the utilization of mental health apps among post-secondary students by ensuring data protection through privacy notices, app promotion of social media sites, and interactive apps such as gamification, guided mediation, live chat, and live therapy.

The study presents the results of a qualitative study aimed at investigating the barriers and facilitators to using mental health apps.

Main Theme 1: Perceived Severity of Mental Illness

A theme that emerged was how the participants viewed the severity of their mental illness. Participants perceived that their mental illness as not severe. They believed seeking a therapist should be reserved as a last resort for seeking help when other options have been exhausted. The participants perceived the severity of their mental

illness as low and requiring a minimal level of behavioural intervention, such as using mental health apps, as opposed to seeking therapy.

"Instead of, like, going to a therapist and making it seem like I have bigger issues and actually do". (P2)

"But like some people, they are at a point where they completely feel like they need help with another person". (P1)

"Like I said, it was kind of like being stressed about a test, not something like a serious thing, if that makes sense". (P2)

Main Theme 2: Cues to Action for Using Mental Health App

Participants were influenced by internal and external cues to use Notion and the Daily Bean apps. One of the participants shared that she was triggered to utilize the mental health app as a result of minor stressors.

"But because I was just kind of using it for, I would say like minor things like minor mental health stressors that would come up." (P2)

Another participant repeatedly expressed concerns that her life has become a blur. She described how using Daily bean helped her differentiate her days and allowed her to set time for herself.

"I feel like every single day its kind of just became a blur. At some point, its kind of just felt like every single day was like the same exact thing, and it was kind of like going on end and pretty tiring, so I feel like to help keep track, keep records, and be able to differentiate each day". (P1)

“At some point, like with school and everything, everything just starts, you know, as I said before, like to blur together, and I was just like, kind of hard to set some time for myself.” (P1)

One of the participants discussed how external cues such as friends, social media websites like Tik Tok, and influencers motivated her to use the Notion mental health app.

“My friend uses it, and I saw it on, like, Tik Tok too. But then, I was just like, let me just look at what this app is even about. Like what's on it, and then I'm just like, okay, this is everything that I needed, and it's completely free too.” (P3)

“Um, yeah, I do. Um, a daily reflection, because it's also like, I've seen a bunch of influencers doing the writing into the journals and seeing, like, you know, expressing gratitude for, you know, what, The Five-Minute Journal?” (P3)

Main Theme 3: Self-efficacy and Coping Strategies

The participants reported using apps such as Clear Fear that incorporate emotion-focused coping strategies and problem-focused coping strategies such as Notion and Daily Bean. Apps with problem-focused coping strategies, such as Notion and Daily Bean, removed the stressor by actively monitoring their habits. High-self-efficacy individuals used the apps with problem-focused coping strategies and continued to use them. Intrinsic motivation and accountability were mentioned by participants as components that influenced self-efficacy.

Meanwhile, apps with emotion-focused coping strategies, such as Clear Fear focus on minimizing or regulating the negative emotions associated with a problem through relaxation techniques such as breathing and walking. Individuals with low self-

efficacy were more likely to avoid stressful situations, which manifested as distractions. One participant reported that going through the Clear Fear app is a coping strategy in itself because it distracts them from what they are currently feeling. Individuals who were low self-efficient were less likely to learn about the apps, which made them perceive the Clear Fear app as not easy to use and not useful, which led them to abandon the app.

Sub-theme 1: High Self-efficacy and Problem-focused Coping Strategy

Two participants used apps such as Notion and Daily Bean that integrated problem-focused coping strategies. The participants stated they used mood and habit trackers to organize and keep track of their daily activities.

"I use this app called Daily Bean, and it's basically like a mood recorder that's like a mood tracker for every day. You can log your days and things like that." (P1)

"I was like, you know, I kind of need something to help me feel more organized, so that's why I got the daily tracker." (P1)

"It's basically like it has like a section for like running, meditation, like seven plus hours of sleep, journaling, and then like the number of screen time, and then like you check mark, like what you've done, like just to track yourself." (P3)

Participants described how tracking habits with Notion helped them adhere to them. One of the participants discussed that when she observed progress while engaged in self-care activities, she felt a sense of satisfaction and self-efficacy.

“So that helps me, like, do my daily tasks, so obviously, there are days where I go without doing, like, haircare, like, myself care, and that helps me, like, for my mental health, like I just do stuff. I feel like it makes me feel good about myself.” (P3)

“I feel like, you know, how I told you, when I kind of do those self-like tasks like, if I forget, it's just a reminder to like oil my hair, it helps me feel better about myself. I don't know.” (P3)

One of the participants stated that using the mood tracking app Daily Bean made her feel accountable for successfully executing behavioural health changes. High-self-efficacy individuals felt accountable for taking problem-oriented action to address a stressful situation. Accountability motivates individuals to take action during a stressful situation and mitigate future problems through self-efficacy.

“So having something small like this, like an app, just helps you feel, I guess, accountable.” (P1)

“But then now, when I'm doing my recaps, at the end of the day, I'm like, it was just this one part that was stressful. But overall, that day was pretty okay.” (P1)

“For me personally, it's kind of more about managing stress. And like, I know like right now, it's kind of just a bit stressful, but in the future, it's going to get better. So, it's like this is something that has helped me right now in this moment, when it's just like, honestly, stress and that I know that I can overcome it, if that makes sense”. (P1)

Sub-theme 2: Low Self-efficacy and Emotion-focused Coping Strategy

One participant used an app such as Clear Fear that integrated emotion-focused coping techniques such as breathing and walking exercises for relaxation. The participant described the app as not helpful as it provided her with coping strategies that she was already aware of and was not helpful for her needs; as a result, she had abandoned the mental health app.

“Um... So, I have used the app Clear Fear, but I don't use it any longer”. (P2)

“I was disappointed that it wasn't as great as I thought it would be or as helpful as I thought it would might be”. (P2)

“Like it was giving me coping strategies that I was already aware of, like, go for a walk or do some deep breathing, but sometimes the deep breathing wasn't like I just never found it as helpful unless I was like, really, really escalated, and I was hyperventilating, having a panic attack. I could understand how it would be helpful.” (P2)

Low self-efficacy had a direct impact on the ease and usefulness of the app. A participant who perceived the app Clear Fear as not easy to use also perceived the app as not useful.

“I just never found it as helpful unless I was like, really, really escalated, and I was hyperventilating, having a panic attack. I could understand how it would be helpful.” (P2)

“Trying to figure out the answer in my head, but I was like, this part is overwhelming for me”. (P2)

Individuals who felt less confident in dealing with stressors (low self-efficacy) were more likely to use the app as a distraction.

“It gives me something to distract myself from, even like going through and trying out the app can be like a coping strategy in and of itself because it's helping me to distract me from what I'm experiencing.” (P2)

Main Theme 4: Barriers of Using Mental Health Apps

The barriers to using mental health apps included cost, lack of awareness, access, credibility, privacy, perceived ease and perceived usefulness.

Sub-theme 1: Cost

The cost of mental health apps was a recurring subject in the participants' interviews. Two participants expressed concerns that the cost of mental health apps made them less accessible. One participant shared that post-secondary students were downloading the app to support their mental health, and therefore app developers that charged for premium features took the point away from helping them.

“Maybe, like, it does offer premium features and stuff that you have to pay for. And I feel like when it comes to mental health apps, yeah, you have to make like, I guess they do have to make a profit and whatever. It's just like people are kind of downloading them for a reason.” (P1)

“Like, yeah, it's about making profit, and that's what you're making the app for. But at the same time, it's like, if you want to help people, you know, making it so that it's accessible and people enjoy using it, like, your premium features include, like, being able to log your sleep or things like that, you know, like changing the colour theme or whatever. Those are small things that can, like, help people or, like, have fun with it. You know what I mean? So, making it like people pay for that some people can't afford it. Some people just don't want to do that. You know what I mean? It kind of takes the point away from helping people, I guess.” (P1)

“And, like, I know some of them aren't free and stuff. So, like, they would obviously need to change that because no one's going to pay for therapy.” (P3)

Sub-theme 2: Lack of Awareness

A participant described how the lack of awareness of mental health apps available can prevent post-secondary students from using them. The participant shared that advertising mental health apps on social media platforms can encourage more post-secondary students to use them.

“I wish I could have used them, but I've never heard of them, and they're not really advertised. And Tik Tok is a great platform to advertise these apps, and I've never seen one.” (P3)

“They (post-secondary students) don't really have much knowledge on, like, mental health apps specifically designed for mental health. So, if I were to search, I searched up some, and I've actually never heard of these ones.” (P3)

Sub-theme 3: Access

A participant described that access could be a barrier due to not being able to use the app in certain situations, such as writing an exam.

“I also think like accessibility because sometimes, like, I might be overwhelmed and anxious to write an exam, but I can't use it while I'm writing the exam.” (P2)

Sub-theme 4: Credibility

Another participant was skeptical about the credibility of online therapists. The participant shared her concerns about not knowing if the therapist is qualified or licensed to assist post-secondary students with their mental health problems.

“If there was an app where you could contact, like, an online therapist, you don't really know who that person is, and you're so quick to judge, but then that's also like a con of, like, using an app.” (P3)

Sub-theme 5: Privacy

One participant expressed concerns over privacy issues while using a mental health app. She said that even though she enjoyed using the app, she occasionally felt paranoid that her personal data would be stolen.

“But honestly, I like the way the app works. So, I'm just kind of like, “Um, it's helping me, so I may as well just use it to the fullest and, like, add small pictures and stuff like it. I don't know; it just makes it more fun, I guess. But I do still have that worry. And I'm like constantly, like every single day, when I am about to like add a little picture or like talk about my day. I'm just like, constantly scared, like, oh my god, is someone going

to steal my information, you know, but like, I kind of just try to ignore it for the sake of, like, enjoying something like this, you know?” (P1)

“Mhh. Like, honestly, when it comes to any app, I'm really paranoid with the information and stuff. This one I'm kind of just trying to ignore that paranoia, like, oh, someone's gonna take my information and stuff. You can log your daily activities, and you can add a picture and stuff like you know, to recap today. I try my best not to add pictures of myself. Or anyone that I know, just because, you know, for safety reasons.” (P1)

“I just honestly try to ignore it at some point, but I feel like in the future, sometimes I'm going to let it get to me and I'm going to end up deleting it just because I'm scared of privacy or whatever.” (P1)

Sub-theme 6: Perceived Ease

Perceived ease was a barrier to using mental health apps. A participant shared that the Clear Fear app was complicated to use and felt that it was more harmful than helpful.

“For example, if I was feeling anxious about a test that I had to write, I would open the app and say, okay, let me see what I can do to calm myself. So, I could click on something to help calm myself down. And then from there, though, it would sometimes ask questions.” (P2)

“I think even just like how functional it is, because if it's not functional, it becomes more overwhelming. And it's actually I think, at that point more harmful to the user.” (P2)

“But then afterwards as you go through the rest of the structure, it wasn't as helpful”. (P2)

Sub-theme 7: Perceived Usefulness

One participant discussed how the Clear Fear app wasn't useful because it didn't meet her specific needs.

“Um, I think my expectations were higher that it would be like a resource that I could open my phone and just be like, okay, what do I need for whatever I'm going through right now, like do I need a coping strategy? Do I need a resource line? But when I went on, sometimes they would just ask questions or would lead me through stuff, and it kind of felt more overwhelming trying to figure out the app than it was helpful.” (P2)

“I did not find it as helpful as I thought it would be. It was helpful and kind of doing the basics of getting some coping strategies. But aside from that, it wasn't as helpful. It wasn't as helpful as I needed it to be”. (P2)

Main Theme 5: Benefits of Using Mental Health Apps

The benefits of using mental health apps include perceived ease, perceived usefulness, access, support systems, and privacy.

Sub-theme 1: Perceived Ease

Participants shared their perspective on whether they believed the mental health app was free of effort. Two of the participants described the app's functions as easy to use. One of the participants described the app as simple to use and compared it to writing in a journal but instead typing.

“The font-wise, everything is perfect. It's like, you know, it's literally like writing into a journal, but you're just typing it.” (P3)

“Very easy to use.” (P3)

The participants reported that apps like Daily Bean with a simplistic design and no distractive features were easier to use. For example, one participant described apps without intrusive push notifications that enabled you to customize the timing of the notification as less hassle and more engaging.

“I feel like it's a very minimalistic app, and it's kind of like it doesn't bother you to constantly come back and record what you're doing or whatever. And it's kind of it just sends like one small reminder that I allowed it to send me, like in the settings and stuff.” (P1)

“I think the whole point of this app itself is to be minimalistic and to just make sure that people aren't annoyed by using it, like they don't find it a hassle or a chore to come back and use it every single day”. (P1)

A participant described that app like Notion as easy to use because it had an easy navigation system. They described the app as having a well-organized navigation menu with all the tabs located on the side of the app.

“The way it's formatted is perfect. It has everything on the side, like quick notes, personal and home task lists, a journal, a reading list, a habit tracker.” (P3)

One of the participants described the Daily Bean app as efficient and requiring less time commitment. The efficiency of the app prompted her to continue to use it.

“I definitely would, just because it's one of these, like, really easy to use apps that don't take too much commitment”. (P1)

“I don't know, like it makes me want to come back and just do it because it's only going to take about five minutes of your day”. (P1)

Overall, the participants who perceived the app Daily Bean and Notion as easy to use reported that they continue to use it.

Sub-theme 2: Perceived Usefulness

The participants described apps such as Daily Bean and Notion as useful for online journaling. One of the participants described how online journaling helped her reflect on past experiences and identify patterns in her mood that affected her emotions.

“Yeah, it's helpful with, like, organizing my days and making sure that I can, you know, kind of help me reflect right, and I feel like at the end of the month, it gives you, like, a little type of summary of, you know, what was good? What was bad? You know.”
(P1)

“It helps you keep track of your emotions as well”. (P1)

A participant reported using online journaling to practice gratitude. The participant described how practicing gratitude helped her focus on the positive aspects of her life rather than negative events.

“That's what I use it for, and like, gratitude, like what happened today, that's what I do. But before, if you asked me this question, like years ago, I felt like a journal would be useless. But now since I am writing in it, I think it's pretty good. It just makes me like, I don't know, and also helps me like manifest things. That's also why I use it.”

(P3)

“Yeah. So, I write down like what good happened to me instead of focusing on the negative. So yeah, and if I were to read it by, like, the next week, is like, you know, that that problem would have already been gone and like, I'm just like, why would I even focus on that when like, it really didn't matter?” (P3)

“Yeah. Because I write about kind of what happened, like the good things that happened. Because in my mind, I'm always focused on, what went wrong today? Instead of, like, not focusing on the positive things.” (P3)

Sub-theme 3: Access

The study's participant described the app as beneficial because of its access. The participants expressed how the app allowed them to have strategies available for them rather than waiting for an appointment with a therapist.

“Everyone has a phone, and it's very rare to find someone who doesn't have a phone. It's just very accessible, like having mental health apps and stuff.” (P1)

“I think the benefits are that, yeah, it is much more accessible, and a lot of people are technologically reliant.” (P2)

“I guess the benefits are that I just have, like, strategies readily available for me because it's not like, I can think of coping strategies. I can work on that with my therapist. But sometimes I go home, and I forget it, or I'm so overwhelmed. It's not coming to mind right away. So, it's just like, Okay, well, maybe I can look for some guidance on my app, and I can just guide me through that.” (P2)

“But I definitely think the biggest benefit is just that it's more accessible than waiting for one week to speak to you.” (P2)

“Just for the convenience of it, you can just open up your app and try to help you out yourself as opposed to, you know, making an appointment to go into that person's home or their office and speak to them.” (P3)

Sub-theme 4: Support Systems

Two of the participants described using the mental health app as a support system.

“It's like, private to you, especially if you're in a situation where you can't leave your house to be able to go physically in person and get therapy or like counselling or whatever, like you kind of have some sort of support system with you on your phone at home.” (P1)

“You know that kind of like, helps me to stay positive, sorry. Like, that day of it, obviously, man, not that they have, but like, it manages my stress in that way too. And its kind of like a sense of support.” (P3)

Sub-theme 5: Privacy

Privacy was a recurring topic that emerged in the participants’ interviews. The participant expressed that the benefit of using a mental health app was that they could seek help anonymously and discreetly without involving other people.

“And it's just, if they're not, you know, safe to, like, speak with someone of that makes any sense.” (P3)

“Once you start going to a person and, like, the first day if it's awkward, you don't want to go to them like it's just weird after that. When you go on an app, you know, what can actually help you, and if you don't want to use it, you don't need to, and then what you've done.” (P3)

“I don't know about other people, but for me, it's kind of like, oh, now I've met this person. They have a record of me, and they know that I'm struggling or whatever. Like, it's kind of just like, now it's like, you have a history that you went to counselling.” (P1)

“But also, like, the level of comfortability as well, like the phone is kind of just like something like that you're going to be having to yourself and no one's really going to be like, no one really knows you're using it until you tell them.” (P1)

“You would rather have it anonymous, like you don't want them to see how you look like kind of thing. So, it's just better to be anonymous about it”. (P3)

Main Theme 6: Recommendations for Improving the Engagement of Mental Health Apps

The participants recommended to improve the engagement of mental health apps include implementing privacy policies to ensure transparency of data collection practices, advertising mental health apps on social media sites to create awareness, and using interactive apps such as gamification, guided mediation, live therapy, and chat to increase engagement

One participant described how app developers should implement privacy policies in their mental health apps. These policies will ensure clients that their personal information will not be collected. As a result, users will feel comfortable using the app, knowing their information is protected.

“Maybe, you know, at the start of some apps, they'll have, like, terms and conditions-type things. Maybe a notice or something saying that we don't use any of the information or whatever. Something like that, like some sort of assurance that you can always look back on and be like, yeah, so they're not going to be taking my information, so it's fine”. (P1)

Another participant described how advertising mental health apps on social media will encourage post-secondary students to use them.

“So, like, what I would say is just to advertise these better, because I have never used them and I would love to use them, but I've never even heard of them.” (P3)

“And like how are they supposed to use these apps if they don't even know what it do? Like what its features are and how it could actually help them specifically, but they're not going to, you know, even download it to see; they need to know what it is to even try it or be intrigued about what it offers.” (P3)

One participant suggested that making the app more interactive could encourage more people to use it. The participant suggested that implementing games, having guided mediation, and having a live therapist and chat can encourage more people to use the app.

“Maybe even having like, games or something that helps reduce your stress.” (P2)

“Yeah, like applications are just like guided breathing exercises, like I press a button and it goes okay, now breathe, like it gives like a scripted version to lead me through the guided deep breathing exercises.” (P2)

“Therapists who are counsellors who are hired by the apps that can just have one readily available or even if there's a wait time of like, 20 minutes or something or 10 minutes, right, but there's someone you can talk to like a live person or even text with. Some people aren't comfortable talking on the phone, but like a live chat.” (P2)

“You don't get the empathy piece where, like, sometimes you just want to hear you and understand, but I also think that experts are also trained to know how to respond to some things.” (P2)

4.4 Summary of the Findings

This study aimed to answer the question: What are the barriers and facilitators of using mental health apps? The three objectives of the study include understanding users' perceptions of mental health apps, identifying barriers and facilitators associated with the usage of mental health apps, and utilizing the Health Belief Model and Technology Acceptance Model to understand post-secondary students' experiences with mental health apps.

One of the objectives of the study was to utilize the Health Belief Model to understand post-secondary students' perspectives on mental health apps. Perceived severity is a construct of the Health Belief Model that refers to the individual's perception of the negative consequence related to an outcome or event (Jones et al., 2015). The study participants described a low perceived severity of mental illness. They described how their mental illness was not severe enough to require professional help but that they preferred the use of mental health apps.

Although the participants' perceived their mental illness as not severe, internal and external cues to action were facilitators for post-secondary students to utilize mental health apps. Internal and external cues are constructs of the Health Belief Model that motivate individuals to make health behaviour changes (Jones et al., 2015). Internal cues such as emotional exhaustion and minor stressors motivated them to use mental health apps. On the contrary, external cues such as friends, social media sites, and influencers motivated one participant to utilize mental health apps.

The other objective of the study was to include the Technology Acceptance Model to understand the use of mental health apps. Perceived ease and usefulness are

constructs of The Technology Acceptance Model. Perceived ease represents the degree to which a technology will be free from effort, and perceived usefulness represents the degree to which using a technology would be beneficial (Muftiasa et al., 2022). The perceived ease of using a smartphone application has been an attraction to consumers (Muftiasa et al., 2022). Apps such as Daily Bean and Notion with a simplistic design, customized push notifications, and an easy navigation system made the users felt it was easy to use and, as a result, felt comfortable achieving their mental health goals. Participants who perceived the Daily Bean and Notion app as easy to use also perceived it as useful and continued to use the mental health app. This is congruent with the Technology Acceptance Model, which stated that perceived ease positively impacted the usefulness of the app (Mutftiasa et al., 2022).

Another study objective was to understand post-secondary students' perceptions of mental health apps. The participants described their experience using apps with emotion and problem-focused coping strategies, as well as suggestions to improve the engagement of mental health apps.

High-self-efficacy individuals tend to use mood and habit trackers such as Daily Bean and Notion to support their mental health. Intrinsic motivation and accountability were factors that influenced high self-efficacy among post-secondary students. The findings of the study indicated that individuals who used problem-focused coping strategies such as mood or habit trackers reported positive outcomes and continued to use them.

Meanwhile, individuals who used the app with emotion-focused coping strategies such as Clear Fear reported a negative experience with the mental health app. Low-self-

efficacy individuals are more likely to avoid stressors and tend to use emotion-focused apps as a distraction when experiencing negative emotions. Individuals with low self-efficacy are less likely to learn about the app, which can translate to the app not being easy to use and useful and, as a result, abandoning the mental health app.

The participants had reported suggestions to improve the engagement of the mental health apps. They suggested using privacy policies to ensure data protection. The participants shared that making mental health apps more interactive by implementing games, guided mediation, live therapists, and live chat would be engaging for post-secondary students. One of the participants initially suggested that robotic responses would be helpful for post-secondary students but then said that a live therapist would be a better option due to the empathy piece, which can be missing from a robot. Another person raised the concern that many post-secondary students are not aware of mental health apps, and therefore advertising mental health apps on social media websites can garner attention and encourage the use of mental health apps.

Chapter 5: Discussion

5.1 Discussion of Results

The study aimed to understand the barriers and facilitators of mental health apps among female Sri Lankan post-secondary students. The findings of the study indicated the barriers to the adoption of mental health apps included low perceived severity, privacy, credibility, lack of awareness of mental health apps, cost, access, low self-efficacy, not being easy to use, and not being helpful. The facilitators for using mental health apps included cues to action, high self-efficacy, privacy, access, support systems, ease of use, and the usefulness of the app.

Barriers to using mental health apps

Individuals who believe they are at risk of a disease will take actions to reduce the severity of the disease (Naslund et al., 2017). A study conducted by Schmidt (2022) found that users' whose perceived severity of mental disorders was high were more willing to use mental health apps to reduce the severity of their mental illness.

However, contrary to Schmidt's (2022) study, the study results indicated that post-secondary students had a low perceived severity of their mental health but were motivated to use the mental health apps as opposed to counselling. They shared that they used mental health apps for minor stressors, such as writing an exam. The post-secondary students discussed how counselling should be reserved for serious cases or if they are not able to manage symptoms alone. This is congruent with Salamanca-Sanabria et al.'s (2023) study, as post-secondary students described reservations about counselling for severe issues.

Post-secondary students tend to normalize mental health issues because they believe their problems are not critically important and are therefore reluctant to seek professional help (Hall et al., 2018). Female South Asians tend to conceptualize depression symptoms as a relatively normal response to social problems (Karasz et al., 2019). They are less likely to attribute symptoms of distress, such as sadness, exhaustion, or anxiety, to psychological or neurological abnormalities or to view professional treatment as necessary compared to European Americans (Karasz et al., 2019). This could explain why female Sri Lankan students preferred less intensive mental health support, such as mental health apps, rather than seeking counselling. They underestimated the risk of disease and, as a result, made low-level behaviour changes (Fikirana et al., 2021; Kim et al., 2020).

Mental health help-seekers have gravitated toward low-barrier choices (O' Daffer et al., 2022). They are expected to navigate choices that involve weighing the risk against the benefits of action (Ferrer & Klein 2015). As a result, they may gravitate toward mental health apps as opposed to counselling because of the perceived low barriers (Mihalo & Halamova, 2021).

The study results are congruent with the Health Belief Model that if the perceived barriers outweighed the perceived benefits, people would abandon the mental health apps. For example, one of the post-secondary students said she felt paranoid that her information would be stolen and therefore would end up deleting the app. This is because the perceived risk is higher when it comes to data privacy concerns, which can prevent students from using it (Liu et al., 2022). A survey conducted by Liu et al. (2022) found that 81% of users felt that the risks of data collection by for-profit companies outweighed

the benefits of using the company's product. This is congruent with Melcher et al.'s (2022) study, as 74% of students reported privacy concerns as a barrier to utilizing mental health apps. The lack of data protection can result in mistrust and undermine the credibility of the product (Liu et al., 2022).

One of the participants stated that credibility can be a barrier to using mental health apps. They had concerns about whether the therapist was qualified or licensed to assist post-secondary students with their mental health problems. This is consistent with Melcher et al.'s (2022) study, where post-secondary students reported concerns over the legitimacy of the apps and whether the information provided in the apps is from credible sources.

The study's results indicated that a lack of awareness of mental health apps among post-secondary students can hinder their use. One participant described that post-secondary students are not aware of or lack knowledge of the mental health apps available to them. This is in line with previous literature showing that post-secondary students' lack of awareness of mental health apps prevented them from using them (Borch et al., 2023; Dederichs et al., 2021; Mayer et al., 2019; Peng et al., 2016; Schueller et al., 2018).

Vulnerable populations, such as ethnic students, may not utilize mental health apps because app developers don't target or market to them. According to Ramos et al. (2021), mental health apps have been developed and evaluated with Caucasian populations, which differ from marginalized communities in terms of socioeconomic status, cultural practices, and contextual factors. The lack of attention to the unique

experiences of ethnic minorities can impede the feasibility, acceptability, engagement, and effectiveness of mental health apps. (Ramon et al., 2021).

Costs can also hinder the accessibility of apps for post-secondary students. One of the post-secondary students described how paying for extra features can be a barrier to utilizing mental health apps. They described how extra features made the app more engaging, but the cost can make it less accessible for post-secondary students, which takes the purpose away from helping them. This is in line with Jembai's study (2022), which found that 70.1% of students reported cost as a barrier to utilizing mental health apps. Similarly, a systematic review study conducted by Aldosari et al. (2023) examined South Asians' experience and attitude towards digital health interventions and found that cost was a barrier for users to utilize mental health apps.

Previous literature suggested that apps can bridge the accessibility gap for mental health resources among post-secondary students (Bunyi et al., 2021; Chandrashekar, 2018). However, the study results indicated that access can be a barrier to using mental health apps. One of the post-secondary students described how accessibility can act as a barrier in situations where post-secondary students may be experiencing test anxiety but cannot access the app immediately. In that case, apps can be a tool to teach post-secondary students to develop adaptive coping strategies in situations where it is difficult to access mental health apps (Cliffe et al., 2022).

The study findings suggest that one participant who used emotional-focused coping strategies had a negative experience while using the app and discontinued it. A study conducted by Mete (2021) investigated the relationship between self-efficacy and coping skills among students. The study showed that individuals with low self-efficacy

were more likely to use emotion-focused coping strategies (Mete, 2021). They were more likely to use the app to regulate or distract their emotions when faced with stressful situations, as opposed to changing the problem itself (Mete, 2021). For example, the study results showed that one of the post-secondary students described using the app as a distraction. Post-secondary students who used the emotion-focused app were shown to experience negative emotions, which led to abandonment of the mental health app (Mete, 2021). Similarly, the study results indicated a post-secondary student felt overwhelmed while using the emotion-focused app, which led them to abandon the app.

Self-efficacy had a direct impact on the ease of use of the app, which impacted the usefulness and adoption of mental health apps (Rahimi et al., 2018; Zhang et al., 2016). A user with a low sense of self-efficacy will be less likely to gain more information from using the mental health app (Rahimi et al., 2018; Zhang et al., 2016). As a result, the users perceived that the app required effort toward learning its use, which affected their perception of its ease (Rahimi et al. 2018, Zhang et al. 2016). This could explain why one of the post-secondary students felt overwhelmed while using the app because a lack of confidence in effectively using the app may lead to a perception of its uselessness, which translates to abandoning the app (Rahimi et al. 2018, Zhang et al. 2016).

One of the post-secondary students reported that mental health apps that are not functional become more harmful than helpful. Moreover, the post-secondary student stated that the app was not easy to use and therefore not useful, and hence abandoned the mental health app. The Technology Acceptance Model stated that individuals who perceived the app as not easy to use were more likely to perceive it as not useful and, as a result, abandon it (Alsyouf et al., 2023; Rahimi et al., 2018). Hence, the findings of the

study are consistent with prior literature showing that perceived ease of use had a direct influence on perceived usefulness and adoption of mental health apps. Hence, the findings of the study are consistent with prior literature showing that perceived ease of use had a direct influence on perceived usefulness and adoption of mental health apps (Alsyouf et al., 2023; Rahimi et al., 2018).

Facilitators to Using Mental Health Apps

Internal and external cues may act as triggers to facilitate changes in health behaviour (Naslund et al. 2017). The study results indicated that emotional triggers such as emotional exhaustion and minor stressors such as test anxiety facilitated post-secondary students' use of mental health apps. Meanwhile, external cues such as friends, social media, and influencers motivated a post-secondary student to use the app. This is in line with Payne's (2015) systematic review, where nine studies showed that cues to action were a main predictor for utilizing mental health apps. A cue to action is needed to trigger post-secondary students to seek support for their mental health (Jones et al., 2015).

The study results indicated that individuals with high self-efficacy were more likely to use apps with problem-focused coping techniques. A study conducted by Vinnikova et al. (2020) found that high self-efficacy indirectly influences problem-focused coping through motivation. Perceived self-efficacy pertained to personal action control or agency (Vinnikova et al., 2020). When adopting the desired behaviour, individuals first form a goal and then attempt to execute the action (Vinnikova et al., 2020). Goals serve as intrinsic motivation and guides to healthy behaviour (Vinnikova et al., 2020). Intrinsic motivation relates to the perception of pleasure and satisfaction from

performing a behaviour (Lu et al., 2023). This explains why a participant who used a habit tracker app to support their self-care goals, such as hair oiling, experienced positive emotions because they were taking measures to accomplish healthy behaviours. Self-efficacy influences behavioral outcomes through intrinsic motivation (Vinnikova et al. 2020). Thus, high self-efficacy can be a facilitator for the use of apps with problem-focused coping strategies.

Post-secondary students reported privacy as a facilitator for using mental health apps. The study participants indicated that apps enable them to access mental health care without anyone knowing it. They addressed stigma towards mental health professionals as a factor in using mental health apps. South Asian students experience culturally linked stigma, which impedes their access to professional health help. A study by Tabassum (2017) found that family and personal reputation were factors in South Asians not seeking help. As a result, participants may prefer mental health apps because they combat the stigma around seeking mental health apps. This is consistent with Das et al.'s (2020) study on the acceptability, feasibility, and clinical effectiveness of digital health interventions among 50 psychiatric patients in India. They found that privacy was a factor in accepting digital health interventions. Borghouts et al.'s (2021) study found that privacy can be a facilitator in using mental health apps for students experiencing stigma or reluctance to seek professional help.

Post-secondary students discussed how accessibility can also be a facilitator for using mental health apps. Post-secondary students expressed that apps provided them with readily available strategies, so they did not need to wait for the assistance of professionals. Mental health apps provided 24/7 availability of support, so post-secondary

students could use the app when needed (Olf, 2015). Post-secondary students carry smartphones throughout their day and therefore can use mental health applications when experiencing stressors (Olf, 2015). The apps can provide immediate relief by providing tools and exercises to alleviate symptoms (Olf, 2015).

Post-secondary students discussed how mental health apps provided a support system in situations where it was difficult to attend in-person care. A support system is a key factor for psychological resilience and a negative indicator of distress. A study conducted by Lai et al. (2022) found that university students with support systems showed lower symptoms of depression.

Sri Lankan students may lack social support because of the cultural stigma surrounding mental health. A study conducted by Shangmudapala (2020) found that 62% of Sri Lankan youths did not turn to family for support, indicating that cultural stigma prevents them from disclosing mental health issues to their family. Shangmudapala's (2020) study found that a lack of support contributes to mental illness among Sri Lankan youths. As a result, Sri Lankan students prefer mental health apps because they provide them with a support system when it's difficult to access in-person care.

A study conducted by Haque and Rubya (2023) found that digital health interventions such as chatboxes offer psychological and social support in situations where real-world human connections, such as families and friends, or seeking professional support are not possible.

Two of the post-secondary students perceived the app as easy to use. They suggested that a simplistic user interface was a main predictor of the ease of use of apps.

Apps with minimalist designs were preferred by post-secondary students. Apps without intrusive push notifications and an easy navigation system were appealing to post-secondary students. This is congruent with Kaveladze et al.'s (2022) study, which examined over 13,000 reviews of 106 mental health apps and found that user interface and user friendliness were important factors for the usability of apps and the retention of mental health apps among post-secondary students. Similarly, Melcher et al.'s study (2022) found that post-secondary students wanted an app that was easy to navigate and simple without too many features.

The study suggested users preferred customized push notifications. This is concurrent with Melcher et al.'s (2022) study, as students found push notifications helpful when they came at their preferred time. Push notifications that came at sporadic times prompted users to swipe left if they were preoccupied with something else, which led them to forget the reminders (Melcher et al., 2022). Moreover, customized push notifications helped users build habits and sustain their use of the app (Melcher et al., 2022). Lastly, the post-secondary students suggested apps that were quick and efficient to use, which improved the ease of the app. This is congruent with Melcher et al.'s (2022) study, as students preferred apps with short interactions, such as less time spent inputting information, app prompts, and notifications.

Two of the post-secondary students indicated that the app was useful for journaling. Journaling helped them with reflection on their moods and gratitude practice. The study's participants described how gratitude helped them become aware of the positive aspects of life. The study's participants described how gratitude helped them with positive reframing and negative rumination. Previous literature showed that

journaling has emerged as the most popular app for post-secondary students (Alslaity et al., 2022). In a study conducted by Smyth et al. (2018), users who used online journaling found improvements in wellbeing. This is congruent with Tolcher et al.'s (2022) study, as university students who used the gratitude app had a significant positive effect on their well-being.

Recommendations for Improving the Engagement of Mental Health Apps

In the study's interview, the participants provided suggestions to improve the engagement of mental health apps. As congruent with previous literature, privacy was a barrier for students utilizing mental health apps (Borghouts, 2021; Koh, 2022). One student suggested that app developers implement privacy policies to assure reliability if their data gets stolen. In contrast, a study by Steinfield (2016) found that while users wanted privacy protection, they were less likely to read the policies. Melcher's (2022) study suggested a solution by providing bullet-point notes summarizing the policies within the app.

The privacy policies of the app are linked to its trustworthiness; users are more likely to not download the app if they do not trust it (Kodish et al., 2023). Therefore, finding other methods to improve the trustworthiness of the app will encourage students to download it (Kodish et al., 2023).

Social media can be a platform for app developers to create trust, credibility, and awareness for mental health apps. One of the post-secondary students reported that the lack of awareness of the mental health app prevented post-secondary students from downloading the app. One of the post-secondary students suggested advertising apps on

social media sites such as TikTok to let people know about the functionality and intrigue users to buy the app. Post-secondary students relied on social media sites as sources of information to buy apps because they lacked professional sources to rely on. Schueller et al.'s (2018) study stated users are more likely to identify mental health apps with informal sources such as social media sites (45.1%) as opposed to formal sources such as health care providers (24.6%). Users' reviews, especially from trusted sources, have been shown to improve the credibility of the product, which translates to an increase in the number of downloads (Schueller et al. 2018). For example, Apple's endorsement of the Calm app as the app of the year had a strong impact on the number of people using and downloading the app (Schueller et al. 2018). Hence, users' reviews or endorsements from trusted sources could boost the credibility of the app (Schueller et al. 2018).

Interactive apps are a way to make mental health care more interesting and engaging without undermining its credibility. One of the participants suggested that interactive apps via gamification, guided breathing exercises, live therapists, and chat could increase the engagement of mental health apps. This is aligned with Cheng et al.'s (2019) systematic review, which found that users' were more likely to download gamified apps because they increased fun, enjoyment, and a sense of mastery. Cheng et al. (2019) reported that the common gamification elements included levels or progress feedback, points or scores, and rewards and prizes. Apps that implemented gamification elements such as rewards elicited a positive emotional reaction, which is a critical part of motivation and ensured the engagement of the apps (Six et al., 2021).

Additionally, interactive sessions such as guided breathing apps can help improve the ease of use of the app (Cheng et al., 2019). Individuals who are new to breathing

exercises may find guided breathing exercises helpful, which increases engagement and retention of the app (Drake et al. 2020). The participant also suggested that implementing live therapy or chat can be helpful for students. This is congruent with Alqahtani's (2021) study, as students suggested apps should provide professional support such as a hotline or live therapist who can be accessed to respond to their concerns immediately.

Diversity, Inclusion and Equity and Cultural Implications

Mental health apps can reduce the treatment gap and improve the mental health outcomes of marginalized communities (Ramos et al., 2021). Despite the plethora of mental health apps available on the market, most of these apps have not been designed or marketed towards marginalized groups. Ramos and colleagues (2021) argue that mental health apps include one of the criteria of diversity, inclusion, and equity. Marginalized communities that do not see their identities represented in the app content may feel the app is not relevant to their differences (Ramos et al., 2021).

Developing mental health apps that incorporate the cultural implications and needs of female Sri Lankan students can increase the acceptance and engagement of mental health apps among this group of people. The findings of the study indicate that privacy and confidentiality are significant factors in utilizing mental health apps, due to the cultural sensitivity implications for mental health. One participant shared concerns over a breach of confidentiality, which prevented them from seeking mental care but motivated them to utilize mental health apps. This was congruent with the Islam and colleagues (2023) study, where mental health stigma and confidentiality breaches were barriers to seeking care.

The scarcity of Sri Lankan representation in digital content, language not available in Tamil or Sinhalese, and lack of representation of Sri Lankans in mental health development and marketing can hinder the inclusivity and acceptability of mental health apps. One participant shared that influencers and social media motivated them to utilize mental health apps. Hence, digital health marketers can utilize Sri Lankan influencers to promote the app and inclusivity.

For future studies, we would like to examine if mental health apps are suitable for other marginalized groups, such as LGBTQ (lesbian, gay, bisexual, transsexual, and queer) individuals with learning disabilities or people of color. For example, future apps should investigate if apps are tailored to specific groups (the use of pronouns, visual representation of different identities in terms of gender, sexual, or religious identities).

Future research should investigate if mental health apps are tailored for other racial minorities that may have difficulties accessing mental health care. For example, Chiu et al.'s (2021) findings suggest East Asians reported lower utilization of mental health services compared to South Asians. Similarly, East Asians have a high prevalence of personal and cultural stigma, preventing them from seeking care; hence, mental health apps may be tailored interventions for East Asians.

Mental Health Apps to Support mental wellbeing

Mental health apps can be used as a complement to therapy or as a tool to support the mental wellbeing of post-secondary students. They offer coping strategies, resources, and a support system to enable users to play an active role in managing their mental

illness. While mental health apps can be a self-care tool, users should not rely on mental health apps alone to cure their mental illness.

There is a lack of evidence that investigates the effects of mental health apps for mild to moderate cases, and the lack of evidence-based apps, diagnostic testing, or expertise can jeopardize the safety of individuals (Akbar et al., 2020).

5.2 Recommendations for Future Research, Practice, and Policy

Mental health apps can be a steppingstone for female Sri Lankan post-secondary students who are seeking mental health support. While mental health apps may not provide sufficient support alone, they can be complementary tools for counselling. Specifically, the use of mood and habit trackers could be beneficial for students.

Although apps can support post-secondary students with mental health challenges, a lack of access to technology or technical skills may hinder post-secondary students from successfully adopting mental health apps (Hiller, 2022). A study conducted by Yoon et al. (2020) found that a combination of low socioeconomic and racial/ethnic minority status as a source of digital divide. Technology access does not only pertain to device ownership but also internet connection, wifi, and maintenance, which may be a challenge for ethnic post-secondary students living in a low-socioeconomic neighborhood, contributing to a lack of access to mental health resources (Hiller, 2022). These digital disparities can explain why some ethnic or racial minority students may be digitally illiterate. Institutions need to bridge the digital divide by loaning mobile devices, providing financial assistance to device owners, and providing courses to help improve information and computer technology.

The government and industry need to regulate the app to ensure it is evidence-based and should have stricter regulations and industry practices that better support consumer privacy and health safety. As a result of the lack of regulatory guidelines, app developers and clinicians remain unclear about the standardized criteria for "approved for use" apps (Koh et al., 2022). App developers should be transparent in regard to data collection, storage, and sharing practices. Information given to third parties can pose a serious security breach for consumers.

Integrating apps into clinical practice can improve the delivery and efficacy of mental health care. However, there needs to be clinical studies investigating the efficacy of the app with individuals with severe mental illness (Chandrashekar, 2018). While mental health apps are designated to support and manage mild symptoms, it is unclear whether these apps can be suitable for individuals with severe symptoms (Chandrashekar, 2018).

Future research should investigate how individual differences such as personality traits, gender, and socioeconomic status influence the effectiveness of mental health apps. A study by Aziz et al. (2023) suggests that personalities such as introversion prefer mental health apps, whereas extraverted individuals prefer in-person mental health support over digital support.

Moreover, this study examined female Sri Lankan students' perceptions of mental health apps; it is unclear whether apps are effective for male Sri Lankan students. According to Livingston et al. (2018), South Asian men deter from engaging in mental health due to the socialization of traditional masculine gender roles. Mental health apps are not tailored for men as they focus on nurturing and emotional vulnerability, which

hinders the acceptance of mental health apps. More research should focus on the mental health needs of Sri Lankan men to create apps that are engaging for men.

5.3 Strengths

A strength of the study is that it is the first of its kind to investigate the uptake of digital health interventions among female Sri Lankan students living in Canada. There is limited literature on the studies of ethnic minorities experiences of digital health interventions, and moreover, little to no research has been conducted on the mental health status of Sri Lankan women in Canada. A lack of understanding of the unique experiences of ethnic minorities could compromise the feasibility, acceptability, engagement, and effectiveness of mental health apps.

A strength of this study is the use of the Health Belief Model and The Technology Acceptance Model theoretical frameworks to understand post-secondary students' perspectives on mental health apps. While Melcher et al. (2022), Wong et al. (2021), and Nowrouzi Kia et al. (2021)'s studies explored post-secondary students' perspectives on mental health, they lacked a theoretical framework. Parker et al.'s (2022) study states that the use of theory supports the understanding of how and why health initiatives such as mental health apps succeed or fail and what key factors predict success. Hence, the study used the Health Belief Model to explain the health perspective of using mental health apps and The Technology Acceptance Model to explain the technology perspective of using mental health apps. Another strength of the study is the use of qualitative research. While previous literature, such as Kaveladze et al. (2022) and Kopka et al. (2023), used quantitative research to explore users' engagement with mental health apps, there are limited studies that use qualitative research to explore factors leading to the low

engagement of mental health apps among post-secondary students. By understanding students' perspectives from the targeted culture group, app developers create apps that are engaging for students. Another strength of the study is Lincoln and Guba's four criteria for rigour. Rigour in qualitative research helps to minimize the risk of bias and maximize the accuracy and credibility of research results (Johnson et al. 2020).

5.4 Limitations

There were several limitations to the study that should be considered when interpreting its results. The low recruitment was an obstacle to conducting the study, which led to a small sample size. A small sample size can hinder the generalizability of our study's results. Levin et al.'s (2020) had difficulties recruiting post-secondary students who used mental health apps. This indicated low engagement with mobile apps among post-secondary students. Future studies should look at using extensive recruitment strategies to recruit participants. Our research study used only emails to recruit participants, but since the email was sent before spring and summer break, this could have affected the number of students being recruited because they were less likely to check emails during their break. Another limitation of the study was that all the participants were female. While predominately female user bases were common in studies of mental health apps, males were less likely to seek help from apps or counselling (Garrido et al., 2022; Lattie et al., 2020). Future studies should investigate male Sri Lankan users' perspectives on mental health apps, and additional design or engagement features should be considered (Lattie et al. 2020).

Another disadvantage of the study is that it did not assess if the students were receiving treatment other than the mental health app, as stress, anxiety, and depression reduction can be attributed to treatments rather than the mental health applications.

The acculturation or immigration status of the participants was not collected, which can impact their perception of mental health and the social context surrounding access to care. For example, acculturative stressors may hinder students from accessing services due to a language barrier, cultural stigma, or a lack of awareness of mental health services. Furthermore, the study did not collect data regarding the immigration status of the participants or their families, as this can affect access to mental health services. For example, immigrants may not have social capital, such as a support system, which can be a factor in utilizing mental health apps. The study did not collect the region of the participants, which may affect their access to mental health apps.

The study did not use multiple coders, which can lead to subjectivity in the study results and bias. A limitation of the study was that in interview questions, results, and discussions, there was an intentional shift from deriving insights from female Sri Lankan students to post-secondary students. This was done intentionally, as there was an emphasis on protecting the privacy of post-secondary students. It was understood throughout the interview that delving into culture-related stigma was a difficult topic, and our goal was to prioritize the participant's comfortability and mitigate potential harm.

Chapter 6: Conclusion

Ethnic and racial minorities are well documented as experiencing health inequalities within the Canadian health care system. South Asians have a higher prevalence of mental disorders and an underutilization of mental health services compared to other ethnic groups. While all races undergo mental health challenges, factors such as culture and racial backgrounds can contribute to differences in mental health outcomes. Sri Lanka, a country in South Asia, is distinct in its demographics due to a history of sectarian and civil violence. It has a high prevalence of mental disorders but is significantly underrepresented in the literature. Mental health apps can help reduce the health disparities among the Sri Lankan community, where cultural stigma, racism, and discrimination prevent them from seeking help. Understanding Sri Lankan students' experiences with mental health apps can help app developers create apps that are culturally relevant to Sri Lankans and thus increase retention.

While prior research looked at the Health Belief Model and the Technology Acceptance Model separately in terms of users' involvement with mental health apps (Naslund, 2017; Paganin et al., 2022; Schmidt, 2022), this study combined the two models to look at the personal and technological aspects that lead to the use and abandonment of mental health applications.

In line with previous literature on the Technology Acceptance Model, perceived ease and perceived use were significant factors in predicting the adoption of mental health apps (Rahimi et al., 2018; Zhang et al., 2016). Individuals who perceived the app as easy to use were more likely to perceive the app as useful and, as a result, adopt the app. Therefore, perceived ease and perceived use were facilitators for using mental health

apps. On the contrary, individuals who perceived the app as not easy to use were more likely to perceive the app as not useful and abandon the mental health app. Apps that are not easy to use and not useful were barriers to using mental health apps. Self-efficacy was a significant factor that influenced the ease and usefulness of the app among the study's participants. If the app was easy to use, they were more likely to feel confident in their ability to use it, which influenced the adoption of mental health apps. Hence, high self-efficacy was a facilitator for using mental health apps.

While apps may provide post-secondary students with benefits such as accessibility, a support system, and privacy, the Health Belief Model suggests that if perceived barriers outweigh benefits, the users are less likely to adapt health behaviors. Barriers such as data privacy and credibility can pose serious health and data safety issues for students, which may result in post-secondary students abandoning the app. There is also a need to include experts from the targeted population in planning, research, and marketing to create a culturally relevant app to engage and increase retention of the targeted group.

References

- Ahadzadeh, A. S., Pahlevan Sharif, S., Ong, F. S., & Khong, K. W. (2015). Integrating health belief model and technology acceptance model: an investigation of health-related internet use. *Journal of Medical Internet Research*, *17*(2), e45.
<https://doi.org/10.2196/jmir.3564>
- Akbar, S., Coiera, E., & Magrabi, F. (2020). Safety concerns with consumer-facing mobile health applications and their consequences: a scoping review. *Journal of the American Medical Informatics Association: JAMIA*, *27*(2), 330–340.
<https://doi.org/10.1093/jamia/ocz175>
- Aldosari, N., Ahmed, S., McDermott, J., & Stanmore, E. (2023). The Use of Digital Health by South Asian Communities: Scoping Review. *Journal of Medical Internet Research*, *25*, e40425. <https://doi.org/10.2196/40425>
- Algorani, E. B., & Gupta, V. (2022). Coping mechanisms. In *StatPearls*. StatPearls Publishing.
- Alharbi, N. S., AlGhanmi, A. S., & Fahlevi, M. (2022). Adoption of health mobile apps during the COVID-19 lockdown: A health belief model approach. *International Journal of Environmental Research and Public Health*, *19*(7), 4179.
<https://doi.org/10.3390/ijerph19074179>
- Alqahtani, F., Winn, A., & Orji, R. (2021). Co-designing a mobile app to improve mental health and well-being: Focus group study. *JMIR Formative Research*, *5*(2), e18172.
<https://doi.org/10.2196/18172>

- Alslaity, A., Suruliraj, B., Oyebode, O., Fowles, J., steeves, darren, & Orji, R. (2022). Mobile applications for health and wellness: A systematic review. *Proceedings of the ACM on Human-Computer Interaction*, 6, 1–29. <https://doi.org/10.1145/3534525>
- Alsyouf, A., Lutfi, A., Alsubahi, N., Alhazmi, F. N., Al-Mugheed, K., Anshasi, R. J., Alharbi, N. I., & Albugami, M. (2023). The use of a Technology Acceptance Model (TAM) to predict patients' usage of a personal health record system: The role of security, privacy, and usability. *International Journal of Environmental Research and Public Health*, 20(2), 1347. <https://doi.org/10.3390/ijerph20021347>
- American Psychological Association (2014). *The road to resilience*. Washington DC: American Psychological Association. <http://www.apa.org/helpcenter/road-resilience.aspx>
- Anderson, K., Burford, O., & Emmerton, L. (2016). Mobile health apps to facilitate self-care: A qualitative study of user experiences. *PLOS ONE*, 11(5). <https://doi.org/10.1371/journal.pone.0156164>
- Arora, P. G., & Algios, A. (2019). School-based mental health for Asian American immigrant youth: Perceptions and recommendations. *Asian American Journal of Psychology*, 10(2), 166–181. <https://doi.org/10.1037/aap0000142>
- Artuch-Garde, R., González-Torres, M. D. C., de la Fuente, J., Vera, M. M., Fernández-Cabezas, M., & López-García, M. (2017). Relationship between resilience and self-regulation: A study of Spanish youth at risk of social exclusion. *Frontiers in Psychology*, 8, 612.

- Augustine, M. (2022) Ripping the Cultural Band-Aid by Decolonizing “Culture” in Mental Health Practice: A Tamil Women’s Mental Health Study. [Ripping the Cultural Band-Aid by Decolonizing “Culture” in Mental Health Practice: A Tamil Women’s Mental Health Study \(dal.ca\)](#)
- Aziz, M., Erbad, A., Belhaouari, S. B., Almourad, M. B., Altuwairiqi, M., & Ali, R. (2023). Who uses mHealth apps? Identifying user archetypes of mHealth apps. *Digital Health*, 9, 20552076231152175. <https://doi.org/10.1177/20552076231152175>
- Babbage, C., Jackson, G. M., & Nixon, E. (2018). Desired features of a digital technology tool for self-management of well-being in a nonclinical sample of young people: Qualitative study. *JMIR Mental Health*, 5(4), e10067. <https://doi.org/10.2196/10067>
- Bakker, D., & Rickard, N. (2018). Engagement in mobile phone app for self-monitoring of emotional wellbeing predicts changes in mental health: MoodPrism. *Journal of Affective Disorders*, 227, 432–442. <https://doi.org/10.1016/j.jad.2017.11.016>
- Barello, S., Triberti, S., Graffigna, G., Libreri, C., Serino, S., Hibbard, J., & Riva, G. (2016). EHealth for patient engagement: a systematic review. *Frontiers in Psychology*, 6, 2013. <https://doi.org/10.3389/fpsyg.2015.02013>
- Baumel, A., Muench, F., Edan, S., & Kane, J. M. (2019). Objective user engagement with mental health apps: systematic search and panel-based usage analysis. *Journal of Medical Internet Research*, 21(9), e14567. <https://doi.org/10.2196/14567>
- Basri, T., Radhakrishnan, K., & Rolin, D. (2022). Barriers to and facilitators of mental health help-seeking behaviors among South Asian American College

- students. *Journal of psychosocial nursing and mental health services*, 60(7), 32–38.
<https://doi.org/10.3928/02793695-20211215-01>
- Bell, V., Méndez, F., Martínez, C., Palma, P. P., & Bosch, M. (2012). Characteristics of the Colombian armed conflict and the mental health of civilians living in active conflict zones. *Conflict and Health*, 6(1), 10. <https://doi.org/10.1186/1752-1505-6-10>
- Birtel, M. D., & Mitchell, B. L. (2023). Cross-cultural differences in depression White British and South Asians: Causal attributions, stigma by association, discriminatory potential. *Psychology and Psychotherapy*, 96(1), 101–116.
<https://doi.org/10.1111/papt.12428>
- Borch, K. B., Oyeyemi, S. O., Cook, S., Diab, K. J., & Pfuhl, G. (2023). Mental health self-help apps for coping with COVID19: Lessons learnt. Proceedings of the Paris Institute for Advanced Study, 5. https://paris.pias.science/article/FP_Borch
- Borghouts, J., Eikey, E., Mark, G., De Leon, C., Schueller, S. M., Schneider, M., Stadnick, N., Zheng, K., Mukamel, D., & Sorkin, D. H. (2021). Barriers to and facilitators of user engagement with digital mental health interventions: Systematic review. *Journal of Medical Internet Research*, 23(3), e24387. <https://doi.org/10.2196/24387>
- Bradvik L. (2018). Suicide risk and mental disorders. *International Journal of Environmental Research and Public Health*, 15(9), 2028.
<https://doi.org/10.3390/ijerph15092028>
- Braun, V., & Clarke, V. (2013). *Successful qualitative research* (1st ed.). Sage Publications Ltd.

- Braun, V., Clarke, V., & Gray, D. (2017). *Collecting qualitative data: a practical guide to textual, media and virtual techniques*. Cambridge University Press.
- Breslau, J., Cefalu, M., Wong, E. C., Burnam, M. A., Hunter, G. P., Florez, K. R., & Collins, R. L. (2017). Racial/ethnic differences in perception of need for mental health treatment in a US national sample. *Social Psychiatry and Psychiatric Epidemiology*, 52(8), 929–937. <https://doi.org/10.1007/s00127-017-1400-2>
- Bruffaerts, R., Mortier, P., Kiekens, G., Auerbach, R. P., Cuijpers, P., Demyttenaere, K., Green, J. G., Nock, M. K., & Kessler, R. C. (2018). Mental health problems in college freshmen: Prevalence and academic functioning. *Journal of affective disorders*, 225, 97–103. <https://doi.org/10.1016/j.jad.2017.07.044>
- Bucci, S., Varese, F., Quayle, E., Cartwright, K., Machin, M., Whelan, P., Chitsabesan, P., Richards, C., Green, V., Norrie, J., & Schwannauer, M. (2022). Minds: A digital intervention to improve mental health and interpersonal resilience for young people who have experienced online sexual abuse: Protocol for a non-randomised feasibility clinical trial and nested qualitative study. *JMIR Research Protocols*. <https://research.manchester.ac.uk/en/publications/minds-a-digital-intervention-to-improve-mental-health-and-interpe>
- Budimir, S., Probst, T., & Pieh, C. (2021). Coping strategies and mental health during COVID-19 lockdown. *Journal of Mental Health (Abingdon, England)*, 30(2), 156–163. <https://doi.org/10.1080/09638237.2021.1875412>

- Bunyi, J., Ringland, K. E., & Schueller, S. M. (2021). Accessibility and digital mental health: Considerations for more accessible and equitable mental health apps. *Frontiers in Digital Health*, 3, 742196. <https://doi.org/10.3389/fdgth.2021.742196>
- Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. *Neurological Research and Practice*, 2, 14. <https://doi.org/10.1186/s42466-020-00059-z>
- Casey, S. M., Varela, A., Marriott, J. P., Coleman, C. M., & Harlow, B. L. (2022). The influence of diagnosed mental health conditions and symptoms of depression and/or anxiety on suicide ideation, plan, and attempt among college students: Findings from the healthy minds study, 2018-2019. *Journal of Affective Disorders*, 298(Pt A), 464–471. <https://doi.org/10.1016/j.jad.2021.11.006>
- Castleberry, A., & Nolen, A. (2018). Thematic analysis of qualitative research data: Is it as easy as it sounds?. *Currents in Pharmacy Teaching & Learning*, 10(6), 807–815. <https://doi.org/10.1016/j.cptl.2018.03.019>
- Chan, S. R., Torous, J., Hinton, L., & Yellowlees, P. (2014). Mobile tele-mental health: increasing applications and a move to hybrid models of care. *Healthcare (Basel, Switzerland)*, 2(2), 220–233. <https://doi.org/10.3390/healthcare2020220>
- Chandrashekar, P. (2018). Do mental health mobile apps work: evidence and recommendations for designing high-efficacy mental health mobile apps. *mHealth*, 4, 6. <https://doi.org/10.21037/mhealth.2018.03.02>

- Chaudhry, T., & Chen, S. H. (2019). Mental illness stigmas in South Asian Americans: A cross-cultural investigation. *Asian American Journal of Psychology*, 10(2), 154–165. <https://doi.org/10.1037/aap0000141>
- Cheng, V. W. S., Davenport, T., Johnson, D., Vella, K., & Hickie, I. B. (2019). Gamification in apps and technologies for improving mental health and well-Being: Systematic review. *JMIR mental health*, 6(6), e13717. <https://doi.org/10.2196/13717>
- Chiauzzi, E., & Newell, A. (2019). Mental health apps in psychiatric treatment: A patient perspective on real world technology usage. *JMIR Mental Health*, 6(4). <https://doi.org/10.2196/12292>
- Chiu, M., Amartey, A., Wang, X., & Kurdyak, P. (2018). Ethnic differences in mental health status and service utilization: A population-based study in Ontario, Canada. *Canadian Journal of Psychiatry*. 63(7), 481–491. <https://doi.org/10.1177/0706743717741061>
- Cliffe, B., Stokes, Z., & Stallard, P. (2022). The acceptability of a smartphone app (BlueIce) for university students who self-harm. *Archives of Suicide Research*, 1–17. <https://doi.org/10.1080/13811118.2021.2022552>
- Coates, W. C., Jordan, J., & Clarke, S. O. (2021). A practical guide for conducting qualitative research in medical education: Part 2-coding and thematic analysis. *AEM Education and Training*, 5(4), e10645. <https://doi.org/10.1002/aet2.10645>
- Cogan, N. A., Liu, X., Y. Chin-Van Chau, Kelly, S. W., Anderson, T., Flynn, C., Scott, L., A. Zaglis, & Corrigan, P. (2023). The taboo of mental health problems, stigma and fear of disclosure among Asian international students: implications for help-seeking,

guidance and support. *British Journal of Guidance & Counselling*, 1–19.

<https://doi.org/10.1080/03069885.2023.2214307>

Compas, B. E., Jaser, S. S., Bettis, A. H., Watson, K. H., Gruhn, M. A., Dunbar, J. P., Williams, E., & Thigpen, J. C. (2017). Coping, emotion regulation, and psychopathology in childhood and adolescence: A meta-analysis and narrative review. *Psychological Bulletin*, 143(9), 939–991.

<https://doi.org/10.1037/bul0000110>

Cuijpers, P., Smit, F., Aalten, P., Batelaan, N., Klein, A., Salemink, E., Spinhoven, P., Struijs, S., Vonk, P., Wiers, R. W., de Wit, L., Gentili, C., Ebert, D. D., Bruffaerts, R., Kessler, R. C., & Karyotaki, E. (2021). The associations of common psychological problems with mental disorders among college students. *Frontiers in Psychiatry*, 12, 573637. <https://doi.org/10.3389/fpsyt.2021.573637>

Da Fonseca, M. H., Kovaleski, F., Picinin, C. T., Pedroso, B., & Rubbo, P. (2021). E-Health practices and technologies: A systematic review from 2014 to 2019. *Healthcare (Basel, Switzerland)*, 9(9), 1192.

<https://doi.org/10.3390/healthcare9091192>

Das, S., Manjunatha, N., Kumar, C. N., Math, S. B., & Thirthalli, J. (2020). Tele-psychiatric after care clinic for the continuity of care: A pilot study from an academic hospital. *Asian Journal of Psychiatry*, 48, 101886.

<https://doi.org/10.1016/j.ajp.2019.101886>

Deady, M., Glozier, N., Calvo, R., Johnston, D., Mackinnon, A., Milne, D., Choi, I., Gayed, A., Peters, D., Bryant, R., Christensen, H., & Harvey, S. B. (2022).

Preventing depression using a smartphone app: a randomized controlled trial.
Psychological Medicine, 52(3), 457–466.

<https://doi.org/10.1017/S0033291720002081>

Dederichs, M., Weber, J., Pischke, C. R., Angerer, P., & Apolinário-Hagen, J. (2021).

Exploring medical students' views on digital mental health interventions: A qualitative study. Internet Interventions, 100398.

<https://doi.org/10.1016/j.invent.2021.100398>

DeJonckheere, M., & Vaughn, L. M. (2019). Semistructured interviewing in primary care

research: a balance of relationship and rigour. Family Medicine and Community

Health, 7(2), e000057. <https://doi.org/10.1136/fmch-2018-000057>

Dennison, L., Morrison, L., Conway, G., & Yardley, L. (2013). Opportunities and

challenges for smartphone applications in supporting health behavior change:

qualitative study. Journal of Medical Internet Research, 15(4), e86.

<https://doi.org/10.2196/jmir.2583>

Devi, M. R. R., Devaki, P. R., Madhavan, M., & Saikumar, P. (2013). The effect of

counselling on the academic performance of college students. Journal of Clinical and

Diagnostic Research: JCDR, 7(6), 1086–1088.

<https://doi.org/10.7860/JCDR/2013/5247.3054>

Dijkstra, M. T., & Homan, A. C. (2016). Engaging in rather than disengaging from stress:

Effective coping and perceived control. Frontiers in Psychology, 7, 1415.

<https://doi.org/10.3389/fpsyg.2016.01415>

- Doan, N., Patte, K. A., Ferro, M. A., & Leatherdale, S. T. (2020). Reluctancy towards help-seeking for mental health concerns at secondary school among students in the COMPASS Study. *International Journal of Environmental Research and Public Health*, 17(19), 7128. <https://doi.org/10.3390/ijerph17197128>
- Dong, X., Yang, K., Zhang, R., & Lv, Y. (2021). The mental health and grade point average among college students from lower socioeconomic status based on healthcare data analysis. *Journal of Healthcare Engineering*, 2021, 2378202. <https://doi.org/10.1155/2021/2378202>
- Doyle, L., McCabe, C., Keogh, B., Brady, A., & McCann, M. (2020). An overview of the qualitative descriptive design within nursing research. *Journal of Research in Nursing: JRN*, 25(5), 443–455. <https://doi.org/10.1177/1744987119880234>
- Drake, C., Cannady, M., Howley, K., Shea, C., & Snyderman, R. (2020). An evaluation of mHealth adoption and health self-management in emerging adulthood. *Annual Symposium Proceedings*, 2019, 1021–1030.
- Drissi, N., Ouhbi, S., Marques, G., de la Torre Díez, I., Ghogho, M., & Janati Idrissi, M. A. (2021). A Systematic literature review on e-Mental health solutions to assist health care workers during COVID-19. *Telemedicine Journal and EHealth: The Official Journal of the American Telemedicine Association*, 27(6), 594–602. <https://doi.org/10.1089/tmj.2020.0287>
- Esmaeelzadeh, S., Moraros, J., Thorpe, L., & Bird, Y. (2018). The association between depression, anxiety and substance use among Canadian post-secondary

students. *Neuropsychiatric Disease and Treatment*, 14, 3241–3251.

<https://doi.org/10.2147/NDT.S187419>

Fante-Coleman, T., & Jackson-Best, F. (2020). Barriers and facilitators to accessing mental healthcare in Canada for Black youth: A scoping review. *Adolescent Research Review*, 5(2), 115–136. <https://doi.org/10.1007/s40894-020-00133-2>

Faurholt-Jepsen, M., Torri, E., Cobo, J., Yazdanyar, D., Palao, D., Cardoner, N., Andreatta, O., Mayora, O., & Kessing, L. V. (2019). Smartphone-based self-monitoring in bipolar disorder: evaluation of usability and feasibility of two systems. *International Journal of Bipolar Disorders*, 7(1), 1. <https://doi.org/10.1186/s40345-018-0134-8>

Fawcett, E., Neary, M., Ginsburg, R., & Cornish, P. (2020). Comparing the effectiveness of individual and group therapy for students with symptoms of anxiety and depression: A randomized pilot study. *Journal of American College Health: J of ACH*, 68(4), 430–437. <https://doi.org/10.1080/07448481.2019.1577862>

Ferrer, R., & Klein, W. M. (2015). Risk perceptions and health behavior. *Current Opinion in Psychology*, 5, 85–89. <https://doi.org/10.1016/j.copsyc.2015.03.012>

Fikriana, R., Fahrany, F., & Rusli, S. A. (2021). Health belief associated with adherence to health protocol in preventing coronavirus diseases on patients' family. *Open Access Macedonian Journal of Medical Sciences*, 9(B), 1011–1015. <https://doi.org/10.3889/oamjms.2021.6762>

Forero, R., Nahidi, S., De Costa, J., Mohsin, M., Fitzgerald, G., Gibson, N., McCarthy, S., & Aboagye-Sarfo, P. (2018). Application of four-dimension criteria to assess rigour

- of qualitative research in emergency medicine. *BMC Health Services Research*, 18(1), 120. <https://doi.org/10.1186/s12913-018-2915-2>
- Freire, C., Ferradás, M., Regueiro, B., Rodríguez, S., Valle, A., & Núñez, J. C. (2020). Coping strategies and self-efficacy in university students: A person-centered approach. *Frontiers in Psychology*, 11, 841. <https://doi.org/10.3389/fpsyg.2020.00841>
- Fruehwirth, J. C., Biswas, S., & Perreira, K. M. (2021). The Covid-19 pandemic and mental health of first-year college students: Examining the effect of Covid-19 stressors using longitudinal data. *PloS one*, 16(3), e0247999. <https://doi.org/10.1371/journal.pone.0247999>
- Garrido, S., Millington, C., Cheers, D., Boydell, K., Schubert, E., Meade, T., & Nguyen, Q. V. (2019). What works and what doesn't work? A Systematic review of digital mental health interventions for depression and anxiety in young people. *Frontiers in Psychiatry*, 10, 759. <https://doi.org/10.3389/fpsyt.2019.00759>
- Garrido, S., Oliver, E., Chmiel, A., Doran, B., & Boydell, K. (2022). Encouraging help-seeking and engagement in a mental health app: What young people want. *Frontiers in Digital Health*, 4, 1045765. <https://doi.org/10.3389/fdgth.2022.1045765>
- Giunti, G., Kool, J., Rivera Romero, O., & Dorrnzoro Zubiete, E. (2018). Exploring the specific needs of persons with multiple sclerosis for mHealth solutions for physical Activity: Mixed-methods study. *JMIR mHealth and uHealth*, 6(2), e37. <https://doi.org/10.2196/mhealth.8996>

- Goel, N. J., Thomas, B., Boutté, R. L., Kaur, B., & Mazzeo, S. E. (2023). "What will people say?": Mental health stigmatization as a barrier to eating disorder treatment-seeking for south asian American women. *Asian American Journal of Psychology*, 14(1), 96–113. <https://doi.org/10.1037/aap0000271>
- Gooday, S. M., Rivera, D., Foran, H., King, N., Milanovic, M., Keown-Stoneman, C. D., Horrocks, J., Tetzlaff, E., Bowie, C. R., Pickett, W., Harkness, K., Saunders, K. E., Cunningham, S., McNevin, S., & Duffy, A. (2019). U-Flourish university students well-being and academic success longitudinal study: a study protocol. *BMJ Open*, 9(8), e029854. <https://doi.org/10.1136/bmjopen-2019-029854>
- Grace, S. L., Tan, Y., Cribbie, R. A., Nguyen, H., Ritvo, P., & Irvine, J. (2016). The mental health status of ethnocultural minorities in Ontario and their mental health care. *BMC Psychiatry*, 16, 47. <https://doi.org/10.1186/s12888-016-0759-z>
- Gustems-Carnicer, J., & Calderón, C. (2013). Coping strategies and psychological well-being among teacher education students. *European Journal of Psychology of Education*, 28, 1127-1140. <https://doi.org/10.1007/s10212-012-0158-x>
- Hall, B. J., Xiong, P., Guo, X., Sou, E. K. L., Chou, U. I., & Shen, Z. (2018). An evaluation of a low intensity mHealth enhanced mindfulness intervention for Chinese university students: A randomized controlled trial. *Psychiatry Research*, 270, 394–403. <https://doi.org/10.1016/j.psychres.2018.09.060>
- Haque, M. D. R., & Rubya, S. (2023). An overview of chatbot-based mobile mental health apps: Insights from app description and user reviews. *JMIR MHealth and UHealth*, 11, e44838. <https://doi.org/10.2196/44838>

- Harrer, M., Adam, S. H., Fleischmann, R. J., Baumeister, H., Auerbach, R., Bruffaerts, R., Cuijpers, P., Kessler, R. C., Berking, M., Lehr, D., & Ebert, D. D. (2018). Effectiveness of an Internet and app-based intervention for college students with elevated stress: Randomized Controlled trial. *Journal of Medical Internet Research*, 20(4), e136. <https://doi.org/10.2196/jmir.9293>
- Henniq, M., & Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine* (1982), 292, 114523. <https://doi.org/10.1016/j.socscimed.2021.114523>
- Hiller, R. (2022). Combating low digital literacy in the college classroom: A narrative review. *Florida Journal of Educational Research*, 59(3). Retrieved from <https://journals.flvc.org/fjer/article/view/130541>
- Hoque, R., & Sorwar, G. (2017). Understanding factors influencing the adoption of mHealth by the elderly: An extension of the UTAUT model. *International Journal of Medical Informatics*, 101, 75–84. <https://doi.org/10.1016/j.ijmedinf.2017.02.002>
- Howard, A. L., Carnrite, K. D., & Barker, E. T. (2022). First- year university students' mental health trajectories were disrupted at the onset of COVID-19, but disruptions were not linked to housing and financial vulnerabilities: A registered report. *Emerging adulthood (Print)*, 10(1), 264–281. <https://doi.org/10.1177/21676968211053523>
- Huberty, J., Green, J., Glissmann, C., Larkey, L., Puzia, M., & Lee, C. (2019). Efficacy of the mindfulness meditation mobile app "Calm" to reduce stress among college

students: Randomized controlled trial. *JMIR MHealth and UHealth*, 7(6), e14273.

<https://doi.org/10.2196/14273>

Hyman, A., Stacy, E., Mohsin, H., Atkinson, K., Stewart, K., Novak Lauscher, H., & Ho, K. (2022). Barriers and Facilitators to Accessing Digital Health Tools Faced by South Asian Canadians in Surrey, British Columbia: Community-Based Participatory Action Exploration Using Photovoice. *Journal of Medical Internet Research*, 24(1), e25863. <https://doi.org/10.2196/25863>

Ishikawa, A., Rickwood, D., Bariola, E., & Bhullar, N. (2022). Autonomy versus support: Self-reliance and help-seeking for mental health problems in young people. *Social Psychiatry and Psychiatric Epidemiology*. <https://doi.org/10.1007/s00127-022-02361-4>

Islam, F., Multani, A., Hynie, M., Shakya, Y., & McKenzie, K. (2017). Mental health of South Asian youth in Peel Region, Toronto, Canada: a qualitative study of determinants, coping strategies and service access. *BMJ open*, 7(11), e018265. <https://doi.org/10.1136/bmjopen-2017-018265>

Islam, F., Qasim, S., Ali, M., Hynie, M., Shakya, Y., & McKenzie, K. (2023). South Asian youth mental health in Peel Region, Canada: Service provider perspectives. *Transcultural Psychiatry*, 60(2), 368–382. <https://doi.org/10.1177/13634615221119384>

Jembai, J. V. J., Wong, Y. L. C., Bakhtiar, N. A. M. A., Lazim, S. N. M., Ling, H. S., Kuan, P. X., & Chua, P. F. (2022). Mobile health applications: awareness, attitudes,

and practices among medical students in Malaysia. *BMC Medical Education*, 22(1).
<https://doi.org/10.1186/s12909-022-03603-4>

Johnson, J. L., Adkins, D., & Chauvin, S. (2020). A review of the quality indicators of rigor in qualitative research. *American Journal of Pharmaceutical Education*, 84(1), 7120. <https://doi.org/10.5688/ajpe7120>

Jones, C. L., Jensen, J. D., Scherr, C. L., Brown, N. R., Christy, K., & Weaver, J. (2015). The Health Belief Model as an explanatory framework in communication research: exploring parallel, serial, and moderated mediation. *Health Communication*, 30(6), 566–576. <https://doi.org/10.1080/10410236.2013.873363>

Karasz, A., Gany, F., Escobar, J., Flores, C., Prasad, L., Inman, A., Kalasapudi, V., Kosi, R., Murthy, M., Leng, J., & Diwan, S. (2019). Mental Health and stress among South Asians. *Journal of Immigrant and Minority Health*, 21(Suppl 1), 7–14.
<https://doi.org/10.1007/s10903-016-0501-4>

Kaveladze, B. T., Wasil, A. R., Bunyi, J. B., Ramirez, V., & Schueller, S. M. (2022). User experience, engagement, and popularity in mental health apps: Secondary analysis of app analytics and expert app reviews. *JMIR Human Factors*, 9(1), e30766.
<https://doi.org/10.2196/30766>

Kern, A., Hong, V., Song, J., Lipson, S. K., & Eisenberg, D. (2018). Mental health apps in a college setting: openness, usage, and attitudes. *MHealth*, 4, 20.
<https://doi.org/10.21037/mhealth.2018.06.01>

- Kim, H., Sefcik, J. S., & Bradway, C. (2017). Characteristics of qualitative descriptive studies: A systematic review. *Research in Nursing & Health*, 40(1), 23–42. <https://doi.org/10.1002/nur.21768>
- Kivlighan, D. M., Schreier, B. A., Gates, C., Hong, J. E., Corkery, J. M., Anderson, C. L., & Keeton, P. M. (2021). The role of mental health counseling in college students' academic success: An interrupted time series analysis. *Journal of Counseling Psychology*, 68(5), 562–570. <https://doi.org/10.1037/cou0000534>
- Kodish, T., Lau, A. S., Gong-Guy, E., Congdon, E., Arnaudova, I., Schmidt, M., Shoemaker, L., & Craske, M. G. (2022). Enhancing racial/ethnic equity in college student mental health through innovative screening and treatment. *Administration and Policy in Mental Health*, 49(2), 267–282. <https://doi.org/10.1007/s10488-021-01163-1>
- Koh, J., Tng, G. Y. Q., & Hartanto, A. (2022). Potential and pitfalls of mobile mental health apps in traditional treatment: An umbrella review. *Journal of Personalized Medicine*, 12(9), 1376. <https://doi.org/10.3390/jpm12091376>
- Konstantopoulos, G., Iliou, T., Karaivazoglou, K., Iconomou, G., Assimakopoulos, K., & Alexopoulos, P. (2020). Associations between (sub) clinical stress- and anxiety symptoms in mentally healthy individuals and in major depression: a cross-sectional clinical study. *BMC Psychiatry*, 20(1), 428. <https://doi.org/10.1186/s12888-020-02836-1>

- Krebs, P., & Duncan, D. T. (2015). Health app use among US mobile phone owners: A National Survey. *JMIR MHealth and UHealth*, 3(4), e101.
<https://doi.org/10.2196/mhealth.4924>
- Kristofferzon, M. L., Engström, M., & Nilsson, A. (2018). Coping mediates the relationship between sense of coherence and mental quality of life in patients with chronic illness: a cross-sectional study. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation*, 27(7), 1855–1863. <https://doi.org/10.1007/s11136-018-1845-0>
- Kruse, C. S., Betancourt, J. A., Gonzales, M., Dickerson, K., & Neer, M. (2022). Leveraging mobile health to manage mental health/behavioral health disorders: Systematic literature review. *JMIR Mental Health*, 9(12), e42301.
<https://doi.org/10.2196/42301>
- Kwan, M., Brown, D., MacKillop, J., Beaudette, S., Van Koughnett, S., & Munn, C. (2021). Evaluating the impact of Archway: a personalized program for 1st year student success and mental health and wellbeing. *BMC public health*, 21(1), 59.
<https://doi.org/10.1186/s12889-020-10057-0>
- Lahtinen, O., Aaltonen, J., Kaakinen, J., Franklin, L., & Hyönä, J. (2021). The effects of app-based mindfulness practice on the well-being of university students and staff. *Current Psychology (New Brunswick, N.J.)*, 1–10. Advance Online Publication. <https://doi.org/10.1007/s12144-021-01762-z>
- Lai, A. Y. K., Cheung, G. O. C., Choi, A. C. M., Wang, M. P., Chan, P. S. L., Lam, A. H. Y., Lo, E. W. S., Lin, C. C., & Lam, T. H. (2022). Mental health, support system,

and perceived usefulness of support in university students in Hong Kong amidst COVID-19 pandemic: A mixed-method survey. *International journal of environmental research and public health*, 19(19), 12931.

<https://doi.org/10.3390/ijerph191912931>

Lamis, D. A., Ballard, E. D., May, A. M., & Dvorak, R. D. (2016). Depressive symptoms and suicidal Ideation in college students: The mediating and moderating roles of hopelessness, alcohol problems, and social support. *Journal of Clinical Psychology*, 72(9), 919–932. <https://doi.org/10.1002/jclp.22295>

Latkin, C. A., Edwards, C., Davey-Rothwell, M. A., & Tobin, K. E. (2017). The relationship between social desirability bias and self-reports of health, substance use, and social network factors among urban substance users in Baltimore, Maryland. *Addictive Behaviors*, 73, 133–136. <https://doi.org/10.1016/j.addbeh.2017.05.005>

Lattie, E., Cohen, K. A., Winkvist, N., & Mohr, D. C. (2020). Examining an app-based mental health self-care program, IntelliCare for college students: Single-arm pilot study. *JMIR Mental Health*, 7(10), e21075. <https://doi.org/10.2196/21075>

Laurie, J., & Blandford, A. (2016). Making time for mindfulness. *International Journal of Medical Informatics*, 96, 38–50. <https://doi.org/10.1016/j.ijmedinf.2016.02.010>

Lin, S. Y., Schleider, J. L., Nelson, B. D., Richmond, L. L., & Eaton, N. R. (2023). Gender and racial/ethnic disparities in undergraduate and graduate students' mental health and treatment use amid the COVID-19 Pandemic. *Administration and Policy in Mental Health*, 50(4), 552–562. <https://doi.org/10.1007/s10488-023-01256-z>

- Linden, B. (2021). Cross-Canada release of the post-secondary student stressors index (PSSI): Protocol for a cross-sectional, repeated measures study. *JMIR research protocols*, 10(8), e27713. <https://doi.org/10.2196/27713>
- Liu, Y., Lu, X., Zhao, G., Li, C., & Shi, J. (2022). Adoption of mobile health services using the unified theory of acceptance and use of technology model: Self-efficacy and privacy concerns. *Frontiers in Psychology*, 13, 944976. <https://doi.org/10.3389/fpsyg.2022.944976>
- Liu, X., Ping, S., & Gao, W. (2019). Changes in undergraduate students' psychological well-being as they experience university life. *International journal of environmental research and public health*, 16(16), 2864. <https://doi.org/10.3390/ijerph16162864>
- Livingston, J., Patel, N., Bryson, S., Hoong, P., Lal, R., Morrow, M., & Guruge, S. (2018). Stigma associated with mental illness among Asian men in Vancouver, Canada. *The International Journal of Social Psychiatry*, 64 (7), 679-689. <https://doi.org/10.1177/0020764018805125>
- Locher, C., Meier, S., & Gaab, J. (2019). Psychotherapy: A world of meanings. *Frontiers in Psychology*, 10, 460. <https://doi.org/10.3389/fpsyg.2019.00460>
- Lomas, T., Cartwright, T., Edginton, T., & Ridge, D. (2015). A qualitative analysis of experiential challenges associated with meditation practice. *Mindfulness*, 6(4), 848–860. <https://doi.org/10.1007/s12671-014-0329-8>
- Lorga, M., Dondas, C., & Zugun-Eloae, C. (2018). Depressed as freshmen, stressed as seniors: The relationship between depression, perceived stress and academic results

among medical students. *Behavioral sciences (Basel, Switzerland)*, 8(8), 70.

<https://doi.org/10.3390/bs8080070>

Lu, K., Pang, F., & Shadiey, R. (2023). Understanding college students' continuous usage intention of asynchronous online courses through extended technology acceptance model. *Education and Information Technologies*, 1–19.

<https://doi.org/10.1007/s10639-023-11591-1>

Ludtke, T., Pult, L. K., Schröder, J., Moritz, S., & Bücken, L. (2018). A randomized controlled trial on a smartphone self-help application (Be good to yourself) to reduce depressive symptoms. *Psychiatry Research*, 269, 753–762.

<https://doi.org/10.1016/j.psychres.2018.08.113>

Lui, J. H. L., Marcus, D. K., & Barry, C. T. (2017). Evidence-Based Apps? A review of mental health mobile applications in a psychotherapy context. *Professional Psychology: research and practice*. Advance Online Publication.

<http://dx.doi.org/10.1037/pro0000122>

Mahapatra, N., & Murugan, V. (2023). South Asian young adults and gender roles: Expectations, expressions, and intimate partner violence prevention. *Violence Against Women*, 10778012231156155. Advance online publication.

<https://doi.org/10.1177/10778012231156155>

Mai, Y., Wu, Y. J., & Huang, Y. (2021). What type of social support is important for student resilience during COVID-19? A latent profile analysis. *Frontiers in Psychology*, 12, 646145. <https://doi.org/10.3389/fpsyg.2021.646145>

- Marshall, J. M., Dunstan, D. A., & Bartik, W. (2019). The digital psychiatrist: In search of evidence-based apps for anxiety and depression. *Frontiers in Psychiatry*, 10, 831. <https://doi.org/10.3389/fpsy.2019.00831>
- Mayer, G., Gronewold, N., Alvarez, S., Bruns, B., Hilbel, T., & Schultz, J.-H. (2019). Acceptance and expectations of medical experts, students, and patients toward electronic mental health apps: Cross-sectional quantitative and qualitative survey study. *JMIR Mental Health*, 6(11), e14018. <https://doi.org/10.2196/14018>
- Mekonen, T., Fekadu, W., Chane, T., & Bitew, S. (2017). Problematic alcohol use among university students. *Frontiers in Psychiatry*, 8, 86. <https://doi.org/10.3389/fpsy.2017.00086>
- Melcher, J., Camacho, E., Lagan, S., & Torous, J. (2022). College student engagement with mental health apps: analysis of barriers to sustained use. *Journal of American College Health*, 1–7. <https://doi.org/10.1080/07448481.2020.1825225>
- Mereu, A., Liori, A., Dessì, C., Girau, M., Mc Gilliard, D. C., Sotgiu, A., Agabio, R., Contu, P., & Sardu, C. (2021). Alcohol-Related Behaviour in Freshmen University Students in Sardinia, Italy. *International Journal of Environmental Research and Public Health*, 18(13), 7203. <https://doi.org/10.3390/ijerph18137203>
- Mete, P. (2021). Structural relationships between coping strategies, self-efficacy, and fear of losing one's self-esteem in science class. *International Journal of Technology in Education and Science (IJTES)*, 5(3), 375-393. <https://doi.org/10.46328/ijtes.180>
- Moghimi, E., Stephenson, C., Gutierrez, G., Jagayat, J., Layzell, G., Patel, C., McCart, A., Gibney, C., Langstaff, C., Ayonrinde, O., Khalid-Khan, S., Milev, R., Snelgrove-

- Clarke, E., Soares, C., Omrani, M., & Alavi, N. (2023). Mental health challenges, treatment experiences, and care needs of post-secondary students: a cross-sectional mixed-methods study. *BMC Public Health*, 23(1), 655.
<https://doi.org/10.1186/s12889-023-15452-x>
- Monaghan, C., Linden, B., & Stuart, H. (2021). Postsecondary mental health policy in Canada: A scoping review of the grey literature: *The Canadian Journal of Psychiatry*, 66(7), 603–615. <https://doi.org/10.1177/0706743720961733>
- Monti, F., Tonetti, L., & Bitti, P. E. (2013). Effectiveness of psychological treatments delivered at a counseling service for students. *Psychological Reports*, 113(3), 955–968. <https://doi.org/10.2466/21.02.PR0.113x28z4>
- Moon, J., Rigg, J. S., & Smith, J. E. (2020). Korean American smokers' perspectives on mobile smoking cessation applications. *Tobacco Use Insights*, 13, 11
<https://doi.org/10.1177/1179173X20972384>
- Morales-Rodríguez, F. M., & Pérez-Mármol, J. M. (2019). The Role of anxiety, coping strategies, and emotional Intelligence on general perceived self-efficacy in university students. *Frontiers in Psychology*, 10, 1689.
<https://doi.org/10.3389/fpsyg.2019.01689>
- Moran, T. P. (2016). Anxiety and working memory capacity: A meta-analysis and narrative review. *Psychological Bulletin*, 142(8), 831–864.
<https://doi.org/10.1037/bul0000051>
- Moreira de Sousa, J., Moreira, C. A., & Telles-Correia, D. (2018). Anxiety, depression and academic performance: A study amongst Portuguese medical students Versus non-

medical students. *Acta Medica Portuguesa*, 31(9), 454–462.

<https://doi.org/10.20344/amp.9996>

Moroz, N., Moroz, I., & D'Angelo, M. S. (2020). Mental health services in Canada: Barriers and cost-effective solutions to increase access. *Healthcare Management Forum*, 33(6), 282–287. <https://doi.org/10.1177/0840470420933911>

Morse J. M. (2015). Analytic Strategies and Sample Size. *Qualitative health research*, 25(10), 1317–1318. <https://doi.org/10.1177/1049732315602867>

Mortier, P., Auerbach, R. P., Alonso, J., Axinn, W. G., Cuijpers, P., Ebert, D. D., Green, J. G., Hwang, I., Kessler, R. C., Liu, H., Nock, M. K., Pinder-Amaker, S., Sampson, N. A., Zaslavsky, A. M., Abdulmalik, J., Aguilar-Gaxiola, S., Al-Hamzawi, A., Benjet, C., Demyttenaere, K., Florescu, S., ... Bruffaerts, R. (2018). Suicidal thoughts and behaviors among college students and same-aged peers: results from the World Health Organization World Mental Health Surveys. *Social Psychiatry and Psychiatric Epidemiology*, 53(3), 279–288. <https://doi.org/10.1007/s00127-018-1481-6>

Mozid, N. E. (2022). Association between psychological distress and coping strategies among students engaged in online learning. *PloS one*, 17(7), e0270877. <https://doi.org/10.1371/journal.pone.0270877>

Muftiasa, A., Sugesco, S., Sultan, M. A., & Hurriyati, R. (2022). The integration of perceived usefulness, ease of use and perceived risk in increasing customer usage intention to access E-channel during covid-19: Evidence from Indonesia.

- Proceedings of the 6th Global Conference on Business, Management, and Entrepreneurship (GCBME 2021). <https://doi.org/10.2991/aebmr.k.220701.051>
- Murnane, E. L., Cosley, D., Chang, P., Guha, S., Frank, E., Gay, G., & Matthews, M. (2016). Self-monitoring practices, attitudes, and needs of individuals with bipolar disorder: implications for the design of technologies to manage mental health. *Journal of the American Medical Informatics Association : JAMIA*, 23(3), 477–484. <https://doi.org/10.1093/jamia/ocv165>
- Nash, S., Sixbey, M., An, S., & Puig, A. (2017). University students' perceived need for mental health services: A study of variables related to not seeking help. *Psychological Services*, 14(4), 502–512. <https://doi.org/10.1037/ser0000172>
- Naslund, J. A., Aschbrenner, K. A., Kim, S. J., McHugo, G. J., Unützer, J., Bartels, S. J., & Marsch, L. A. (2017). Health behavior models for informing digital technology interventions for individuals with mental illness. *Psychiatric Rehabilitation Journal*, 40(3), 325–335. <https://doi.org/10.1037/prj0000246>
- Nicholas, J., Larsen, M. E., Proudfoot, J., & Christensen, H. (2015). Mobile apps for bipolar disorder: A systematic review of features and content quality. *Journal of Medical Internet Research*, 17(8), e198. <https://doi.org/10.2196/jmir.4581>
- Nicolaidou, I., Aristeidis, L., & Lambrinos, L. (2022). A gamified app for supporting undergraduate students' mental health: A feasibility and usability study. *Digital Health*, 8, 20552076221109059. <https://doi.org/10.1177/20552076221109059>
- Nowrouzi-Kia, B., Stier, J., Ayyoub, L., Hutchinson, L., Laframboise, J., & Mihailidis, A. (2021). The characteristics of Canadian university students' mental health,

engagement in activities and use of smartphones: A descriptive pilot study. *Health Psychology Open*, 8(2), 20551029211062029.

<https://doi.org/10.1177/20551029211062029>

Odoyo Collins Otieno, Liyala, S., Benson Charles Odongo, & Abeka, S. (2016). Theory of Reasoned Action as an Underpinning to technological innovation adoption studies.

World Journal of Computer Application and Technology, 4(1), 1–7.

<https://doi.org/10.13189/wjcat.2016.040101>

Olf, M. (2015). Mobile mental health: A challenging research agenda. *European Journal of*

Psychotraumatology, 6, 27882. <https://doi.org/10.3402/ejpt.v6.27882>

Orosa-Duarte, Á., Mediavilla, R., Muñoz-Sanjose, A., Palao, Á., Garde, J., López-Herrero, V., Bravo-Ortiz, M. F., Bayón, C., & Rodríguez-Vega, B. (2021). Mindfulness-based mobile app reduces anxiety and increases self-compassion in healthcare students: A randomised controlled trial. *Medical Teacher*, 43(6), 686–693.

<https://doi.org/10.1080/0142159X.2021.1887835>

Özen-Dursan B., Kaptan, S. K., Giles, S., Husain, N., & Panagioti, M. (2023).

Understanding self-harm and suicidal behaviours in South Asian communities in the UK: systematic review and meta-synthesis. *BJPsych open*, 9(3), e82.

<https://doi.org/10.1192/bjo.2023.63>

Paganin, G., Apolinário-Hagen, J., & Simbula, S. (2022). Introducing mobile apps to

promote the well-being of German and Italian university students. A cross-national application of the Technology Acceptance Model. *Current psychology*, 1–12.

<https://doi.org/10.1007/s12144-022-03856-8>

- Page, C. E., & Coutellier, L. (2018). Adolescent stress disrupts the maturation of anxiety-related behaviors and alters the developmental trajectory of the prefrontal cortex in a sex- and age-specific manner. *Neuroscience*, 390, 265–277.
<https://doi.org/10.1016/j.neuroscience.2018.08.030>
- Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method Implementation research. *Administration and Policy in Mental Health*, 42(5), 533–544. <https://doi.org/10.1007/s10488-013-0528-y>
- Parker, G., Shahid, N., Rappon, T., Kastner, M., Born, K., & Berta, W. (2022). Using theories and frameworks to understand how to reduce low-value healthcare: a scoping review. *Implementation Science : IS*, 17(1), 6.
<https://doi.org/10.1186/s13012-021-01177-1>
- Payne, H. E., Lister, C., West, J. H., & Bernhardt, J. M. (2015). Behavioral functionality of mobile apps in health interventions: A systematic review of the Literature. *JMIR MHealth and UHealth*, 3(1), e20. <https://doi.org/10.2196/mhealth.3335>
- Peng, W., Kanthawala, S., Yuan, S., & Hussain, S. A. (2016). A qualitative study of user perceptions of mobile health apps. *BMC Public Health*, 16(1).
<https://doi.org/10.1186/s12889-016-3808-0>
- Ponzo, S., Morelli, D., Kawadler, J. M., Hemmings, N. R., Bird, G., & Plans, D. (2020). Efficacy of the digital therapeutic mobile app BioBase to reduce stress and improve mental well-being among university students: Randomized controlled trial. *JMIR MHealth and UHealth*, 8(4), e17767. <https://doi.org/10.2196/17767>

- Puthran, R., Zhang, M. W., Tam, W. W., & Ho, R. C. (2016). Prevalence of depression amongst medical students: a meta-analysis. *Medical education*, 50(4), 456–468.
<https://doi.org/10.1111/medu.12962>
- Rahimi, B., Nadri, H., Lotfnezhad Afshar, H., & Timpka, T. (2018). A systematic review of the technology acceptance model in health informatics. *Applied Clinical Informatics*, 9(3), 604–634. <https://doi.org/10.1055/s-0038-1668091>
- Rahman, O., & Rollock, D. (2011). Acculturation, Competence, and Mental Health Among South Asian Students in the United States. *Journal of Multicultural Counseling and Development*, 32(3), 130–142. <https://doi.org/10.1002/j.2161-1912.2004.tb00366.x>
- Ramon, S., Quirk, A. D., & Zisman-Ilani, Y. (2021). Editorial: Shared decision making in mental health: International perspectives on implementation. *Frontiers in psychiatry*, 12, 793284. <https://doi.org/10.3389/fpsy.2021.793284>
- Ramos, G., Ponting, C., Labao, J. P., & Sobowale, K. (2021). Considerations of diversity, equity, and inclusion in mental health apps: A scoping review of evaluation frameworks. *Behaviour Research and Therapy*, 147, 103990.
<https://doi.org/10.1016/j.brat.2021.103990>
- Russo, S. J., Murrough, J. W., Han, M. H., Charney, D. S., & Nestler, E. J. (2012). Neurobiology of resilience. *Nature Neuroscience*, 15(11), 1475–1484.
<https://doi.org/10.1038/nn.3234>
- Salamanca-Sanabria, A., Jabir, A. I., Lin, X., Alattas, A., Kocaballi, A. B., Lee, J., Kowatsch, T., & Tudor Car, L. (2023). Exploring the perceptions of mHealth interventions for the prevention of common mental disorders in university students

in Singapore: Qualitative study. *Journal of Medical Internet Research*, 25, e44542.
<https://doi.org/10.2196/44542>

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & Quantity*, 52(4), 1893–1907.
<https://doi.org/10.1007/s11135-017-0574-8>

Saxon, L., Makhshvili, N., Chikovani, I., Seguin, M., McKee, M., Patel, V., Bisson, J., & Roberts, B. (2017). Coping strategies and mental health outcomes of conflict-affected persons in the Republic of Georgia. *Epidemiology and psychiatric sciences*, 26(3), 276–286. <https://doi.org/10.1017/S2045796016000019>

Schmidt, A. (2022). The factors influencing the adoption of mental health applications. Run. <http://hdl.handle.net/10362/145753>

Schueller, S. M., Neary, M., O'Loughlin, K., & Adkins, E. C. (2018). Discovery of and interest in health apps among those with mental health needs: Survey and focus group study. *Journal of Medical Internet Research*, 20(6), e10141.
<https://doi.org/10.2196/10141>

Schulte-Frankenfeld, P. M., & Trautwein, F. M. (2022). App-based mindfulness meditation reduces perceived stress and improves self-regulation in working university students: A randomised controlled trial. *Applied Psychology. Health and Well-being*, 14(4), 1151–1171. <https://doi.org/10.1111/aphw.12328>

Shanmuganandapala, B. (2020). Mental health and well-being among Tamil youth of Sri Lanka Origin living in Toronto: A mixed- methods approach.

<https://yorkspace.library.yorku.ca/server/api/core/bitstreams/dcc9c0a7-f643-4e2b-a4bc-30ca4284ab98/content>

Shanmuganandapala, B., & Khanlou, N. (2019). An Interview Between a Professor and a Nursing Graduate Student on the Current State of Post-secondary Student Mental Health in Ontario, Canada. *International Journal of Mental Health and Addiction*, 17(3), 418–424. <https://doi.org/10.1007/s11469-019-00104-2>

Shoib, S., Chandradasa, M., Rathnayake, L., Usmani, S., & Saeed, F. (2022). Children, adolescent, and youth mental health in Sri Lanka in the context of recent violence, COVID-19, and economic crisis: A call for action. *The Lancet Regional Health. Southeast Asia*, 2, 100021. <https://doi.org/10.1016/j.lansea.2022.100021>

Sinha Deb, K., Tuli, A., Sood, M., Chadda, R., Verma, R., Kumar, S., Ganesh, R., & Singh, P. (2018). Is India ready for mental health apps (MHApps)? A quantitative-qualitative exploration of caregivers' perspective on smartphone-based solutions for managing severe mental illnesses in low resource settings. *PloS one*, 13(9), e0203353. <https://doi.org/10.1371/journal.pone.0203353>

Six, S. G., Byrne, K. A., Tibbett, T. P., & Pericot-Valverde, I. (2021). Examining the effectiveness of gamification in mental health apps for depression: Systematic review and meta-analysis. *JMIR Mental Health*, 8(11), e32199. <https://doi.org/10.2196/32199>

Smyth, J. M., Johnson, J. A., Auer, B. J., Lehman, E., Talamo, G., & Sciamanna, C. N. (2018). Online positive affect journaling in the improvement of mental distress and well-being in general medical patients with elevated anxiety symptoms: A

preliminary randomized controlled trial. *JMIR Mental Health*, 5(4), e11290.

<https://doi.org/10.2196/11290>

Solmi, M. *et al.* (2021) “Age at onset of mental disorders worldwide: Large-scale meta-analysis of 192 epidemiological studies,” *Molecular Psychiatry*, 27(1), pp. 281–295.

Available at: <https://doi.org/10.1038/s41380-021-01161-7>.

Southwick, S. M., Bonanno, G. A., Masten, A. S., Panter-Brick, C., & Yehuda, R. (2014).

Resilience definitions, theory, and challenges: interdisciplinary

perspectives. *European Journal of Psychotraumatology*, 5, 10.3402/ejpt.v5.25338.

<https://doi.org/10.3402/ejpt.v5.25338>

Stanisławski, K. (2019). The Coping circumplex model: An integrative model of the structure of coping with stress. *Frontiers in Psychology*, 10, 694.

<https://doi.org/10.3389/fpsyg.2019.00694>

Steinfeld, N. (2016). “I agree to the terms and conditions”: (How) do users read privacy policies online? An eye-tracking experiment. *Computers in Human Behavior*, 55(B),

992–1000. <https://doi.org/10.1016/j.chb.2015.09.038>

Stiles-Shields, C., Montague, E., Lattie, E. G., Kwasny, M. J., & Mohr, D. C. (2017). What might get in the way: Barriers to the use of apps for depression. *Digital health*, 3,

2055207617713827. <https://doi.org/10.1177/2055207617713827>

Subaşı, M. (2020). Modeling the relationships among mastery goal orientations, positive coping strategy, and motivational beliefs in science. *Science Education International*,

31(4), 328–333. <https://doi.org/10.33828/sei.v31.i4.1>

- Subhi, Y., Bube, S. H., Rolskov Bojsen, S., Skou Thomsen, A. S., & Konge, L. (2015). Expert involvement and adherence to medical evidence in medical mobile phone apps: A systematic review. *JMIR mHealth and uHealth*, 3(3), e79. <https://doi.org/10.2196/mhealth.4169>
- Subic-Wrana, C., Beutel, M. E., Brähler, E., Stöbel-Richter, Y., Knebel, A., Lane, R. D., & Wiltink, J. (2014). How is emotional awareness related to emotion regulation strategies and self-reported negative affect in the general population? *PloS One*, 9(3), e91846. <https://doi.org/10.1371/journal.pone.0091846>
- Tabassum, R. (2017). Gender Inequality in Mental Health: A Review from the South Asian Context. *Bangladesh Journal of Medical Science*, 16(2), 203–206. <https://doi.org/10.3329/bjms.v16i2.31938>
- Taiwo, J. (2015). A commentary on the relationship between self-efficacy, problem-focused coping and performance. *Behavioural Sciences Undergraduate Journal*, 2(1), 37–41. <https://doi.org/10.29173/bsuj291>
- Tembo, C., Burns, S., & Kalembo, F. (2017). The association between levels of alcohol consumption and mental health problems and academic performance among young university students. *PloS One*, 12(6), e0178142. <https://doi.org/10.1371/journal.pone.0178142>
- Thompson, N. J., Fiorillo, D., Rothbaum, B. O., Ressler, K. J., & Michopoulos, V. (2018). Coping strategies as mediators in relation to resilience and posttraumatic stress disorder. *Journal of Affective Disorders*, 225, 153–159. <https://doi.org/10.1016/j.jad.2017.08.049>

- Thurston, A. M., Stöckl, H., & Ranganathan, M. (2021). Natural hazards, disasters and violence against women and girls: a global mixed-methods systematic review. *BMJ Global Health*, 6(4), e004377. <https://doi.org/10.1136/bmjgh-2020-004377>
- Tolcher, K., Cauble, M., & Downs, A. (2022). Evaluating the effects of gratitude interventions on college student well-being. *J Am Coll Health*. 27, 1-5.
- Tran, D. T., & Silvestri-Elmore, A. (2021). Healthcare-seeking behaviours in college students and young adults: a review. *Journal of Research in Nursing: JRN*, 26(4), 320–338. <https://doi.org/10.1177/1744987120951594>
- Vahdat, S., Hamzehgardeshi, L., Hessem, S., & Hamzehgardeshi, Z. (2014). Patient involvement in health care decision making: a review. *Iranian Red Crescent Medical Journal*, 16(1), e12454. <https://doi.org/10.5812/ircmj.12454>
- Vasileiou, K., Barnett, J., Thorpe, S., & Young, T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology*, 18(1), 148. <https://doi.org/10.1186/s12874-018-0594-7>
- Versteeg, M., & Kappe, R. (2021). Resilience and higher education support as protective factors for student academic stress and depression during Covid-19 in the Netherlands. *Frontiers in Public Health*, 9, 737223. <https://doi.org/10.3389/fpubh.2021.737223>
- Vidourek, R. A., King, K. A., Nabors, L. A., & Merianos, A. L. (2014). Students' benefits and barriers to mental health help-seeking. *Health Psychology and Behavioral Medicine*, 2(1), 1009–1022. <https://doi.org/10.1080/21642850.2014.963586>

- Vinnikova, A., Lu, L., Wei, J., Fang, G., & Yan, J. (2020). The use of smartphone fitness applications: The role of self-efficacy and self-regulation. *International Journal of Environmental Research and Public Health*, 17(20), 7639.
<https://doi.org/10.3390/ijerph17207639>
- Voth, M., Chisholm, S., Sollid, H., Jones, C., Smith-MacDonald, L., & Brémault-Phillips, S. (2022). Efficacy, effectiveness, and quality of resilience-building mobile health Apps for military, veteran, and public safety personnel populations: Scoping Literature Review and App Evaluation. *JMIR MHealth and UHealth*, 10(1), e26453.
<https://doi.org/10.2196/26453>
- Wiens, K., Bhattarai, A., Dores, A., Pedram, P., Williams, J. V., Bulloch, A. G., & Patten, S. B. (2019). Mental health among Canadian postsecondary students: A mental health crisis? *The Canadian Journal of Psychiatry*, 65(1), 30–35.
<https://doi.org/10.1177/0706743719874178>
- Wijayaratne S. (2020). After the Violence. *Journal of Religion and Health*, 59(1), 428–430.
<https://doi.org/10.1007/s10943-019-00965-w>
- Wong, H. W., Lo, B., Shi, J., Hollenberg, E., Abi-Jaoude, A., Johnson, A., Chaim, G., Cleverley, K., Henderson, J., Levinson, A., Robb, J., Voineskos, A., & Wiljer, D. (2021). Postsecondary student engagement with a mental health app and online platform (Thought Spot): Qualitative study of user experience. *JMIR Mental Health*, 8(4), e23447. <https://doi.org/10.2196/23447>

- Worku, D., Dirriba, A. B., Wordofa, B., & Fetensa, G. (2020). Perceived stress, depression, and associated factors among undergraduate health science students at Arsi university in 2019 in Oromia, Ethiopia. *Psychiatry Journal*, 2020, 4956234. <https://doi.org/10.1155/2020/4>
- Wu, G., Feder, A., Cohen, H., Kim, J. J., Calderon, S., Charney, D. S., & Mathé, A. A. (2013). Understanding resilience. *Frontiers in Behavioral Neuroscience*, 7, 10. <https://doi.org/10.3389/fnbeh.2013.00010>
- Wu, Y., Sang, Z. Q., Zhang, X. C., & Margraf, J. (2020a). The relationship between resilience and mental health in Chinese college students: A longitudinal cross-lagged analysis. *Frontiers in Psychology*, 11, 108. <https://doi.org/10.3389/fpsyg.2020.00108>
- Wu, Y., Yu, W., Wu, X., Wan, H., Wang, Y., & Lu, G. (2020b). Psychological resilience and positive coping styles among Chinese undergraduate students: a cross-sectional study. *BMC Psychology*, 8(1), 79. <https://doi.org/10.1186/s40359-020-00444-y>
- Yoon, H., Jang, Y., Vaughan, P. W., & Garcia, M. (2020). Older adults' internet use for health information: Digital divide by race/ethnicity and socioeconomic status. *Journal of Applied Gerontology : The Official Journal of the Southern Gerontological Society*, 39(1), 105–110. <https://doi.org/10.1177/0733464818770772>
- Zhang, X., Han, X., Dang, Y., Meng, F., Guo, X., & Lin, J. (2016). User acceptance of mobile health services from users' perspectives: The role of self-efficacy and response-efficacy in technology acceptance. *Informatics for Health and Social Care*, 42(2), 194–206. <https://doi.org/10.1080/17538157.2016.1200053>

Zhao, L., Sznajder, K., Cheng, D., Wang, S., Cui, C., & Yang, X. (2021). Coping styles for mediating the effect of resilience on depression among medical students in web-based classes during the COVID-19 pandemic: Cross-sectional questionnaire study. *Journal of Medical Internet Research*, 23(6), e25259.
<https://doi.org/10.2196/25259>

Appendices

Appendix A

Letter of Approval from Ontario Tech University Research Ethics Board

Date: February 17, 2023
To: Wendy Stanyon
From: Ginny Brunton, REB Vice-Chair
File # & Title: 17159 - Understanding the Usage of Mental Health Apps among Postsecondary Students
Status: **APPROVED**
Review Type: **Full Board Review**
REB Expiry Date: **February 01, 2024**
Documents Approved:

Document Type	Document Name	Version Date
Data Collection Materials	Appendix 1- Data Collection Semi Structured Interview	2023/01/16
Confidentiality Agreements	Appendix 7- Thank You Note	2023/01/16
Participant Materials/Handouts	Appendix 6- Thank You Note	2023/01/16
Data Management Plan	Appendix 5- Data Management Plan	2023/01/16
Consent Letter	Appendix 2- Consent Form	2023/01/16
Other	Appendix 8- Proposal	2022/10/03
Recruitment Materials	Appendix 4 - Letter of Invitation	2022/10/03

Notwithstanding this approval, you are required to obtain/submit, to Ontario Tech Research Ethics Board, any relevant approvals/permissions required, prior to commencement of this project.

The Ontario Tech Research Ethics Board (REB) has reviewed

and approved the research study named above to ensure compliance with the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2 2018), the Ontario Tech Research Ethics Policy and Procedures and associated regulations. As the Principal Investigator (PI), you are required to adhere to the research protocol described in the REB application as last reviewed and approved by the REB. In addition, you are responsible for obtaining any further approvals that might be required to complete your project.

Under the TCPS2 2018, the PI is responsible for complying with the continuing research ethics reviews requirements listed below:

Renewal Request Form: All approved projects are subject to an annual renewal process. Projects must be renewed or closed by the expiry date indicated above (“Current Expiry”). Projects not renewed 30 days post expiry date will be automatically suspended by the REB; projects not renewed 60 days post expiry date will be automatically closed by the REB. Once your file has been formally closed, a new submission will be required to open a new file.

Change Request Form: If the research plan, methods, and/or recruitment methods should change, please submit a change request application to the REB for review and approval prior to implementing the changes.

Adverse or Unexpected Events Form: Events must be reported to the REB within 72 hours after the event occurred with an indication of how these events affect (in the view of the Principal Investigator) the safety of the participants and the continuation of the protocol (i.e. un-anticipated or un-mitigated physical, social or psychological harm to a participant).

Research Project Completion Form: This form must be completed when the research study is concluded.

Always quote your REB file number (**17159**) on future correspondence. We wish you success with your study.

Sincerely,

Dr. Ginny Brunton
REB -Vice-Chair
Ginny.Brunton@ontariotechu.ca

Appendix B

Interview Guide

Socio-Demographic Questionnaire

- 1) What is your gender?
- 2) What is your age?
- 3) What program are you currently enrolled in?
- 4) What is your ethnicity?

Semi Structured Interview Questions

- 1) Which mental health apps have you used? Do you continue to use those apps? Why or Why not? Are there any other apps you use? (Anderson et al., 2016)
- 2) What are the driving factors influencing your intention to using mental health apps? How do you perceive them? Do you have specific examples you would like to share? (Anderson et al., 2016)
- 3) What do you like about the app? How does the app fulfill your needs? Would you recommend the app to others? Explain why or why not? (Anderson et al., 2016)
- 4) How would you describe the usefulness of the app? What makes/made the app information clear and understandable (or not)? How do/did you find the font size and representation? How do/did you add remarks to your readings? (Anderson et al., 2016)
- 5) Do you find it easy or difficult to use mental health apps to manage your mental health? (Anderson et al., 2016)

If “easy”: what makes it easy for you?

If “difficult: what makes it difficult for you?

- 6) What are some of the perceived benefits of using the mental health app?
- 7) What are some of your perceived barriers regarding adherence to the app?
- 8) What are some of the benefits of using technology to assist in managing your mental health, as opposed to traditional methods?