Contribution of the Big 5 personality traits to the mental health of Canadian adults and youth during the COVID-19 pandemic

by

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Abstract:

The Coronavirus Disease (COVID-19) epidemic was first detected in China in December 2019 and spread to other countries quickly. Many studies have shown that the COVID-19 pandemic adversely affected mental health. Individual differences such as personality could influence people's responses to the pandemic. In our first study, we examined how personality traits of Neuroticism and Extraversion (using the Five-Factor Model as our framework) were related to the mental health of Canadians during the first year of the COVID-19 pandemic. Using data from an online survey with 1096 responses and controlling for demographic variables, we found that personality traits of Neuroticism and Extraversion are associated with the current mental health of Canadians during the COVID-19 pandemic, with Extraversion positively related to mental health and Neuroticism negatively related to it. In our second study, we tried to replicate the results of our first study, a year later, in the second year of the pandemic. Our results were similar to our first study and we found that Extraversion was positively and Neuroticism negatively was associated with the mental health of Canadians. We also extended our first study by including all 5 personality traits in our analysis and controlling for coping and response to COVID-19 stress (in addition to demographic variables) and found that Agreeableness, Openness to Experience, and Conscientiousness were positively and significantly related to the mental health of Canadians. In our third study, we examined how personality traits (using the Five-Factor Model as our framework and controlling for coping and response to COVID-19 stress and demographic variables) and coping and response to COVID-19 stress were related to the mental health of Canadian children and adolescents during the second year of the pandemic. Using parent reports of 100 preschoolers and 607 7–18-year-old children, we found that the big 5 personality traits were associated with the mental health of Canadian youth during COVID-19 pandemic. In preschoolers,

Neuroticism and Agreeableness predicted the most mental health problems, and in 6-18-year-old children, Extraversion negatively predicted the most mental health problems. Also, Openness to Experience was the weakest predictor of mental health status in Canadian youth. Furthermore, we conducted a moderated hierarchical regression analysis to determine whether the relationship between personality traits and SDQ variables is moderated by age in 7–18-year-old children. Our results indicated that age did not moderate the relationship between personality traits and SDQ variables with the exception of a negative interaction effect between age and Extraversion on Hyperactivity/Inattention and a very weak positive interaction effect between age and Conscientiousness on Total Difficulty score.

The results of this study could have important implications for mental health research, prevention, and treatment of mental health issues in adults and children. For instance, since the results of our study showed that different individuals with different personality traits are experiencing the pandemic differently, thus, they may need mental health services that are more specifically tailored to their personality type. Also, our findings could help healthcare providers to develop more targeted interventions for prevention or treatment. Moreover, by identifying personality traits that could put children at risk for mental health problems, healthcare professionals and caregivers can take steps to intervene early and prevent the development of more severe mental health problems and also tailor treatment plans for children with mental health issues.

Preface

This thesis is an original work by Anahita Shokrkon. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name “How personality predicts the effects of COVID-19 epidemic on mental health of Canadians”, No. Pro00100751, May 15, 2020.

Chapter 2 of this thesis has been published by A. Shokrkon, and E. Nicoladis, “How personality traits of Neuroticism and Extraversion predict the effects of COVID-19 on the mental health of Canadians” PLOS ONE, vol. 16, issue 5, e0251097. I was responsible for the conceptualization, data collection, and analysis as well as the manuscript composition. E. Nicoladis was responsible for the supervision, reviewing, and editing.

To my husband Saman, my parents, Nahid and Mohammadkazem and my brother Arya
For all their love, support, and companionship.

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Table of Contents

List of Tables

Chapter 1

Introduction

Introduction

The Coronavirus Disease 2019 (COVID-19) first emerged in Wuhan, China, in late 2019 and rapidly spread worldwide (Wang et al., 2020). The COVID-19 outbreak was listed as a global public health emergency on January 30, 2020, by the World Health Organization (WHO) (WHO, 2020). The effects of the pandemic and its consequences (such as social distancing measures, increased unemployment, financial insecurity, school closures, and daily routine disruptions) have been extensive and far-reaching, impacting almost every aspect of life, including mental health. Many studies have shown that mental health has been adversely affected due to the pandemic, resulting in increased stress, anxiety, and depression reported across the globe (Cullen et al., 2020; Moreno et al., 2020; Usher et al., 2020).

However, not all individuals experienced the psychological effects of changes caused by COVID-19 similarly (Williams et al., 2020). For instance, previous research suggested that individual differences, such as genetics, life experiences, and personality, could significantly contribute to how individuals experience a crisis, therefore, affecting their mental health (Kotov et al., 2010; Tiet et al., 2001).

In this dissertation, I specifically explore the contribution of personality traits to the mental health of Canadians (youth and adults) during the COVID-19 pandemic. This dissertation will begin with an overview of mental health and the novel Coronavirus, the changes it caused, and its impact on mental health. Then, I will elaborate more on personality traits and how they could affect mental health.

What is Mental Health?

Mental health is defined as "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and

is able to make a contribution to his or her community" (WHO, 2005a). Mental health also involves the integration of the individual's mental state, functioning in a social context, and the individual's psychological functioning (Lamars et al., 2011; WHO, 2005b). Furthermore, it influences how we deal with stress, interact with others, and make healthy decisions (WHO, 2018). Mental health is not only referred to as an absence of psychopathological symptoms, it is also defined as the experience of feelings of well-being (Westerhof & Keyes, 2010).

The most recent research on positive mental health is based on two long-standing theories: the hedonic and the eudaimonic concepts (Keyes et al., 2002). The hedonic tradition refers to feelings of happiness, and satisfaction and defines well-being in terms of attaining pleasure and avoiding pain (Keyes et al., 2007). Hedonic well-being is a multidimensional construct, encompassing general evaluations of life on an emotional level (e.g., life satisfaction), and the experience of positive affect and the absence of negative affect (Diener, 2000; Diener et al., 1999). Researchers who focus on emotional well-being are working in accordance with the hedonic tradition (Diener et al., 1999).

The eudaimonic tradition places emphasis on individual strivings and self-realization and defines well-being in terms of how optimally a person functions (Deci & Ryan, 2008). Ryff's conceptual and empirical work has had the greatest influence as she identified six basic elements of positive functioning that together make up psychological well-being (Ryff, 1989; Ryff & Keyes, 1995). These six elements are *Self-acceptance* (the acceptance of past and present aspects of oneself), *Purpose in life* (life goals and beliefs that provide direction and meaning), *Autonomy* (self-direction determined by internal standards that are socially accepted), *Positive relationships with others* (maintaining fulfilling personal relationships expressing empathy and intimacy),

Environmental mastery (managing a complex environment in accordance with one's needs), and *Personal growth* (knowledge of one's potential for growth).

Ryff's research is primarily concerned with optimal functioning with regard to individual fulfillment. Another researcher, Keyes (1998), has suggested that it is also important to examine the optimal social functioning of individuals with regard to social involvement and embeddedness in society. He identified the following five dimensions of an optimally functioning individual in society: *Social coherence*: being able to make meaning of what is happening in society; *Social acceptance*: being positive towards others as well as understanding their challenges), *Social actualization* (believing that the community is capable of evolving positively), *Social contribution* (one's sense of contributing to society and being valued by it), and *Social integration* (a feeling of community membership). Hedonic well-being (emotional well-being) and the psychological and societal aspects of eudaimonic well-being together constitute the definition of positive mental health (Keyes, 2005). These are the aspects of mental health we focused on in the present studies, particularly in our studies on adults.

The mental health of an individual could be affected by a variety of factors, including genetics, life experiences, stress, physical health, social relationships and support, and cultural and societal factors. As a result of the COVID-19 pandemic, all aspects of life were affected, which could, in turn, have an adverse effect on mental health. In the next sections of this dissertation, we will focus on the history of COVID-19 and how it could affect mental health.

COVID-19 History across the world and in Canada

Coronavirus disease 2019 (COVID-19) is a viral illness caused by severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2). The first known case was detected in Wuhan, China, in

December 2019 (Page et al., 2021). The illness spread rapidly throughout the world, causing the COVID-19 pandemic. The COVID-19 outbreak was declared a global health emergency on January 30, 2020, by the WHO (WHO, 2020). The COVID-19 virus causes a number of physical symptoms, such as fever, cough, headache, fatigue, difficulty breathing, olfactory loss, and loss of taste (Kooraki et al., 2020; Saniasiaya et al., 2021).

In Canada, the first COVID-19 case was identified on January 25, 2020 (Canadian Institute of Health Information, 2022). So far, there have been more than 4.5 million cases of the disease, and more than 50 thousand people lost their lives in Canada (Government of Canada, 2023). Since the beginning of the pandemic, governments and public health authorities across Canada introduced many public health measures including non-medical mask use, physical distancing, isolation, and quarantine.

The data from the first round of our study (adults) was gathered during the first and second waves of the pandemic (June and July 2020). During that period, many changes occurred in Canada for example, a state of emergency was declared, social restriction measures were introduced, lockdown rules were implemented, schools and universities were closed and unemployment rates significantly increased (Statistics Canada, 2021). Moreover, a profound decline in the mental health of Canadians was also reported. For instance, Statistics Canada reported declines in mental health: in 2020 48% of Canadians reported having excellent or very good mental health compared to 68% in 2019.

The data of the second round of our study (children and adults) was gathered during the third wave of the pandemic (June and July 2021). At that time, provinces entered and exited lockdown, many social restrictions were still in place, and vaccinations had been started in November 2020 in Canada. According to the Public Health Agency of Canada positive mental

health continued to decline in 2021 and the COVID-19 pandemic adversely affected more than seven out of ten Canadians (Public Health Agency of Canada, 2021). Also, results of a survey on COVID-19 and Mental Health revealed that one in four (25%) Canadians over the age of 18 displayed symptoms of depression, anxiety, or posttraumatic stress disorder in spring 2021, an increase from one in five (21%) in fall 2020 (Stats Canada, 2021).

COVID-19 pandemic and mental health

The COVID-19 pandemic and the associated changes to how people live their lives have contributed to a significant increase in risk factors associated with mental health problems. For instance, lockdown rules and social distancing measures have contributed to feelings of loneliness and isolation, in particular among seniors and individuals who were living alone (Hwang et al., 2020). Due to the downturn in the economy, many people have faced financial insecurity and stress, particularly those who lost their jobs or had their hours reduced (Statistics Canada, 2022). The closure of schools and universities disrupted education for millions of students and caused widespread learning loss (Viner et al., 2020). The pandemic has forced many small and medium-sized businesses to close, resulting in substantial economic losses (Gostin & Wiley, 2020). As a result of the pandemic, daily routines have been disrupted, such as work, school, and social activities, resulting in feelings of uncertainty and instability (Murray et al., 2021). Due to the pandemic, stress and workload have increased among those who care for children, sick family members, or aging relatives (Wade et al., 2021). Also, the pandemic has caused traumatic experiences that may have a lasting effect on the mental health of affected individuals, such as healthcare workers and those who have lost loved ones (Carson et al., 2021; d'Ettorre et al., 2021). The pandemic has also disrupted access to mental health services and resources, preventing some people from getting the help they need (Brunier & Drysdale, 2020). Moreover, confinement at

home has led to more tension and violence in some relationships and along with disruptions to support systems, this could be a contributing factor to the increased psychological distress and mental health issues (Kourti et al., 2021). Lastly, fear of the disease, becoming infected, or spreading the virus to loved ones could also result in constant worry and stress, impacting the mental health of individuals during the pandemic (Fitzpatrick et al., 2021).

Numerous studies during the pandemic showed that many people were experiencing increased symptoms of depression, anxiety, post-traumatic stress disorder, and stress due to the psychosocial stressors caused by the pandemic (Chamaa et al., 2021; Lei et al., 2020; Cullen et al., 2020; Moreno et al., 2020; Usher et al., 2020). Moreover, stress, anxiety, and isolation caused by the pandemic, along with the disruption of treatment and recovery services, could raise the possibility of substance abuse, addiction, and relapse (Hulsey et al., 2020). Other types of behavioral addiction such as gaming and gambling, as a result of lockdowns and self-quarantine, and food addiction, as a distraction or escape from the pandemic isolation, have also significantly increased (Balhara et al., 2020; Centers for Disease Control and Prevention, 2021). Studies have also found that the prevalence of insomnia has also increased during the pandemic which could be the result of stressful life events and concerns about finances and employment (Morin et al., 2021).

Nevertheless, individuals did not experience similar psychological effects as a result of the COVID-19 pandemic (Williams et al., 2020). For example, it is suggested that individual differences, such as genetics, life experiences, and personality, affect how an individual experiences a crisis, ultimately affecting their mental health (Kotov et al., 2010; Tiet et al., 2001). In this dissertation, we are studying how *personality traits* contribute to people's mental health during the pandemic. In the following section, I will provide a more detailed explanation of personality and theories.

Personality

Personality refers to people's unique and fundamental characteristic patterns of thoughts, feelings, and behaviors that distinguish people from one another (Diener et al., 2019; Matthews et al., 2003). It determines how a person views the world and communicates with others, and it tends to remain fairly stable throughout one's lifetime (Diener et al., 2019). Personality psychologists have developed taxonomies and various trait models have been proposed over the years, and there has been controversy over which is the most appropriate model (John & Srivastava, 1999; McCrae & Costa, 2013). Among the previous prominent models were Eysenck's Personality Inventory (Eysenck & Eysenck, 1964) and Cattell's 16 Personality Factors (Cattell, 1988).

The Five-Factor Model (FFM) is currently the most widely accepted and consensual personality model, the main personality domains consist of Extraversion, Neuroticism, Agreeableness, Openness to Experience, and Conscientiousness (McCrae & Costa, 2008). Each personality trait represents a continuum, and individuals can fall anywhere on the continuum (Goldberg, 1993). These traits are clusters of a number of distinct traits; thus, they encompass many different facets of personality (Goldberg, 1993). There are also many researchers examining the applicability of the FFM of personality to children (Halverson et al., 1994; Kohnstamm et al., 1998). The FFM framework has been shown to be valid and applicable to children as young as preschool age and several studies have identified five factors comparable to the FFM traits in adults (Asendorpf & Denissen, 2006; Grist & McCord, 2010; Halverson et al., 1994; Mervielde & Asendorpf, 2000).

Extraversion (vs. Introversion) describes individuals who enjoy socializing, and are energetic, enthusiastic, and action-oriented (Taylor & Broffman, 2011) They tend to experience more positive emotions and they tend to get stimulation from being in the company of others

resulting in increasing their level of positive emotions (Watson et al., 1992). Extraversion trait has shown to be stable throughout adulthood and has shown strong cross-cultural generality (Walker, 2020). Extraversion is usually associated with higher positive mental health and higher levels of subjective well-being (Carver & Scheier, 2014; Diener et al., 1999) since individuals who score high on Extraversion tend to engage in social activities that increase their level of positive emotions (Pavot et al., 1990; Watson et al., 1992).

Neuroticism (or Emotional instability vs. Stability) corresponds to persons who tend to be pervasively sensitive to negative cues, worry or ruminate constantly and experience negative emotions (such as anger, anxiety, depression, or vulnerability) more often (Borders, 2020; Costa and McCrae 1985). Also, individuals who score high on Neuroticism are more likely to avoid social interactions, be reserved, and prefer solitary activities over social activities (McCrae & Costa, 1991). A high level of Neuroticism has been associated with a variety of psychological disorders, such as anxiety disorders, mood disorders, substance abuse disorders, eating disorders, personality and conduct disorders, somatoform disorders, and schizophrenia (Jylhä et al., 2009; Kotov et al., 2010; Rosmalen et al., 2007; Widiger & Oltmanns, 2017).

Agreeableness (vs. Antagonism) represents the tendency to concur and agree with others, especially authority figures (Ellis et al., 2018). It characterizes the tendency to be kind, cooperative, considerate, friendly, flexible, generous, and helpful (Graziano & Tobin, 2009). Agreeableness also describes an individual's tendency to build and maintain prosocial relationships (Nguyen et al., 2013). Agreeableness is associated with positive affect, psychological well-being, and mental health (DeNeve & Cooper, 1998; Schmutte & Ryff, 1997).

Openness to Experience (or Unconventionality) refers to being creative, inventive, open to novel ideas, and having a willingness to try new things (LePine, 2003). Individuals who score high on Openness to Experience usually exhibit a strong aesthetic sense and are willing to take on new challenges even though they could involve some risk (McCrae, 1987). Openness to Experience has been associated with overall well-being (Ahmad Marzuki, 2013; Dong & Ni, 2020; Keyes et al., 2002) and positive concepts such as positive emotions, individual growth, autonomy, life purpose, and independence (Anglim & Horwood, 2020; Anglim et al., 2020; Dong & Ni, 2020; Keyes, 2005).

Conscientiousness (or Constraint vs. Disinhibition) denotes a tendency to be careful, efficient, and organized, to show self-discipline, to be on time and to be goal-oriented, and to favor planned over spontaneous behavior (Roberts et al., 2005). Conscientiousness refers to the level of responsibility, and organization that people exhibit and the qualities of being prudent, and dependable (Barrick & Mount, 1991). Individuals with high Conscientiousness scores are less susceptible to adverse effects of anxiety, depression, and stress (Kotov et al., 2010; Tran et al., 2020).

Personality and Mental Health

Studies have demonstrated that personality plays an important part in well-being and mental health (e.g., Costa & McCrae, 1980; Diener, 1984; Diener & Larsen, 1993; Diener & Lucas, 1999; Myers & Diener, 1995). Of the five personality traits, Extraversion and Neuroticism have been studied the most. A study by Costa and McCrae (1980) demonstrated that personality traits of Neuroticism and Extraversion explained variance in well-being and that personality significantly predicts well-being after 20 years (Costa & McCrae, 1984). Other more recent studies

have also found that there is a strong negative relationship between Neuroticism and well-being and mental health and a strong positive relationship between Extraversion and well-being and mental health (Anglim et al., 2020; Lee et al., 2008). McCrae & Costa (1991) also discovered that in addition to Neuroticism and Extraversion being associated with well-being, Conscientiousness, and Agreeableness are also associated with well-being. Openness to experience has also been found to be associated with well-being (Dong & Ni, 2020; Keyes et al., 2002).

There is no established model to explain how personality traits could contribute to mental health. Nevertheless, various mechanisms have been suggested as explanations for the associations between personality traits with mental health. These suggested mechanisms incorporate both biological and behavioral pathways.

For instance, mental health and personality may share biological components. According to Gray's (1990) Reinforcement Sensitivity theory, the Behavioral Inhibition System (linked to anxiety and related to avoidance and inhibition when encountering danger and conflict) and the Behavioral Approach System (regulating positive approach behavior by motivating actions toward accomplishing goals and achieving positive emotional rewards) are comprised of multiple brain regions and circuits that are linked to both personality and well-being (Elliot & Thrash, 2002). There is also some evidence showing that Neuroticism and psychopathology and Extraversion and positive mental health share a similar physiological basis (Smits & Boeck, 2006). For instance, serotonin, a neurotransmitter related to both Behavioral Inhibition System and the Behavioral Approach System) is associated with both Neuroticism and psychopathology, while dopamine is associated with both Extraversion and positive affect (Costa & McCrae, 2008; Lasky-Su et al., 2005).

Moreover, personality may provide opportunities for life events and foster environments that contribute to mental health via behavioral pathways (Ozer & Benet-Martínez, 2006). For instance, people who score higher in Neuroticism are more susceptible to negative affect, are more likely to experience negative life events, are more likely to interpret them negatively, and are more likely to maintain the negative affect for a long period of time (Widiger & Oltmanns, 2017). On the other hand, people who score higher in Extraversion are more likely to experience positive life events (Magnus et al., 1993), experience greater amounts of positive emotions during social interactions (Pavot et al., 1990), and participate more actively in social settings, which could contribute to more positive emotions (Watson et al., 1992).

Current Research

In our current study, we investigate the impact of the COVID-19 pandemic on Canadian youth and adults, considering their personality traits. Our first study is a cross-sectional study conducted in 2020, we recruited 1096 participants and investigated how Neuroticism and Extraversion personality traits are related to the mental health of Canadians during the pandemic. Our second study is a cross-sectional study, for this study we recruited 1392 new adult participants to see if we can replicate the pattern, we found in our first study a year later (using the same mental health and personality questionnaires). We also extended the first study by including all Big 5 personality traits in our analysis. For our third study, in 2021, 100 parents of preschool children and 607 parents of 6-18-year-old children were recruited to complete mental health, personality, and response to stress questionnaires to determine how the personality traits of children and adolescents influence their well-being during the pandemic.

Understanding the relationships between personality traits and mental health variables enables an understanding that the pandemic and its consequences might affect individuals with

different personalities differently and it could contribute to the growing body of evidence that interventions with mental health would be more effective if they were tailored to the individual's personality.

Hypotheses

1. Hypothesis 1 (Study 1): Personality traits of Neuroticism and Extraversion are associated with the well-being of Canadian adults during the first year of the pandemic (after controlling for demographic variables). Neuroticism negatively contributes to positive mental health and Extraversion Positively contributes to positive mental health.
2. Hypothesis 2 (Study 2; replication of study 1): The results of the first study will be replicated. Neuroticism is negatively associated with positive mental health and Extraversion is positively associated with the positive mental health of Canadian adults a year later in the pandemic (after controlling for demographic variables and Coping and Response to Stress variables).
3. Hypothesis 3 (Study 2; Expansion of study 1): Agreeableness, Openness to Experience, and Conscientiousness are positively associated with the mental health of Canadians during the pandemic (after controlling for demographic variables and coping and response to stress variables).
4. Hypothesis 4 (Study 3): Personality traits are associated with the mental health of Canadian preschoolers during the COVID-19 pandemic with Extraversion, Agreeableness, Openness to Experience, and Conscientiousness negatively associated with Total Difficulty score, Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, Peer Relationship Problems (using SDQ measure) and Neuroticism positively related to them (after

controlling for demographic variables and coping and response to stress variables). Also, Extraversion, Agreeableness, Openness to Experience, and Conscientiousness are positively associated with Prosocial Behaviour and Neuroticism is negatively associated with it in preschoolers.

5. Hypothesis 5 (Study 3): Personality traits are associated with the mental health of 7–18-year-old children during the COVID-19 pandemic with Extraversion, Agreeableness, Openness to Experience, and Conscientiousness negatively associated with Total Difficulty score, Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, Peer Relationship Problems (using SDQ measure) and Neuroticism positively related to them (after controlling for demographic variables and coping and response to stress variables). Also, Extraversion, Agreeableness, Openness to Experience, and Conscientiousness are positively associated with Prosocial Behaviour and Neuroticism is negatively associated with it in 7–18-year-old children.
6. Hypothesis 6 (Study 3): Age does not moderate the relationship between personality traits (Neuroticism, Extraversion, Agreeableness, Openness to Experience, and Conscientiousness) and SDQ variables (Total Difficulty score, Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, Peer Relationship Problems and Prosocial Behavior) in 7–18-year-old children, after controlling for demographic variables and coping and response to stress variables.

Chapter 2

Study 1: How personality traits of Neuroticism and Extraversion predict the effects of COVID-19 on the mental health of Canadians

Shokrkon, A., & Nicoladis, E. (2021). How personality traits of neuroticism and extroversion predict the effects of the COVID-19 on the mental health of Canadians. *Plos one*, *16*(5), e0251097.

Abstract:

The Coronavirus Disease (COVID-19) epidemic was first detected in China in December 2019 and spread to other countries quickly. Some studies have found that the COVID-19 pandemic has had adverse mental health consequences. Individual differences such as personality could contribute to people's behaviors during a pandemic. In the current study, we examine how personality traits of Neuroticism and Extraversion (using the Five-Factor Model as our framework) are related to the mental health of Canadians during the COVID-19 pandemic. Using data from an online survey with 1096 responses, this study performed multiple regression analyses to explore how personality traits of Neuroticism and Extraversion predict the effects of COVID-19 on the mental health of Canadians. The results showed that personality traits of Neuroticism and Extraversion are associated with the current mental health of Canadians during the COVID-19 pandemic, with Extraversion positively related to mental health and Neuroticism negatively related to it. Results contribute to the management of individual responses to the COVID-19 pandemic and could help public health services provide personality-appropriate mental health services during this pandemic.

Introduction

The Coronavirus Disease (COVID-19) epidemic was first detected in China in December 2019 and spread to other countries, including Canada, in early 2020. In Canada, the first case of respiratory infection by COVID-19 was reported on 23 January 2020 (Marchand-Senécal et al., 2020). The World Health Organization (WHO) classified the COVID-19 outbreak as a pandemic in March 2020 (WHO 2020a) and as a result, in many countries including Canada, serious public restriction measures were announced. For instance, in March 2020, a state of emergency was declared in Canada, travel restrictions were announced and non-essential businesses closure was mandated (Government of Canada, 2020a, 2020b).

Previous outbreaks, such as the outbreak of Severe Acute Respiratory Syndrome (SARS) in 2003 and Ebola in 2014 showed that social restrictions had great and long-lasting negative effects on the mental health of people and the consequences included acute stress disorders, anxiety, irritability, poor concentration, deteriorating work performance, post-traumatic stress disorders, high psychological distress, depressive symptoms and insomnia (Brooks et al., 2020). The new COVID-19 disease and the consequences including worries over health, financial issues, job losses, working from home, home-schooling of children, lack of physical contact with other family members, friends and colleagues, and unpredictability have also caused severe psychological stress for many individuals around the world according to researchers (Bao et al., 2020; Wanget al., 2020) and international organizations such as WHO (WHO, 2020a).

However, some individuals experienced the psychological effects of COVID-19-related life changes more severely than others (Williams et al., 2020). The results of a poll in April 2020 by Angus Reid Institute showed that while 40% of Canadians reported that their mental health has worsened, another 10% reported that their mental health had worsened “a lot” (Angus Reid

Institute, 2020a). Angus Reid Institute later published another study showing that as many Canadians have become more isolated, they announced that they are more worried about their mental health. Their results showed that, in 2019, two-thirds (67%) of Canadians rated their mental health as good or very good but this year just 53% said the same. One in five (19%) now rated their mental health as either poor or very poor (Angus Reid Institute, 2020b).

Individual differences in characteristic patterns of thinking, feelings, behaviors, and emotions could contribute to people's behaviors during a pandemic. For instance, individual differences (such as personality traits) could significantly impact the risk perception of a pandemic (Khosravi, 2020). Also, in non-pandemic times, people who score higher in Extraversion trait, tend to have greater mental health and neurotics do not (Albuquerque et al., 2012; Buecker et al., 2020; Kotov et al., 2010; Lahey, 2009; Otonari et al., 2012) and with the pandemic-related social isolation, this pattern could change. The present study tested how personality traits of Neuroticism and Extraversion, from the Five-Factor Model (FFM), are related to the mental health of Canadians during the COVID-19 pandemic. For the sake of coherence and in order to address our research hypothesis, in the present study we focused only on personality traits of Neuroticism and Extraversion. The FFM is the most well-known model of personality consisting of the five broad domains of Neuroticism (or emotional instability vs. stability), Extraversion (vs. introversion), Openness to experience (or unconventionality), Agreeableness (vs. antagonism), and Conscientiousness (or constraint vs. disinhibition) (Goldberg, 1993). Understanding how personality contributes to people's mental health status during the COVID-19 pandemic could provide guidance for public health services to develop personality-tailored advice and help construct evidence-based recommendations for future infectious disease outbreaks. I will elaborate more on the connection between personality and mental health below.

In pre-pandemic time, out of the five-factor model of personality (FFM), Neuroticism and Extraversion tend to show the strongest links to mental health (Albuquerque et al., 2012; Buecker et al., 2020; Kotov et al., 2010; Lahey, 2009; Otonari et al., 2012). People who score high on the Neuroticism trait usually experience more negative affectivity (i.e. anxiety, anger, self-consciousness, irritability, and fear), respond worse to stressors leaving them vulnerable to adverse outcomes in the context of stressful experiences, are more anxious and insecure (Barrick et al., 2001), predisposing them to psychological distress (Costa & McCrae, 1992), and act more impulsively in comparison to individuals who score low on Neuroticism (Mitchell et al., 2020; Thompson, 2008). High Neuroticism is associated with a range of detrimental health outcomes, including lower subjective well-being (Diener et al., 1999), depressive symptoms, anxiety, mood, and substance abuse disorders (Hakulinen et al., 2015; Kotov et al., 2010; Malouff et al., 2005; Ruiz et al., 2008). Particularly in the context of a pandemic, people who score high on the Neuroticism trait are more likely to experience more stress, not only in response to the threat of the disease but also in reaction to social restrictions (Liu et al., 2020). Recent studies during the COVID-19 pandemic have also shown that individuals who score higher on Neuroticism experienced more generalized anxiety and depressive symptoms (Lee et al., 2020), more worrying and negative affect in their daily lives (Kroencke et al., 2020; Liu et al., 2020), found work/study restrictions and hygiene measures more restricting and experienced lower subjective well-being (Modersitzki et al., 2020), had more concerns about finances and relationships and were less optimistic about the duration estimates related to the COVID-19 pandemic (Aschwanden et al. 2020). Also, some researchers proposed that it is probable that people who score high in the Neuroticism trait might concentrate more on COVID-19-related information and pandemic consequences than people who score lower in this trait (Khosravi, 2020). As a result, those high in

Neuroticism can adopt social distancing to avoid COVID-19 infection (Abdelrahman, 2020; Zajenkowski et al., 2020), which can lead to experiencing even more mental health issues.

Extraversion is another trait that has shown strong correlations with mental health outcomes. As introverts and extroverts demonstrate substantially different attitudes toward social life (Smillie et al., 2019; Zelenski et al., 2014), the effects of social distancing might vary depending on individuals' Extraversion levels. Individuals who score high in Extraversion tend to experience positive emotions, activity, assertiveness, need for stimulation, and gregariousness compared to people with low on Extraversion (John et al., 2008; McCabe, & Fleeson, 2012). Individuals who score higher in Extraversion trait are energized and flourish by being around other people, and enjoy activities involving social interactions which is helpful in increasing their level of positive emotions (Watson et al., 1992). A higher score in the Extraversion trait has been associated with better-perceived health (Goodwin & Engstrom, 2002), well-being (Anglim et al., 2020; Steel et al., 2008; Diener et al., 1999; Lee et al., 2008), resilience (Brajša-Žganec et al., 2011; Oshio et al., 2018), positive affect (Lucas et al., 2008; Watson & Clark, 1997; Watson et al., 1988), and positive mental health (Lamers et al., 2012). In contrast, individuals who score high in introversion typically tend to have fewer social interactions than extroverts, experience more psychological problems in general, experience more intense emotions and more struggles in regulating their emotions, and have more adjustment problems (Fadda & Scalas, 2016; Janowsky, 2001; Jylha et al., 2009; Lucas et al., 2008).

There is controversy regarding the association between the Extraversion trait and mental health during a pandemic. One group of researchers claim that the lifestyle associated with social distancing during the pandemic might feel more unusual to extroverts than to people who score

lower in Extraversion, as individuals who score higher in Extraversion trait are energized by crowds and social interactions, and seek the company of others when stressed (Woodcock et al., 2013). Therefore, social isolation by inhibiting their need for social engagement might have more deleterious effects on the mental health of individuals who score higher in Extraversion compared to people who score lower in Extraversion, who continue to enjoy spending time in their solitude like the time before social distancing (Wijngaards et al., 2020). Many articles published on widely-visited popular websites such as Bloomberg (2020), Reuters (2020), The Conversation (2020), and the psychology website Psychology Today (2020) have introduced introversion as an asset for flourishing during social isolation related to COVID-19. Conversely, some researchers proposed that extroverts are more capable of adjusting to life-changing events, experiencing more positive affect, and keeping their positive affect longer than people who score lower in Extraversion, especially in more emotionally distressing situations (Steel et al. 2008). Moreover, extroverts usually have stronger social relationships which might have a buffering effect during the pandemic crisis (Folk et al., 2020). For instance, compared to people who score lower in Extraversion, people who score higher in Extraversion have more extended social networks (Harris et al., 2017; Lang et al., 1998), consequently, more support would be available to them during a difficult time. They also have higher quality relationships (Harris et al., 2017), experience more friendships satisfaction (Wilson et al., 2015), and perceive their social support higher (Swickert et al., 2002; Tan et al., 2017). Therefore, it is possible they only experience small declines in their mental health compared to people who score lower in Extraversion. Some recent research findings during the COVID-19 pandemic confirmed this possibility, showing negative outcomes for people who score lower in Extraversion and more positive outcomes for individuals who score higher in Extraversion. Studies have found negative associations between higher Extraversion and loneliness, anxiety, and

depression experienced as a result of COVID-19 changes (Nikčević et al., 2020; Wei, 2020), and associations between experiencing more optimism, psychological adjustment, and optimal functioning such as creative thinking with Extraversion (Aschwanden et al., 2020; Michinov & Michinov, 2020).

The present study

For this study, online questionnaires were sent to adults living across Canada using Qualtrics, a survey platform, distributed through social networks and from the email listings of the University of Alberta. Before participating in the study, all participants gave their consent through Qualtrics in a question asking "Do you wish to continue the survey, if you do your consent to participate is implied, with two options of "I consent" and "I do not wish to continue". This study was reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta (Pro00102974). Participation in the study was voluntary and ten random participants received a $50 gift card of their choice.

The primary aim of this study was to examine how personality traits of Neuroticism and Extraversion are related to the mental health of Canadians during the COVID-19 pandemic. As many previous studies have shown associations between personality traits and mental health (Lamers et al., 2012), it is important to investigate how personality traits are associated with mental health during the Covid-19 pandemic, in which the "new normal" is introduced due to imposed social and public life restrictions. Based on the literature presented above we hypothesize that the mental health status of Canadians during the COVID-19 epidemic is associated with personality traits of Neuroticism and Extraversion. We hypothesized that people who score higher in Neuroticism are experiencing more difficulties adjusting to the new situation, therefore experiencing more mental health issues, as Neuroticism is associated with increased vulnerability

to stress and changes in life circumstances. Our expectations regarding Extraversion were less clear. On the one hand, the lifestyle of social distancing during the pandemic might feel more difficult to people who score higher in Extraversion than to people who score lower in Extraversion, as people who score higher in Extraversion seek the company of others when stressed (Woodcock et al., 2013), therefore social isolation could have more deleterious effects on their mental health compared to people who score lower in Extraversion. On the other hand, many studies have indicated that people who score higher in Extraversion perform better in adjusting to life-changing events, showing more positive affect, and keeping their positive affect longer than people who score lower in Extraversion, especially in more emotionally ambivalent situations (Steel et al., 2008). This study contributes to our understanding of the relationship between personality traits of Neuroticism and Extraversion and the mental health of Canadians during the COVID-19 pandemic. In particular, as there are various predictions regarding the effects of the pandemic (such as social isolation) on mental health among extroverts, this study could be enlightening.

We also hypothesized that both demographic characteristics specific to the COVID-19 situation (age, gender, and job status) and the ones specific to the COVID-19 situation (change in income, domestic conflict, social interaction loss, and child care loss variables) contribute to the mental health of Canadians.

To assess mental health, we examined the relation of the personality traits of Neuroticism and Extraversion to emotional, psychological, and social well-being. We hypothesized that Neuroticism and Extraversion have stronger associations with emotional well-being. Also, we expected associations with psychological and social well-being, as the new circumstances related

to the COVID-19 pandemic had imposed many social restrictions on people's lives which is detrimental to their social well-being and also limited the opportunities for people to experience self-acceptance, personal growth, autonomy, purpose in life, a sense of mastery, and positive relations with important others which is how Ryff (1989) defines psychological mental health (Ryff, 1989).

Materials and methods

Participants

A sample of 1429 initiated our survey, after removing the incomplete data, 1096 participants (880 females, 202 males, and 14 other genders; mean age = 26.47 years [SD = 9.5; range 18 to 86 years]) were recruited for this study who completed a battery of questionnaires during June and July 2020. Participants were required to: (1) be at least 18 years of age; (2) reside in Canada; and (3) consent to participate.

Measures

Mental Health

The **s**hort form of the Mental Health Continuum (MHC-SF) is derived from the long-form (MHC-LF) and consists of 14 items representing theoretically derived feelings of well-being (MHC-SF; Keyes et al., 2008; Lamers et al., 2012). Participants rated the frequency of each feeling during the past month on a 6-point Likert scale from never (1) to every day (6), which means that the total score on the scale could range from 14 to 84 points. MHC-SF is a multidimensional test and contains three items representing emotional well-being (eg., during the past month, how often did you feel interested in life), six items representing psychological well-being (one item from

each of the 6 dimensions of Ryff's (1989) model of psychological well-being; eg., during the past month, how often did you feel that you had warm and trusting relationships with others), and five items represent social well-being (one item from each of the 5 dimensions of Keyes' (1998) model of social well-being; eg., during the past month, how often did you feel that you had something important to contribute to society) (Keyes, 1998). Emotional well-being represents a balance of positive over negative emotions and the existence of life satisfaction, following the hedonic tradition in this area of research (Diener et al., 1999). Psychological well-being is in accordance with the eudaimonic tradition of well-being and defines people as mentally healthy when they experience self-acceptance, personal growth, autonomy, purpose in life, a sense of mastery, and positive relations with important others (Ryff, 1989). Social well-being is also in accordance with the eudaimonic tradition. According to this approach, optimal functioning in a community is vital for understanding effective functioning and well-being (Keyes, 1998), and individuals are defined as mentally healthy when they feel that they fit in and contribute to the society so that they understand how society operates, and acknowledge that society develops in a positive direction (Keyes, 1998). Together, emotional, psychological, and social well-being construct the definition of positive mental health which is in line with the definition of the World Health Organization (2005) defining mental health as when an individual experiences a feeling of well-being (emotional well-being), and when functioning effectively in both private (psychological well-being) and social life (social well-being) (Lamers et al., 2012; WHO, 2005).

We computed a mean score, with higher scores indicating higher levels of emotional well-being, psychological well-being, and social well-being. In the current study, Cronbach's alpha was .86 for emotional well-being, .81 for social well-being, and .86 for psychological well-being.

Extraversion and Neuroticism Traits

We used the two Extraversion and Neuroticism scales from Goldberg's IPIP Big-Five Factor Markers, which is a self-report measure of personality traits based on the FFM and is based on the most commonly used model of personality (Goldberg, 1992). Extraversion (e.g. "I don't mind being the center of attention") and Neuroticism (e.g. "I am easily disturbed") consist of 10 items that are answered on a 5-point Likert scale, where 1 = Disagree, 3 = Neutral, and 5 = Agree. A total score was computed for each personality trait (10–50), with higher scores showing higher levels of that personality trait. Cronbach's alpha in the current study was .92 for Extraversion and .89 for Neuroticism.

Demographics

The following demographic characteristics of all participants were collected: 1) age, 2) gender, 3) their current job status and if there has been a change in their income over the last 2 months, and 4) pre-existing mental health issues. We believe the mentioned characteristics could have important contributions to the well-being of participants as some of these characteristics had changed as a result of the COVID-19 pandemic. For example, many Canadians lost their job and income as a result of the pandemic which could impact their well-being (Panchal et al., 2020). Also, age and gender have been shown to make significant differences in the mental health status of people during the COVID-19 pandemic (Thibaut et al., 2020; Vahia et al., 2020). Also, we asked our participants some specific questions regarding their personal experience with the COVID-19 pandemic such as, if they or anyone living in their household were diagnosed with COVID-19, if they experienced any kind of domestic conflicts as a result of the pandemic and staying more at home, to what extent the pandemic has affected their social interactions, and if losing childcare

services affected them in some way. We believe the people's experiences with the COVID-19 pandemic could impact their mental health. Further demographic information is provided in Table 1.

Table 1.

Sample demographics characteristics

Demographics	Options	(%)
Current Job status		
	Not employed	16.7%
	Temporary/ Part-time Employment	20.9%
	Full-time Employment	21.5%
	Pursuing Further Studies (student)	40.9%
Change in income		
	Decrease in income	35.2%
	Increase in income	21.4%
	No change	43.3%
COVID-19 diagnosis		
	The person him/herself	.2%
	Someone in their household	.5%
	No one	99.3%
Experience of domestic conflict		
	Yes	25.1%
	No	74.9%
Experience of childcare service loss		
	Yes	5.3%

	No	94.7%
Social interaction loss		
	It has not affected my social interactions.	2.3%
	It has somewhat affected my social interactions.	33.5%
	It has largely affected my social interactions.	64.3%
Prior mental health issues		
	Yes	22.5%
	No	77.5%

Analyses

All analyses described as follows were conducted with IBM SPSS Statistics (Version 26). To study the association of personality traits of Neuroticism and Extraversion with positive mental health, we first computed Pearson correlation coefficients between Neuroticism and Extraversion on the one hand, and emotional, psychological, and social well-being on the other hand, as well as the demographic characteristics. Then, hierarchical multivariate regression models were used to assess the relationship between independent variables and the outcome variable. Those demographic characteristics with significant association with the dependent variables (emotional, psychological, and social well-being) during bivariate analyses were entered into the hierarchical regression models (the first and the second models).

In the regression model, gender, age, prior mental health history, and job status were entered in the first block in order to control for potential confounding variables (the final block of the three hierarchical regression analyses is shown in Table 3). We chose to enter these variables first because these demographic variables were not specific to the COVID-19 situation (controls). In the second block, change in income, domestic conflict, social interaction loss and, child care loss variables (variables specific to the COVID-19 situation) were entered into the model. Finally, after controlling for demographic variables independent of the COVID-19 situation and specific to the COVID-19 situation, personality traits of Neuroticism and Extraversion were entered into the model.

Results

Table 2 shows the means, standard deviations, and correlations between Neuroticism and Extraversion personality traits, and positive mental health subscales. The Neuroticism and Extraversion personality traits were significantly and negatively correlated at $r(1095) = -.19$. Also, Neuroticism and Extraversion were significantly related to positive mental health subscales

Table 2

Means, standard deviations, and correlations between positive mental health, Neuroticism and Extraversion personality traits.

		Demographics												Personality traits						
					4			5		6			8							
	Mean (SD)	1	2.1	3.1	4.1	4.2	4.3	5.1	5.2	6.1	6.2	7	8.1	8.2	9	10	11	12	13	14
1.Age	26.47 (9.35)	-																		
2.Gender			-																	
2.1.Female		-.10**																		
Male		REF																		
3.Mental health issues				-																
3.1.Yes		-.06*	.08**																	
No		REF																		
4.Job status																				
4.1.Full-time		.35**	-0.02	-0.07	-	-	-													
4.2.Part-time		-.11**	.06*	-.00																
4.3.Student		-.17**	-0.04	.07*																
No Job		REF																		
5.Income Change								-	-											
5.1.Increase		-.18**	0.03	0.01	0.05	.14**	-.09**													
5.2.Decrease		0.04	0.05	0.04	-.11**	.08**	-0.04													
No change		REF																		

6.COVID-19 Diagnosis										-	-									
6.1.The Person		0.02	-0.03	-0.02	-0.02	0.03	0	-0.02	0.01											
6.2.Household		0.05	-0.25	-0.04	0.02	0	0.01	0	0	-										
No One		REF																		
7.Domestic Conflict																				
7.1.Yes		-.12**	0.01	.10**	-0.02	0.05	0	0	0.05	-0.02	.10**	-								
No		REF																		
8.Social interactions Change													-	-						
8.1.Somewhat		0.02	-0.03	-0.04	0.04	0	-0.01	.08**	-.07*	-0.03	0.05	-0.02								
8.2.Largely		-0.01	0.05	0.05	-0.04	-0.01	0.03	-.06*	.07*	0.03	-0.04	-.02								
No change		REF																		
9.Childcare Loss																				
9.1.Yes		.15**	0	0	.07*	0.01	-.08**	0	0.03	-0.1	0.03	.06*	0.02	-0.01	-					
No		REF																		
10.Emotional WB	9.32 (3.25)	.08**	0.04	-.15**	.10**	-0.02	-0.03	0.05	-.10**	0	-0.04	-.20**	.13**	-.15**	-0.03	-				
11.Psychological WB	17.68 (6.52)	.12**	-0.02	-.17**	.11**	-0.04	0	0.01	-.08**	0.02	-0.01	-.20**	.14**	-.16**	-.05*	.71**	-			
12.Social WB	10.61 (5.65)	.17**	-.06*	-.16**	.16**	-.07*	-0.02	0	-.07**	0.04	0.01	-.20**	.12**	-.12**	-0.03	.58**	.67**	-		
13.Neuroticism	16.91 (8.47)	.19**	.20**	.33**	-.12**	0.03	.05*	0.02	.08**	-0.01	-0.01	.17**	-.08**	-0.01	0.04	-.39**	-.41**	-.46**	-	
14.Extraversion	19.20 (9.12)	0.05	0	0	.07*	-0.02	-0.03	0.02	0.01	.00	.00	0.02	-.07*	0.05	0.03	.20**	.28**	.35**	-.19**	-

WB: well-being * p < .005, ** p < .001.

Table 3.

Hierarchical regression analysis (standardized beta weights) of personality traits of Neuroticism and Extraversion in relation to emotional, psychological and social well-being, controlled for demographics.

	Social well-being			Emotional well-being			Psychological well-being		
	Beta	95% CI		Beta	95% CI		Beta	95% CI	
Age	.06*	.00	.07	-.01	-.02	.01	.02	-.02	.05
Gender				N/A	N/A	N/A	N/A	N/A	N/A
Female	.01	-.51	.98						
Male	REF								
Prior mental health issues									
Yes	-.03	-1.18	.29	-02	-.61	.26	-.01	-1.10	.52
No	REF			REF					
Job status									
Full-time	.06*	.11	1.68	.04	-.12	.77	.03	-.36	1.36
Part time	-.02	-1.11	.37	N/A	N/A	N/A	N/A	N/A	N/A
No	REF			REF					
Change in income									
Decrease in income	-.04	-1.10	-.12	-.05*	-.75	-.02	-.02	-.99	.36
No change	REF			REF			REF		
Domestic conflict									
Yes	-.13**	-2.45	-1.09	-.15**	-1.52	-.71	-.13**	-2.80	-1.31
No	REF			REF			REF		
Social interaction loss									
Somewhat affected	.04	-1.41	2.55	-.10	-1.89	.45	-.05	-2.87	1.50
Largely affected	-.06	-2.71	1.22	-.23**	-2.73	-.40	-.19*	-4.81	-.48
Not affected	REF								
Child Care	N/A	N/A	N/A	N/A	N/A	N/A			
Yes							-.04	-2.86	.02
No							REF		
Neuroticism	-.30**	-.24	-.16	-.30**	-.13	-.09	-.34**	-.30	-.22
Extraversion	.23**	.11	.18	.16**	.04	.08	.30**	.18	.25

N/A: not applicable * p < .005, ** p < .001.

Note. Social well-being: R^2=.06 for block 1 (F(3, 1091)= 16.25; p <.001); ΔR^2= .04 for Block 2 (F_{change}(8, 1086)= 13.52; p <.001); ΔR^2= .15 for Block 3 (F_{change}(2, 1092)= 113.79; p <.001). Emotional well-being: R^2=.03 for block 1 (F(3, 1091)= 12.54; p <.001); ΔR^2= .06 for Block 2 (F_{change}(8, 1086)= 18.66 ; p <.001). ΔR^2= .12 for Block 3 (F_{change}(2, 1092)=86.10; p <.001). Psychological well-being: R^2=.04 for block 1 (F(2, 1092)= 16.94; p <.001); ΔR^2= .05 for Block 2 (F_{change}(5, 1089)= 14.30; p <.001); ΔR^2= .23 for Block 3 (F_{change}(2, 1092)= 186.71; p <.001).

In agreement with our expectations, Neuroticism was negatively and significantly related to all subscales of emotional and psychological, and social well-being when controlling for demographics, and the Extraversion trait (see Table 3). Moreover, Extraversion was also positively and significantly related to all three scales of emotional well-being, psychological and social well-being (see Table 3). Over and above the contribution of demographics, the two personality traits over and above the contribution of the demographic characteristics, explained 22% of emotional well-being, 33% of psychological well-being, and 26% of the social well-being of the variance. These results showed Neuroticism and Extraversion personality traits were both related to all three subscales of mental health.

Discussion

This study examined how personality traits of Neuroticism and Extraversion (using the Five-Factor Model (FFM) as our framework) are related to the current mental health of Canadians (emotional, psychological, and social well-being) during the COVID-19 pandemic. Our main finding was that personality traits of Neuroticism and Extraversion are associated with the current mental health of Canadians during the COVID-19 pandemic, with Extraversion positively related to the three subscales and Neuroticism negatively related to the three subscales. The two measured personality traits, over and above the contribution of demographics, explained 22% of emotional well-being, 33% of psychological well-being, and 26% of the social well-being of the variance. In support of our hypothesis, both Neuroticism and Extraversion were related to all three subscales of positive mental health, with a stronger association with psychological and social well-being.

Also, our results show that demographic characteristics specific to the COVID-19 pandemic have impacted the mental health status of Canadians. For instance, age was positively correlated with the emotional, psychological, and social well-being of our participants. This is in line with previous studies showing the association between age and mental health during the COVID-19 pandemic (Vahia et al., 2020; Pieh et al., 2020). Also, the existence of domestic conflicts negatively affected the emotional, psychological, and social well-being of our participants. This is also in line with previous studies during the COVID-19 pandemic indicating that domestic conflicts during the pandemic have resulted in deteriorated mental health (Gadermann et al., 2021).

Neuroticism

In line with our expectations, Neuroticism is negatively and significantly associated with emotional, psychological, and social well-being. Our findings are in line with earlier studies indicating that Neuroticism is associated with more mental health issues in general (Diener et al., 1999; Hakulinen et al., 2015; Kotov et al., 2010; Malouff et al., 2005), and also with recent studies during the COVID-19 pandemic showing that individuals who score higher on Neuroticism are experiencing more mental health problems (Aschwanden et al. 2020; Kroencke et al., 2020; Liu et al., 2020; Modersitzki et al., 2020). According to previous research individuals who score high on the Neuroticism trait often experience more negative affectivity and respond worse to stressors that leave them susceptible to unfavorable outcomes in the context of a stressful experience such as the COVID-19 pandemic (Barrick et al., 2001), predisposing them to psychological distress (Costa & McCrae, 1992). High Neuroticism is associated with a range of detrimental health outcomes, including lower subjective well-being (Diener et al., 1999), depressive symptoms, anxiety, mood, and substance use disorders (Clark et al., 1994; Hakulinen et al., 2015; Kotov et al., 2010; Malouff et al., 2005).

Extraversion

Overall, higher Extraversion was associated with higher emotional, psychological, and social well-being. The finding that extroverts are experiencing less mental health issues as a result of social distancing and lockdown measures is in line with previous studies demonstrating that Extraversion is associated with better mental health in general (Costa & McCrae, 1980; Gale et al., 2013; Lamers et al., 2010), and during the COVID-19 pandemic (Nikčević et al., 2020; Wei, 2020). A possible explanation could be that according to previous research, compared to people

who score lower in Extraversion, extroverts are more capable of adjusting to life changing events, such as the new circumstances the world is currently experiencing as they use adaptive strategies such as reappraisal, problem solving, or acceptance more than people who score lower in Extraversion (Barańczuk, 2019). Individuals who score higher in Extraversion also experience more positive affect, and keep their positive affect longer, especially in more emotionally stressful situations (Steel et al., 2008), are less susceptible to mental illnesses (Malouff et al., 2005; Spinhoven et al., 2014), and are generally happier (Steel et al., 2008; Anglim et al., 2020). Moreover, as people who score higher in Extraversion have more friends and social networks, higher perceived social support, and higher quality relationships (Harris et al., 2017; Lang et al., 1998; Swickert et al., 2002; Tan et al., 2017), they may rely on their social support to maintain their positive mental health.

Limitations and future directions

The current study has some limitations that need to be considered. First, while the current study covered a wide age range, the sample was not completely representative of the general population, as around 41% of our participants were students with a mean age of 26.47 years and about 80% were female. The second limitation of this study is that although we aimed for participants from all over Canada, most of our sample reside in Alberta (the place the study was conducted). The third limitation of this study is that our data were gathered only at one point in time during the first wave of COVID-19 and as it was summer, people could spend more time outside. At this time, the participants had experienced few (if any) effects of COVID-19 (see Table 1). For example, 99% of the participants neither themselves were diagnosed with COVID-19, nor anyone in their household were. The effects of personality on mental health could change as the

personal relevance changes. Another limitation of the present study is that the measurements used to assess personality and well-being were the short version of the measurements. We chose the short version of the tests in order to collect data from a large group of participants who completed the tests online. Around 79% of people who started answering the questions answered all the questions and we believe if we used the longer versions, a lot of our participants wouldn't have finished all the questions. However, we made sure our measurements had acceptable psychometric properties, for instance, MHC-SF had shown great internal consistency (> .80) and discriminant validity in different countries (Fadda et al., 2016; Lamers et al., 2012). It has also been reported that the IPIP scale has great construct, criterion, convergent, and discriminant validity (Gow et al., 2005; Guenole & Chernyshenko, 2005; Lim & Ployhart, 2006).

Regardless of these limitations, the current study makes important contributions to understanding the associations between personality traits of Neuroticism and Extraversion, and the mental health of Canadians during a global health crisis and could lead to a revelatory direction for future research into personality and mental health. Future research should investigate the impacts of personality traits of Neuroticism and Extraversion on the mental health of Canadians during the second wave of COVID-19 in winter when people had to stay at home more than in summer due to the cold weather. Also investigating the impacts of other personality traits on mental health could be informative and help public health services provide personality-appropriate mental health services during this pandemic.

Conclusion

These findings, taken together, confirm previous research findings demonstrating Neuroticism and Extraversion are impactful on mental health (Jylhä et al., 2009). Our results indicated that individuals who scored higher on Neuroticism were experiencing more mental health issues and in contrast, individuals who scored higher on Extraversion were experiencing fewer mental health issues. These relationships are similar to the pre-pandemic times, we believe the reason that the pandemic has not changed the relationship between the Extraversion trait and mental health is that people who score higher in Extraversion generally experience more positive affect, and keep their positive affect longer, especially in more emotionally stressful situations (Steel et al., 2008), they also have more friends and social networks, higher perceived social support, and higher quality relationships (Harris et al., 2017; Lang et al., 1998; Swickert et al., 2002; Tan et al., 2017), they may rely on their social support to maintain their positive mental health. Moreover, we believe that the reason that the pandemic has not changed the relationship between the Neuroticism trait and mental health is that Neuroticism is associated with more mental health issues in general (Diener et al., 1999; Kotov et al., 2010; Hakulinen et al., 2015; Malouff et al., 2005).

This study has important implications for understanding how different individuals are experiencing the pandemic. Public health messages can be tailored to consider these differences. Also, since individuals have had different mental health effects during the pandemic, they may also cope with the post-pandemic world differently.

Chapter 3

Study 2: The impact of personality traits on the positive mental health of Canadian adults during the COVID-19 pandemic: A Replication and Extension Study

Abstract:

The COVID-19 epidemic was first reported in 2019 and rapidly spread across the globe. Many studies have shown that the COVID-19 pandemic adversely affected mental health. Individual differences such as personality could influence people's responses to the pandemic. For example, the results of a previous study by Shokrkon and Nicoladis (2021) showed that the personality trait of Extraversion positively and Neuroticism negatively contributed to the mental health of Canadians. The goal of our study was to replicate this study using the same tasks and a similar population and extend it by including all 5 personality traits in our analysis and also controlling for the variable of Response to COVID-19 Stress (in addition to demographic variables). Our results were similar to Shokrkon and Nicoladis (2021) and we also found that Extraversion positively and Neuroticism negatively are associated with the mental health of Canadians. We also found that Agreeableness, Openness to Experience, and Conscientiousness are positively and significantly related to the mental health of Canadians. Our results could provide a guide for the screening of people more at risk for mental health issues based on personality traits.

Introduction:

The Coronavirus Disease (COVID-19) pandemic was first reported in 2019 and was declared a global public health emergency in January 2020, by the World Health Organization (WHO) (WHO, 2020a). The consequences of the pandemic such as contagion and lockdown have had many psychological effects throughout the world (Gan et al., 2022; Grover et al., 2020; Holingue et al., 2020; Prati & Mancini, 2021). The WHO also stated global concerns regarding the pandemic's impact on mental health and psychosocial well-being (WHO, 2020b).

In Canada, concerns about health, lockdown, unemployment, instability, as well as interruptions in daily routines during the pandemic influenced Canadians' mental health (Capaldi et al., 2021). It is reported that in the fall of 2020, the prevalence of positive mental health outcomes of Canadians dropped significantly compared to levels prior to the pandemic in 2019, 59.95% in 2020 compared to 66.71% in 2019 (Capaldi et al., 2021). According to the Public Health Agency of Canada positive mental health continued to decline in 2021 and the COVID-19 pandemic adversely affected more than seven out of ten Canadians (Public Health Agency of Canada, 2021). Also, results of a later survey on COVID-19 and Mental Health revealed that one in four (25%) Canadians over the age of 18 displayed symptoms of depression, anxiety, or posttraumatic stress disorder in spring 2021, an increase from one in five (21%) in fall 2020 (Statistics Canada, 2021).

It is possible that individual differences in thinking processes, feelings, behaviors, and emotions could lead people to respond differently during a public health crisis. For example, people with certain personality traits may respond to such public health crises in different ways (Sutin et al., 2020). Unfamiliar and uncertain situations are particularly likely to expose the influence of dispositional tendencies on people's daily experiences and actions (Caspi & Moffitt, 1993). Dynamic theories of personality support this argument, positing that differences in personality are more pronounced in situations that activate the traits (Denissen & Penke, 2008,

Tett & Guterman, 2000). Therefore, since the COVID-19 pandemic has been associated with many stressors such as uncertainty, it is important to study the associations of personality with mental health.

Throughout the past decades, the five-factor model (FFM) has become widely accepted as a framework for explaining and describing personality characteristics. FFM consists of the dimensions of Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness (Goldberg, 1992). Pre-pandemic research has shown that individuals' personalities are associated with well-being and contribute to the likelihood of developing mental health issues (Diener & Lucas, 1999; Steel et al., 2008), with Neuroticism and Extraversion having the strongest associations with mental health (Kotov et al., 2010; Otonari et al., 2012), influencing the affective aspects of mental health, via biological and behavioral mechanisms (Lamers et al., 2012).

Neuroticism is characterized by irritability, anger, sadness, anxiety, worry, hostility, and vulnerability (Lahey, 2009) and is shown to be associated with multiple mental health problems (Friedman et al., 2011; Hudek-Knezević & Kardum, 2009). Individuals who score higher on Neuroticism are more prone to experience negative emotions (Costa & McCrae, 1980, Emmons & Diener, 1985, Steel et al., 2008) and mental health disorders such as depression, anxiety, somatic symptom, eating disorders, and substance use disorders (Jorm et al., 2000; Jylhä, & Isometsä, 2006; Kotov et al., 2010; Leary & Hoyle, 2009; Malouff et al., 2005). In contrast, Extraversion is usually associated with more positive mental health (Carver & Scheier, 2014). For instance, individuals who score higher on Extraversion are more likely to engage in social activities that enhance and maintain their level of positive emotions (Pavot et al., 1990; Watson et al., 1992) and report higher levels of subjective well-being (Costa, & McCrae, 1980; Diener et al., 1999, Lee et al., 2008). Openness to Experience is defined as an individual's tolerance for ambiguity and

Openness to new ideas (McCrae & Costa Jr, 1997). It has also been linked with creativity, curiosity, adaptability, appreciation, and independence (McCrae, 1993; Kaufman, 2013). Previous studies found that Openness to Experience was connected to overall well-being (Ahmad Marzuki, 2013; Dong & Ni, 2020; Keyes et al., 2002), and also other positive constructs such as positive emotions, personal growth, autonomy, purpose in life and independence (Anglim & Horwood, 2020; Anglim et al., 2020; Dong & Ni, 2020; Keyes, 2005). Conscientiousness refers to the level of responsibility, and organization that people exhibit and the qualities of being prudent, and dependable (Barrick & Mount, 1991). Conscientiousness has also been associated with active and functional problem-solving strategies under challenging situations, including seeking support, positive psychological adjustment, positive reinterpretation, and acceptance (Afshar et al., 2015). Research has shown that individuals who score high in Conscientiousness are less vulnerable to adverse effects of anxiety, depression, and stress (Kotov et al., 2010; Tran et al., 2020). Agreeableness refers to the qualities of being warm, friendly, empathic, straightforward, trustworthy, and having a tendency toward prosocial behavior (Lynam & Miller, 2019). Agreeableness also captures patience, forgiveness, and a degree of tolerance for anger (Anglim et al, 2020). Agreeableness has been shown to be associated with positive affect, psychological well-being, and mental health (DeNeve & Cooper, 1998; Schmutte & Ryff, 1997).

Literature regarding the pandemic's adverse mental health outcomes has been growing since its onset. Several studies have shown that people's personality traits are associated with their mental health (Anglim, & Horwood, 2021; Anglim et al., 2020) with Neuroticism and Extraversion being most strongly associated with mental health and well-being during the pandemic (Buecker et al., 2020; Modersitzki et al., 2021; Shokrkon & Nicoladis, 2021). For instance, Shokrkon and Nicoladis (2021) gathered data from 1096 Canadian adults (880 females, 202 males, and 14 other genders; mean age = 26.47 years [SD = 9.5; range 18 to 86 years]) in the first summer of the

pandemic in 2020. They measured Mental health using the short form of the Mental Health Continuum (MHC-SF) and personality traits using Goldberg's PIP Big-Five Factor Markers and also some demographic factors that are known to impact mental health (including age, gender, changes in social interactions during COVID-19, mental health history). They used the hierarchical multivariate regression method to analyze their data. After controlling for demographic variables, their results showed a significant association between the personality traits of Extraversion and Neuroticism with the positive mental health of Canadians (emotional, social, and psychological). Extraversion was positively associated with mental health and Neuroticism was negatively associated with mental health. The primary purpose of the present study was to replicate their study with a very similar population from the same country and using the same measures, only with data gathered a year later in the second summer of the pandemic in 2021. The reason we decided to replicate our first study is that it was conducted in the first year of the pandemic which differed substantially from the second year in several ways. First, by the second year of the pandemic, a number of vaccines were developed and distributed around the globe. This has resulted in increased vaccination rates and a reduced risk of severe illness, death, and other consequences of COVID-19. Second, there have been differences between the public health policies implemented in the first and second year of the pandemic. In the first year, many countries including Canada imposed strict lockdowns and restrictions on social gatherings to prevent the spread of the virus. By the second year, many of these restrictions were relaxed in Canada. Third, societal responses may also have varied between years one and two. In the first year, there may have been more fear and uncertainty about the virus and its effects on daily life. By the second year, people may have grown accustomed to living with the pandemic and adapting to the changes it brought. Therefore, by replicating our first study we wanted to investigate the generalizability of our findings to a

different context, where the pandemic was at a different stage. Moreover, in addition to demographic variables, we decided to control for the variable of Coping and Responses to COVID-19 Stress since it could be a contributing factor to well-being during the pandemic.

Present Study

The main objective of the present study is to replicate previous work by Shokrkon and Nicoladis (2021), using the same measures and with a very similar population. In their study, they tested how Neuroticism and Extraversion impacted the mental health of Canadians during the COVID-19 pandemic using the data gathered in the summer of 2020. We gathered our data, a year later in the summer of 2021 using the same demographic questions, mental health, and personality measures. We expected to replicate their results and find that Extraversion is positively and Neuroticism is negatively associated with the mental health of Canadians

Moreover, we aimed to extend their study by investigating the impacts of all big 5 personality traits (instead of only Extraversion and Neuroticism) on the mental health of Canadians during the pandemic. Furthermore, among the psychological variables that contribute to the relationship between stressors and mental health outcomes during pandemics, coping and response to stress are likely to play an important role (Serafini et al., 2020), therefore we also gathered data on coping and response to COVID-19 stress to control for the effects of these variables on the relationship between personality traits and mental health.

Method

Participants

A sample of 1392 participants (1030 female-identifying people, 334 male-identifying people, and 27 other genders; mean age = 24.02 years [SD = 6.42 range 18 to 62 years]) were

recruited for this study who completed a battery of questionnaires during June and July 2021. For this study, all participants were at least 18 years old, residing in Canada, and consented to participate.

Procedure

This study was reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta (Pro00100751). To conduct this study, Qualtrics, a survey platform, was used to collect data from adults living across Canada. The surveys were distributed through social media channels and via the University of Alberta's email listings.

All participants gave their consent to participate in the study through Qualtrics answering a question “Do you wish to continue the survey? If you choose to continue, your consent to participate is implied”. There are two options: “I consent” and “I do not wish to continue”. Participation in the study was voluntary and ten randomly selected participants received a $50 gift card.

Measures

Mental Health

We used the short form of the Mental Health Continuum (MHC-SF), the same mental health scale used by Shokrkon and Nicoladis (2021). The short form is derived from the long form (MHC-LF) and includes 14 items reflecting the construct definition of each well-being domain (MHC-SF; Keyes et al., 2008; Lamers et al., 2012). This test is theory-driven and encompasses all the theoretical facets of mental health (Yeo, & Suárez, 2022). Out of 14 items, three items represent emotional well-being (happy, interested in life, and satisfied) six items represent psychological well-being including one item from each of the 6 dimensions of Ryff’s (1989), (eg., during the

past month, how often did you feel that you liked most parts of your personality), and five items represent social well-being including one item from each of the 5 dimensions of Keyes' (1998) model of social well-being (eg., during the past month, how often did you feel that you belonged to a community like a social group, or your neighborhood). A six-point Likert scale is used by participants, ranging from 1 (Never) to 6 (Everyday) thus the total score on the scale could range from 14 to 84 points. MHC-SF demonstrated excellent internal consistency (> .80) in adults in several countries (Keyes, 2005; Lamers et al., 2011; Westerhof & Keyes, 2008). The MHC-SF has also shown good convergent validity (Keyes et al., 2008) and good discriminant validity (Doré et al., 2011; Lamers et al., 2011; Perugini et all, 2017).

Personality

To measure personality traits, the same test used by Shokrkon and Nicoladis (2021), Goldberg's IPIP Big-Five Factor Markers, was used. This test is a self-report, 50-item questionnaire measuring personality traits based on the FFM (Goldberg, 1992). This test measures the five personality dimensions of Openness to Experience (eg., I have a vivid imagination), Conscientiousness (eg., I get chores done right away), Extraversion (eg., I am the life of the party), Agreeableness (eg., I sympathize with others' feelings), and Neuroticism (eg., I get stressed out easily). The IPIP items were administered with a five-point Likert-type scale ranging from 1 ("Disagree") to 5 ("Agree"). For each trait, a total score was calculated (10–50), with higher scores indicating higher levels. This scale has been widely used and reported to have good construct, criterion, convergent, and discriminant validity (Gow et al., 2005; Guenole & Chernyshenko, 2005; Lim & Ployhart, 2006).

Responses to Stress Questionnaire (RSQ) COVID-19

RSQ is a multidimensional questionnaire designed for particular stressors, in this case, the COVID-19 pandemic (Connor-Smith et al., 2000). There are 57 items categorized into five factors (Connor-Smith et al., 2000). For each item, participants are asked: How much do you do this? and rated based on a scale of 1 to 4: 1 (Not at All), 2 (A Little), 3 (Some), and 4 (A lot). The five total factors include three types of coping: Primary Control Engagement Coping: (eg., emotional expression, emotion regulation, and problem-solving); Secondary Control Engagement Coping (eg., acceptance, cognitive restructuring, distraction, and positive thinking); and Disengagement Coping (eg., avoidance, denial, and wishful thinking). The RSQ also measures two types of involuntary responses to stress: Involuntary Engagement (eg., emotional arousal, impulse action, intrusive thoughts, physiological arousal, and rumination) and Involuntary Disengagement (eg., cognitive interference, emotional numbing, escape, and inaction). Each of the five factors is calculated as a ratio score of the total stress response items scored. This test has reports of good reliability and validity, for instance, internal consistency ranging from $\alpha = 0.73$ to 0.85 (Connor-Smith et al., 2000).

We used this test as an extension to the tests Shokrkon and Nicoladis (2021) used. We used this measure to control for the impacts of this variable on the association between personality traits and mental health.

Demographics

In this study, we collected similar demographic characteristics as Shokrkon and Nicoladis (2021) did, including age, gender, current job status, if there has been a change in participants' income over the last 2 months and mental health history. As mentioned by Shokrkon and Nicoladis (2021) these demographic characteristics may play an important role in participants' well-being

during a pandemic. For instance, job loss and income loss has shown to be associated with mental health issues such as anxiety, depression, and panic attacks (de Miquel et al., 2021). Also, age and gender have been demonstrated to be significant determinants of the well-being of individuals during the COVID-19 pandemic (Thibaut & van Wijngaarden-Cremers, 2020; Vahia et al., 2020).

Also, similar to Shokrkon and Nicoladis (2021), our participants were asked specific questions about how they experienced COVID-19, including whether they or anyone living in their households were affected by COVID-19, whether they had domestic conflicts due to staying at home more as a result of the pandemic, how the pandemic affected their social interactions, as well as whether losing childcare services affected them. We also believe the experiences people had with the COVID-19 pandemic might have an impact on their mental health. Table 4 provides additional demographic information.

Table 4

Sample demographics characteristics

Demographics	Options	Percentage
COVID-19 Diagnosis		
	Yes	12%
	No	88%
Change in Income		
	Decrease in income	25%
	Increase in income	28%
	No change	46%
Experience of domestic conflict		
	Yes	30%
	No	70%
Experience of child care loss		
	Yes	5%
	No	95%
Job Status		
	Not employed	10%
	Temporary/Part-time Employment	29%
	Full-time Employment	20%
	Student	41%
Social interactions		
	Not Affected	2%
	Somewhat Affected	30%
	Largely Affected	68%

Prior mental health Issue		
	Yes	23%
	No	76%

Statistical Analyses

The analyses were conducted using IBM SPSS Statistics (Version 28). A Pearson correlation coefficient was computed between personality traits and emotional, psychological, and social well-being variables, as well as demographic characteristics, in order to determine the association between personality traits and positive mental health. The variables with at least one significant correlation with outcome variables are presented in Table 5. After that, hierarchical multivariate regression models were used to examine the relationship between the predictor variables and the outcome variables. As Shokrkon and Nicoladis (2021) did, hierarchical regression models were constructed using only those demographic characteristics that were significantly associated with the dependent variables (emotional, psychological, and social well-being) during bivariate analyses (the first model). We entered gender, age, prior mental health history, job status, changes in income, domestic conflict, social interaction changes, and childcare loss into the first block of the regression model to control for possible confounding factors. Then, as an extension to Shokrkon and Nicoladis (2021), coping and response to COVID-19 stress variables were entered into the second block of our regression models to control for them, as we reasoned that coping and response to COVID-19 stress play an important role in predicting mental health outcomes during the pandemic. In the end, after controlling for demographics and coping and response to COVID-19 stress variables, we entered the five personality traits into the model. The final block of the three hierarchical regression analyses is shown in Table 6.

Results

The means, standard deviations, and correlations between all personality traits, coping and response to COVID-19 stress variables, and demographic variables are presented in Table 5. All five personality traits are significantly correlated with positive mental health subscales. Extraversion, Openness to Experience, Agreeableness, and Conscientiousness were positively correlated with all three subscales of mental health, while Neuroticism was negatively correlated with them.

As expected, and in line with the study of Shokrkon and Nicoladis (2021), Neuroticism was negatively and significantly associated with emotional, psychological, and social well-being after controlling for demographics and Response to COVID-19 Stress variables (see Table 6). Furthermore, Extraversion was also positively and significantly associated with emotional, psychological, and social well-being (see Table 6). Our results were similar to those reported by Shokrkon and Nicoladis (2021).

As an extension to Shokrkon and Nicoladis (2021), we also investigated the contribution of Openness to Experience, Agreeableness, and Conscientiousness to positive mental health controlling for demographic and Response to COVID-19 Stress variables. Agreeableness was positively and significantly associated with all three scales of emotional, psychological, and social well-being while Openness to Experience, and Conscientiousness were positively and significantly related to emotional and psychological well-being.

In addition to the demographic and Response to COVID-19 Stress variables, personality traits accounted for 30% of the variance in emotional well-being, 40% of psychological well-being, and 25% of social well-being.

Table 5

The means, standard deviations, and correlations between personality traits, Response to COVID-19 Stress variables positive mental health subscales.

		1	2	3			4	5		6		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
				3.1	3.2	3.3		5.1	5.2	6.1	6.2																	
1-Age	24.2 (6.42)	-																										
2- Gender	-																											
Male		-.01	-																									
Female		REF																										
3-Job Status	-																											
3.1 Part-time		-.03	-	-																								
3.2 Full-time		.00	.12**	-.30**	-																							
3.3 Student		.00	.06*	-.54**	-.40**	-																						
No job		REF	.02																									
4-Covid	-																											
Yes		-.01	-.00	.05*	-.08**	.02	-																					
No		REF																										
5-Income Change	-																											
5.1. Increase		-.03	-.06	.20**	.16**	-.19**	.00	-																				
5.2. Decrease		.06**	-.00	.06*	-.15**	.00	.06	-.35**																				
No change		REF																										
6-Social Interaction Change	-																											
6.1. Somewhat		.02	.01	-.00	.03	-.01	-.02	-.06**	-.03	-																		

6.2. Largely No Change		-.01 REF	-.02	.01	-.02	.00	.03	.07**	.03	-.95**	-									
7- Domestic	-																			
Yes		-.03	-.05*	-.01	-.01	-.02	.11**	-.03	.13**	-.05*	.08**	-								
No		REF																		
8-Mental Health Issue	-																			
Yes		-.01	-	.02	-.00	.00	-.00	.03	.12**	-.06**	.08**	.13**	-							
No		REF	.19**																	
9-Childcare Loss Yes	-																			
No		.00 REF	.02	-.04	.03	-.00	.02	-.05*	.08**	-.02	.03	.07**	-.00	-						
10-Covid Vaccine	-																			
Yes		-.06*	.04	.05	.02	-.01	-.10**	.04	-.05*	-.05*	.06**	.00	.03	-.02	-					
No		REF																		
11- PCC	.18 (.04)	.04	-.03	-.02	.03	.00	.00	.00	-.07**	.11**	-.10**	-.09**	-.10**	-.03	.01	-				
12-SCD	.26 (.05)	.01	.17**	-.01	.05*	-.01	.00	.03	-.09**	.17**	-.19**	-.13**	-.29**	.-.06*	.02	.34**	-			
13- DC	.14 (.02)	.01	-.00	.05	-.05*	-.01	.02	.00	.02	-.09**	.09	.05*	.06*	.02	-.09**	-.54**	-.36**			
14-IEC	.22 (.04)	-.03	- .13**	-.00	-.00	-.00	.00	-.00	.09**	-.15**	.17**	.13**	.25**	.08**	.01	-.46**	-.80**	.10**		
15- IDC	.17 (.03)	-.04	-.05*	.01	-.05*	.01	-.04	-.05*	.10**	-.12**	.11**	.11**	.19**	.02	.01	-.68**	-.64**	.30**	.44**	-

16-Extraversion	18.85 (8.94)	.04	.00	.02	.06**	-.06*	.03	.03	.03	-.06*	.09**	-.02	.02	.04	-.02	.22**	.07**	-.08**	-.07**	-.21**	-								
17-Agreeableness	30.58 (5.91)	.01	-.19**	.07**	.06**	-.08**	-.02	.02	.01	-.08**	.12**	-.00	.08**	.01	.00	.23**	-.07**	-.11**	.03	-.13**	.29**	-							
18-Conscientiousness	26.36 (6.74)	.00	.01	-.03	.05*	.01	-.01	.07**	-.05*	.09**	-.09**	-.10**	-.19**	-.02	-.02	.22**	.16**	-.13**	-.13**	-.25**	.05	.08**	-						
19-Openness	28.34 (6.23)	-.00	-.03	-.05	.10**	-.02	-.03	.03	.02	-.02	.03	.02	.13**	.03	-.01	.24**	.08**	-.20**	-.07**	-.16**	.26**	.25**	.10**	-					
20-Neuroticism	16.40 (8.63)	.03	.25**	-.04	.06	.02	-.00	.01	-.07**	.12**	-.13**	.16**	.33**	.02	.02	-.33**	-.49**	-.27**	-.44**	-.37	-.15**	-.02	-.25**	-.03	-				
21-Emotional WB	12.49 (3.19)	.02	.00	.00	.08**	-.00	.01	.08**	-.12**	.09**	-.10**	-.15**	-.15**	-.04	-.05	.39**	.33**	-.25**	-.31**	-.40**	.22**	.16**	.24**	.17**	-.42**	-			
22-Social WB	15.11 (5.73)	.01	.08**	-.02	.09**	-.00	.05*	.06*	-.06*	-.06*	.11**	-.09**	-.13**	.02	-.00	.36**	.25**	-.25**	-.22**	-.33**	.27**	.19**	.18**	.17**	-.36**	.62**	-		
23-Psychological WB	23.61 (6.77)	.02	.04	-.02	.11**	-.00	.02	.10**	-.05*	.05*	-.05*	-.11**	-.13**	-.02	-.03	.46**	.31**	-.28**	-.29**	-.42**	.36**	.23**	.32**	.28**	-.40**	.70**	.66**	-	

PCD:Primary Control Coping, SCD: Secondary Control Coping, DC: Disengagement Coping, IEC: Involuntary Engagement Coping, and IDC: Involuntary Disengagement Coping.

* $p < .005$, ** $p < .001$.

Table 6

Hierarchical regression analysis of personality traits in relation to emotional, psychological and social well-being, controlled for demographics and Response to COVID-19 Stress variables

	Emotional WB			Social WB			Psychological WB		
	Beta	95% CI		Beta	95% CI		Beta	95% CI	
Gender	N/A			.05*	.01	1.35	N/A		
Male									
Full Time Job Status	.01	-.27	.46	.03	-.14	1.27	.04	-.01	1.43
Covid	N/A			.05*	.11	1.79	N/A		
Yes									
Income Change									
Increase	.02	-.13	.53	.04	-.09	1.79	.07*	.38	1.70
Decrease	-.05*	-.78	-.06	-.00	-.78	.59	.01	-.45	.96
Social Interaction Change									
Somewhat	-.15	-2.16	.01	-.02	-2.32	1.75	-.08	-3.38	.89
Largely	-.19*	-2.39	-.23	-.09	-3.21	.83	-.08	-3.38	.85
Domestic Conflict	-.04	-.61	.02	-.01	-.90	.31	-.01	-.85	.38
Mental Health Issue	-.00	-.39	.33	-.04	-1.23	.16	-.01	-.89	.53
Primary Control Coping	.15	-14.59	39.43	.21	-28.67	89.55	.29	-3.27	102.81
Secondary Control Coping	.06	-22.84	30.48	.13	-45.47	71.24	.16	-32.51	72.17
Disengagement Coping	.01	-25.77	28.60	.01	-57.40	61.70	.06	-37.46	69.29
Involuntary Engagement Coping	.05	-25.79	27.93	.12	-43.90	73.80	.10	-37.79	67.69

Involuntary Disengagement Coping	-.09	-35.24	18.43	.00	-57.61	59.40	.01	-49.77	55.61
Extraversion	.07**	.01	.04	.13**	.05	.12	.19**	.11	.18
Agreeableness	.08**	.02	.07	.11**	.05	.15	.06**	.02	.12
Conscientiousness	.07**	.01	.05	.03	-.01	.07	.16**	.11	.20
Openness to Experience	.05**	.00	.05	.04	-.00	.09	.12**	.08	.18
Neuroticism	-.26**	.07	.11	-.20**	.09	.17	-.20**	.12	.20

N/A: Not Applicable * p < .005, ** p < .001.

Note: Emotional Well-being: R^2=.06 for block 1(F(6,1386)=15.67; p<.001); ΔR^2: .16 for block 2(F_{change}(11,1381)=57.94; p<.001). ΔR^2=.08 for block 3 (F_{change}(16,1376)=31.73; p<.001). Social Well-being: R^2=.05 for block 1(F(6,1386)=10.33; p<.001); ΔR^2: .11 for block 2(F_{change}(11,1381)=38.56; p<.001). ΔR^2=.07 for block 3 (F_{change}(16,1376)= 27.76; p<.001). Psychological well-being: R^2=.05 for block 1(F(6,1386)=12.71; p<.001); ΔR^2: .21 for block 2(F_{change}(11,1381)=80.38; p<.001). ΔR^2=.13 for block 3 (F_{change}(16,1376)= 64.04; p<.001).

Discussion

The purpose of the present study was to replicate and extend a study by Shokrkon and Nicoladis (2021). They found that personality traits of Neuroticism and Extraversion were associated with the positive mental health of Canadians during the first summer of the COVID-19 pandemic. As the COVID-19 pandemic has extensive mental health consequences around the world and it is important to have appropriate mental health services delivered to people, we decided to replicate Shokrkon and Nicoladis (2021) study a year later to see if the results remained the same.

Neuroticism

In line with Shokrkon and Nicoladis (2021), we also found that Neuroticism was negatively and significantly associated with emotional, psychological, and social well-being. Our results also

support other studies suggesting that Neuroticism is linked to an increased number of mental health issues in general before (Kotov et al., 2010; Lahey, 2009; Widiger & Oltmanns, 2017), and during the pandemic (Aschwanden et al., 2021; Kroencke et al., 2020; Liu et al., 2021; Ng & Kang, 2022; Shokrkon & Nicoladis, 2021).

There are a number of possible explanations for our result, for instance, generally, individuals who score higher on Neuroticism are more likely to experience negative emotional responses and distress during stressful and uncertain situations such as the COVID-19 pandemic (Kroencke et al., 2020; Liu et al., 2021). They are also more likely to engage in risky behaviors such as smoking cigarettes, drinking alcohol, having unprotected sex, and participating in delinquent activities, in an attempt to relieve stress which could be detrimental to their mental health (Mõttus et al., 2012). Furthermore, people who score high in Neuroticism tend to be less interested in contributing to their social environment (Keyes, 2002), which could lead to these individuals be less able to integrate socially, contribute, and adjust to the changed environmental circumstances (Petrillo et al., 2015) happening during the COVID-19 pandemic.

Extraversion

Also as found by Shokrkon and Nicoladis (2021), our results indicated that Extraversion was positively and significantly associated with all three subscales of positive mental health. Our results are in line with pre-pandemic findings (Lamers et al., 2012; Steel et al., 2008) and also studies during the pandemic (Anglim et al., 2020; Shokrkon & Nicoladis, 2021; Wei et al., 2020) showing a positive association between Extraversion and positive mental health.

An explanation for this may be that generally, people who score higher in Extraversion engage more in social situations, including virtual interactions during the pandemic, therefore, they feel a greater sense of social connection (Lee et al., 2008), which help to boost their level of

positive emotions (Watson et al., 1992). People who score high in Extraversion even maintain positive emotions for a longer period of time compared to people who score low in Extraversion, particularly during a crisis (Steel et al., 2008). Moreover, as people who score high in Extraversion have more friends and social networks, they may be more likely to seek social–emotional support to cope with the stress caused by the COVID-19 pandemic (Swickert et al., 2002).

Agreeableness

Our results indicated that Agreeableness was positively and significantly associated with all three subscales of positive mental health. This is in line with previous pre-pandemic research (Lamers et al., 2012; Schmutte & Ryff, 1997; Steel et al., 2008) and research conducted during the pandemic (Gupta & Parimal, 2020; Proto & Zhang, 2021) showing a positive relationship between Agreeableness and positive mental health.

A possible explanation of our results is that individuals who score high in Agreeableness are generally friendly and warm, which allows them to receive more social support during the time of crisis such as the COVID-19 pandemic (Li et al., 2020). Also, generally, Agreeableness is a reflection of social conformity, and compliance (Barrick & Mount, 1991) which could mean individuals who score high in Agreeableness could be less affected by the COVID-19 pandemic since they are better able to get along with others in stressful situations (Zhang et al., 2021).

Openness to Experience

We found that Openness to Experience was significantly and positively associated with psychological and emotional subscales of mental health. This finding is in line with previous studies showing a relationship between Openness to Experience and positive mental health before (Ahmad Marzuki, 2013; Dong & Ni, 2020; Keyes et al., 2002) and during the pandemic (Anglim et al., 2020; Hölscher, 2021).

A possible explanation could be that during the pandemic, the Openness to Experience trait might be an effective personal characteristic resource for dealing with the challenges associated with COVID-19. Since individuals who score higher on Openness to Experience are more likely to be able to adapt to new situations and constructively change them (Asselmann et al., 2020), they might be more accepting of the changes and be more open to new protocols for day-to-day living resulting from COVID-19 pandemic, and therefore may be more resilient to the mental threat of the disease (Zhang et al., 2021). They could also explore new things and consequently have a greater resistance to boredom during the pandemic (Zhang et al., 2021). Moreover, individuals who score higher on Openness to Experience are generally more likely to experience higher positive emotions, stimulation, novelty, diversity, growth, personal growth, and purpose in life (Anglim & Horwood, 2020; Roberti, 2004), which could have positive impacts on their overall well-being.

Conscientiousness

Our results showed that Conscientiousness was significantly and positively associated with psychological and emotional mental health. This finding supports previous research before (Kotov et al., 2010; Schmutte & Ryff, 1997; Steel et al., 2008) and during the pandemic (Anglim et al., 2020; Liu et al., 2022), showing a positive relationship between Conscientiousness and positive mental health.

A possible explanation could be that Conscientiousness has been indicated to be a personal characteristic resource in coping with stress because individuals who score high in Conscientiousness are more likely to plan and avoid maladaptive responses to stress (Vollrath & Torgersen, 2000). Thus, individuals who score high in Conscientiousness may be more prepared to cope with COVID-19 stress, thereby being less negatively affected. Furthermore, individuals

who score high in Conscientiousness tend to be more engaged in their work which allows them to devote themselves to their work as well as a variety of other meaningful activities (Barrick & Mount, 1991) which could enable them to be less psychologically affected by the pandemic. Also, individuals who score higher in Conscientiousness generally exhibit better emotional regulation skills (Friedman & Kern, 2014), which could result in improving their mental health (Berking & Wupperman, 2012).

Conclusion

The present study replicated the results of the study by Shokrkon and Nicoladis (2021), as we found that Extraversion was positively and Neuroticism was negatively associated with all three subscales of positive mental health, even after controlling for demographic variables and coping and response to COVID-19 stress. We extended their study by testing whether Agreeableness, Openness to Experience, and Conscientiousness were also related to mental health outcomes. We found that all three of these personality variables were positively related to positive mental health, even after controlling demographic variables and coping and response to COVID-19 stress.

Our findings are in line with studies conducted before the pandemic and it is likely that the pandemic has not changed the relationship between personality traits and mental health. For instance, Neuroticism is associated with more mental health issues in general (Diener et al., 1999; Kotov et al., 2010). Furthermore, individuals who score higher in Extraversion are in general more likely to experience higher positive emotions and maintain them (Watson et al., 1992; Steel et al., 2008). Agreeableness is associated with being generally friendly and warm, which makes more Agreeable individuals receive support during times of crisis (Li et al., 2020) Individuals who score higher in Openness to Experience tend to adapt better to new circumstances and make constructive

changes to them (Asselmann et al., 2020). Individuals who score high in Conscientiousness are more likely to develop a plan and respond constructively to crises (Vollrath & Torgersen, 2000).

While the pandemic may not have changed the relationship between personality variables and mental health outcomes, the present results contribute to the growing evidence that interventions with mental health could benefit from taking personality into account. Our results are important for understanding that the pandemic and the consequences might affect individuals with different personalities differently (Shokrkon & Nicoladis, 2021). As the COVID-19 pandemic has affected the world since 2019 and is constantly mutating and showing no signs of ending soon, mental health professionals should develop personality-appropriate intervention programs to enhance mental health around the world. These personality-appropriate intervention strategies to promote mental health could prepare individuals for dealing with the pandemic consequences developed by the pandemic's persistent long-term nature. Also, our results may provide a guide for the screening of individuals more susceptible to mental health issues based on personality traits.

Chapter 4

Study 3: Mental Health in Canadian Children and Adolescents during COVID-19 Pandemic: The Role of Personality and, Coping and Stress Responses

Abstract:

In December 2019, the Coronavirus Disease (COVID-19) pandemic first emerged in China and quickly spread to other countries. Previous studies have shown that the COVID-19 pandemic and the consequences have negatively impacted the mental health of adults. Individual differences such as personality could contribute to mental health. Furthermore, coping and responses to stress may affect an individual's response to the pandemic. In the past, studies have only investigated this relationship in adults. In the current study, we examine how personality traits (using the Five-Factor Model as our framework) and coping and response to COVID-19 stress are related to the mental health of Canadian children and adolescents during the pandemic. Using parent reports of 100 2–6-year-old preschool children and 607 7–18-year-old children, we performed multiple regression analysis to explore how personality traits predict the effects of COVID-19 on mental health. The results showed that personality traits are associated with the mental health of Canadian youth during the COVID-19 pandemic. In preschoolers, Neuroticism and Agreeableness predicted the most mental health problems, and in 6-18-year-old children, Extraversion negatively predicted the least mental health problems. Also, Openness to Experience was the weakest predictor of mental health status in Canadian youth. We also conducted a moderated hierarchical regression analysis to explores whether age moderates the relationship between personality traits and SDQ variables in 7–18-year-old children. Our results showed that age did not moderate the relationship between personality traits and SDQ variables except for a negative interaction effect between age and Extraversion on Hyperactivity/Inattention and a very weak positive interaction effect between age and Conscientiousness on Total Difficulty score. Our findings could be useful in understanding children's responses to the COVID-19 pandemic and could assist public health services in delivering mental health services specifically tailored to children's personalities during and after this pandemic.

Introduction

The Novel Coronavirus (COVID-19) epidemic started in China in December 2019 and was declared a global pandemic in early 2020, by World Health Organization (WHO, 2020). Several studies have documented that the public's mental health has deteriorated since the outbreak of COVID-19 in early 2020 (Gadermann et al., 2021; Hossain et al., 2021; Jiao, et al., 2020; Kumar, & Nayar, 2021). According to Statistics Canada, based on a Survey on COVID-19 and Mental Health, one in four (25%) Canadians expressed symptoms of depression, anxiety, or post-traumatic stress disorder (PTSD) in spring 2021, compared with one in five (21%) in fall 2020 (Statistics Canada, 2021).

At the beginning of the pandemic, only a relatively small number of children have been physically affected by the disease (She et al., 2020), with most showing only mild symptoms compared to adults (Patel, 2020). However, during the second and third wave of the pandemic (when our study was conducted), the number of the children infected with COVID-19 increased, (Canadian Institute for Health Information, 2022), and at the same time vaccines were also becoming available for children.

The existing public health policies, like containment measures, could negatively affect children's mental health. The COVID-19 pandemic has brought significant educational and social disruptions to children around the world. For instance, in Canada, school closures affected 5.7 million children and youth attending elementary and secondary school (Statistics Canada, 2021). Even when schools remained open, students' experiences of schooling changed dramatically. For instance, in order to prevent the spread of COVID-19, curriculum delivery methods have changed, social distancing measures have been implemented during classes and recess and mask-wearing has been mandated across Canada (Vaillancourt et al., 2021). Moreover, many parents were forced to work from home due to the pandemic and although some children could benefit from increased

interactions with them, many have experienced increased levels of emotional distress (Sprang and Silman, 2013; Xie et al., 2020). Having to stay at home could also disturb children's sleep/wake cycles, and physical exercise activities, and lead to excessive use of technology (Xie et al., 2020). The pandemic has also been associated with an increase in family economic stressors and parental unemployment, which could result in short- and long-term mental health effects in children (Costello et al., 2003). Furthermore, domestic violence and emotional, physical, or sexual abuse are more likely to occur in a situation like the pandemic since stress and anxiety could trigger abusive behaviors, victims of abuse have limited access to resources during lockdowns, and many individuals have been forced to spend more time at home with their abusers, which could increase the risk of abuse or exacerbate the severity of abuse (Ali et al., 2021; Ramaswamy & Seshadri, 2020).

Children's development has also been impacted by the drastic changes in all aspects, particularly the interruptions to the development of skills that are fundamental for optimum growth and wellness (Araújo et al., 2021). For instance, children and youth are spending less time interacting with peers and adults compared with before the pandemic (McNamara, 2021), resulting in immediate adverse consequences (Moore et al., 2020), such as negative effects on cognitive development (Deoni et al., 2022), socio-emotional development (Egan et al., 2021), academic performance (Davies & Aurini, 2021) and mental health (Kang et al., 2021).

Not all individuals have been equally affected by the pandemic. Several studies have shown that individual differences such as personality traits could predict differences in psychosocial and mental health outcomes, and the well-being of adults before the pandemic (Albuquerque et al., 2012; Bucher et al., 2019; Strickhouser et al., 2017) and also during the pandemic (Proto, & Zhang, 2021; Shokrkon, & Nicoladis, 2021). Moreover, personality traits could influence the coping style individuals select in different stressful situations (van Berkel, 2009) as coping is a dynamic process

that changes with time as a consequence of varying demands and perceptions of the situation (Moos & Holahan, 2003). Nonetheless, a limited number of studies have explored the contribution of personality and coping to the impacts of the pandemic on the well-being of children and adolescents. Personality is defined as a set of mental structures and adaptive strategies acquired throughout life via socialization and the further expression of temperament within individuals (Rothbart et al., 2000). In this study, we are testing how personality traits, using the Five-Factor Model (FFM; McCrae & Costa, 1987), are associated with the mental health of children and adolescents during the COVID-19 pandemic in Canada. The FFM is one of the most widely recognized summaries of human personality traits (Eysenck, 1992; Goldberg, 1993) consisting of the five dimensions of Neuroticism (or Emotional Instability vs. Stability), Extraversion (vs. Introversion), Openness to Experience (or unconventionality), Agreeableness (vs. Antagonism), and Conscientiousness (or Constraint vs. Disinhibition) (Goldberg, 1992). The FFM framework has been shown to be valid and applicable to children as young as preschool age (Abe & Izard, 1999; Asendorpf & Denissen, 2006; Grist & McCord, 2010; Halverson et al., 2003). Understanding how personality affects children's mental health during the COVID-19 pandemic may assist public health services to implement services tailored to each child's personality.

Also, alongside the personality traits, we are interested in examining the contribution of Coping and Response to Stress on the mental health of Canadian youth as coping could have a central role in determining the impact of the pandemic (Buheji et al., 2020), as how one responds to stress could have significant long-term and immediate consequences (Corbett et al., 2021). Coping consists of cognitive and behavioural strategies used to manage stress (Biggs et al., 2017). There are two types of coping strategies: adaptive and maladaptive (Compas et al., 2017). Adaptive strategies including primary control engagement coping (in which one attempts to modify the stressor directly or modify one's response to the stressor, for example, by solving problems) and

secondary control engagement coping (which focuses on adjusting to the problem, for example, using cognitive reorganization) have been found to significantly reduce the risk of negative mental health outcomes (Carver et al., 1989; Connor-Smith et al., 2000; Rosenberg et al., 2011). In contrast, maladaptive strategies including disengagement coping (which involves attempts to suppress arousal, for example, using avoidance), involuntary engagement coping (which involves involuntary emotional and physiological stress, for example, using distracting thoughts and sympathetic arousal), and involuntary disengagement coping (which involves attempts to disengage from one's emotions, for example using through emotional numbing) have been linked to adverse mental health outcomes (Compas et al., 1997; Connor-Smith et al., 2000; Matthews et al., 2016). Therefore, the coping behaviors and strategies used by children and adolescents play an important role in maintaining an appropriate mental health adjustment in a situation like the current pandemic (Idoiaga et al., 2020), therefore, we will investigate their contribution to children's mental health.

The Present Study

In this study, we are interested in seeing how personality traits contribute to mental health of children from preschool to adolescence. We also wanted to see if the relationship between personality traits and mental health variables (SDQ measures) are the same for older and younger children. Online questionnaires were sent to parents of 2–18-year-old children living across Canada using Qualtrics, a survey platform, distributed via social networks and from the email listings of the University of Alberta. Prior to participating in the study, parents consented through Qualtrics to a question asking "Do you wish to continue the survey, if you do your consent to participate is implied", with two options of "I consent" and "I do not wish to continue". The study was approved by the Research Ethics Board at the University of Alberta (Pro00100751). The data

used in this study is available in the Figshare repository for other researchers to use. Participation in our study was voluntary and ten random participants received a $50 gift card of their choice.

In our study, we analyzed the data of children under 6 and over 6 separately for two reasons: 1) the personality measurement we used differed for the two groups and 2) we believe children being in school vs. out of school could have various impacts. For instance, containment measures and policies (such as mask wearing, and social distancing measures) were different for daycares and schools. In addition, school-aged children are more likely to be more comfortable using technology and social media platforms independently to connect with peers. However, the lack of in-person social interactions may still negatively impact their mental health. Younger children usually do not have access to social media platforms, which may make them more isolated as a result of being unable to connect with their peers. Moreover, children of different ages might have a different online-learning experience during the pandemic. For example, as mentioned before, older children might find it easier to use technology for online learning, and they may be more capable of engaging in online learning activities independently since they have more advanced cognitive skills. In our study, we conducted a moderation regression analysis in order to understand how the relationship between personality traits and mental health variables (SDQ variables) might change over the age range of 7-18 years, and to see whether any differences in this relationship could be explained by age.

Materials and Methods

Participants

A sample of 100 parents of preschool children (80 mothers, 18 fathers, and 2 other caregivers; mean age = 33.75 years [SD = 5.73; range 18 to 48 years]) were recruited for this study who completed parent reports of questionnaires during June and July 2021. The children of

participants were 52 males, and 48 females; mean age = 3.52 years [SD = 1.14; range 2 to 6 years]. To make sure our preschooler's study is not underpowered, we used the GPower software application. This power analysis is undertaken to determine the minimum sample size required. The required power was set at 1- $\beta = 0.80$. The level of significance was set at $\alpha = 0.05$. The effect size was kept at the range value of 0.15 (medium effect size) and the number of predictors is taken as 12. Power analysis revealed that in order to achieve, power of 0.80, a total sample size of n = 44 is needed for our study.

Also, 607 parents of 7-18-year-old children participated in our study (350 mothers, 257 fathers; mean age = 37.56 years [SD = 3.47; range 21 to 58 years]) and completed parent reports of questionnaires. The children of participants were 307 males, and 300 females; mean age =12.55 years [SD = 3.47; range 6 to 18 years]. All participants were required to: (1) reside in Canada; and (2) consent to participate.

Measures

Mental Health

Mental health was assessed using parents' reports on the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997).We used the age-appropriate versions of SDQ for parents of preschoolers and 7–18-year-old children. The SDQ asks questions about positive and negative characteristics displayed by the child in the past 6 months in five categories: Emotional Symptoms (e.g., often unhappy, downhearted), Conduct Problems (e.g., fights with other children), Hyperactivity/Inattention (e.g., constantly fidgeting or squirming), Peer Relationship Problems (e.g., tends to play alone) and Prosocial Behavior (e.g., considerate of other people's feelings). There are five items in each subscale, and the parent/caregiver rates each item as either: Never = 0, Somewhat True = 1, or Certainly True = 2. The Total Difficulties score is generated by adding

up the values of the first four scales, leading to a possible score between 0 and 40, where higher scores indicate an increasing level of behavioral difficulties. A total SDQ score of 17 or higher is considered abnormal. In a study by Croft et al. (2015), all sub-scales showed acceptable internal reliability of subscales ranging from ω = 0.66 (Peer Relationship Problems) to ω = 0.83 (Hyperactivity/Inattention) in preschool children. Another study on 6-17-year-old Canadian children found evidence for the factorial validity and reliability of the parent-rated SDQ and acceptable internal consistency ranging from 0.79 to 0.88 for the subscales (Hoffman et al., 2020).

Personality

Preschoolers' Measurement

The M5–PS–35 is a five-factor personality questionnaire that has been validated for use in preschool populations (Grist et al., 2012). The M5-PS-35 includes items such as "is friendly towards peers" (Extraversion), "loves to help people" (Agreeableness), "completes tasks successfully" (Conscientiousness), "is afraid of many things" (Neuroticism), and "adapts to new activities" (Openness to Experience). Each question uses a 5-point Likert-type scale, ranging from Inaccurate to Accurate. Grist et al. (2012) showed that the revised and shortened version shows strong construct validity and improved internal reliability, internal consistency values are E = .77; A = .90; C = .87; N = .79; O = .71.

7–18-year-olds Measurement

Personality of 7–18-year-old children was measured by parents' reports on the Big Five Questionnaire for Children (BFQ-C) which is a 65-item questionnaire that measures the Big Five in children and adolescents (Barbaranelli et al., 2003). The traits are Extraversion (e.g., "I easily make friends"), Agreeableness (e.g., "I trust in others"), Conscientiousness (e.g., "I like to keep

all my school things in order"), Neuroticism/Emotional instability (e.g., "I easily get angry") and Openness/Intellect (e.g., "I easily learn what I study at school"). Items are scored on a five-point Likert scale ranging from 1 = almost never to 5 = almost always. For each factor, individual item scores are combined to yield a total score. A study by Vreeke and Muris (2012) found that parent report on the BFQ-C was found to have good alphas for Extraversion (.79), Agreeableness (.87), Conscientiousness (.88), Neuroticism (.86), and Openness (.86).

Coping and Response to Stress

Coping and Responses to Stress Questionnaire (RSQ) COVID-19 (Connor-Smith et al., 2000), a multidimensional questionnaire, is adapted to specific stressors or domains of stress, in this case, the COVID-19 pandemic. There are 57 items categorized into five factors (Connor-Smith et al., 2000). For each item, participants are asked: *How much do you do this?* On a scale of 1 to 4: 1 (Not at All), 2 (A Little), 3 (Some), and 4 (A lot). The five total factors include three types of *coping*: Primary Control Engagement Coping: (i.e., emotional expression, emotion regulation, and problem-solving); Secondary Control Engagement Coping (i.e., acceptance, cognitive restructuring, distraction, and positive thinking); and Disengagement Coping (i.e., avoidance, denial, and wishful thinking). The RSQ includes two types of involuntary responses to *stress*: Involuntary Engagement (i.e., emotional arousal, impulse action, intrusive thoughts, physiological arousal, and rumination) and Involuntary Disengagement (i.e., cognitive interference, emotional numbing, escape, and inaction). Each of the five factors—Primary Coping, Secondary Coping, Disengagement Coping, Involuntary Engagement, and Involuntary Disengagement—is calculated as a ratio score of the total stress response items endorsed. Therefore, Primary Coping, for example, represents the propensity of an individual to use this coping style relative to the four other factors. The RSQ has demonstrated excellent internal

consistency, test-retest reliability, and convergent and construct validity (Coiro et al., 2021; Compas et al., 2017).

Demographic Variables

All participants (parents of 2–18-year-old children) were asked to provide the following demographic information: parents' age, their current job status and if there has been a change in their income over the last 2 months if they had pre-existing mental health issues, children's age and gender, and the number of children in the family and birth order of children.

All parents were also asked specific questions about their experiences with the COVID-19 pandemic, for example, if they or anyone living in their household were diagnosed with COVID-19, whether they experienced domestic conflicts as a consequence of the pandemic, how the pandemic interfered with their social interactions, if the loss of childcare services affected them and if the children experienced any issues with their siblings. We reasoned that children's mental health could be affected by the personal experiences people have with the COVID-19 pandemic. Table 7 (preschoolers) and table 8 (7–18-year-old children) provide additional demographic information.

Table 7

Preschool sample demographics characteristics

Demographics	Options	Percentage
Child's gender		
	Male	52%
	Female	48%
Parents' Job Status		
	Not employed	14%
	Temporary/Part-time Employment	13%
	Full-time Employment	30%
	Student	43%
Social interactions		
	Not Affected	10%
	Somewhat Affected	50%
	Largely Affected	40%
Sibling Issues		
	Did not have sibling issues	89%
	Did have sibling issues	11%

Table 8

7–18-year-olds sample demographics characteristics

Demographics	Options	Percentage
Income Change		
	Yes, it has decreased	51.7%
	Yes, it has increased	39.5%
	No change	8.7%
Job Status		
	Not employed	31.6%
	Temporary/Part-time Employment	28.7%
	Full-time Employment	33.9%
	Student	5.8%
Domestic conflict		
	Yes	85.5%
	No	14.5%
Social interactions		
	Not Affected	69.5%
	Affected	30.5%
Sibling Issues		
	Did not have sibling issues	53.2%
	Did have sibling issues	46.8%

Statistical Analyses

Following are the results of all analyses conducted in IBM SPSS Statistics (Version 28). In order to investigate the relationship between personality traits with mental health (positive and negative attributes), first, we calculated Pearson correlation coefficients between personality traits on one hand and Total Difficulty scores, Emotional Symptoms, Hyperactivity/Inattention, Peer Relationship Problems, and Prosocial Behaviors on the other, as well as demographic factors. The variables with at least one significant association with outcome variables are presented in Table 2 (preschoolers) and table 5 (7–18-year-old children).

A hierarchical multivariate regression model was then used to assess the relationship between independent variables and outcome variables. Among demographic variables and coping and response to COVID-19 stress factors, those significantly associated with the dependent variables (Total Difficulty scores, Conduct Problems, Emotional Symptoms, Hyperactivity/Inattention, Peer Relationship Problems, and Prosocial Behaviors) during bivariate analyses were entered into the first and the second models of the hierarchical regression models. The five coping and response to COVID-19 stress factors, Primary Coping, Secondary Coping, Disengagement Coping, Involuntary Engagement, and Involuntary Disengagement were entered in the second block in order to control for potential confounding variables (Table 9 for preschoolers and table 11 for 7–18-year-old children show the final block of the three hierarchical regression analyses).

We entered the (correlated) demographic variables and Coping and Response to COVID-19 Stress variables into the first and second blocks to control for them, as we reasoned that those demographic variables and coping and response to COVID-19 stress play a critical role in determining the impact of the pandemic on children. Finally, after controlling for demographics

and coping and response to COVID-19 stress variables, the five personality traits were entered into the model.

Additionally, we examined whether children's age moderated the relationship between personality traits and mental health variables among 7–18-year-olds, using moderated hierarchical multivariate regression analysis. We first mean-centered our continuous predictor variables. Following previous analyses, we first entered the demographic variables and coping and response to COVID-19 stress factors (those significantly associated with the dependent variables) into the first and the second blocks of the hierarchical regression models. Following that, we entered personality traits variables into the third block, and the interaction effects between age and personality traits into the fourth block of our regression model. The final block of the moderated hierarchical multivariate regression analysis (personality traits and age interaction effects) is shown in Table 12.

Results

Preschool Children

The means, standard deviations, and correlations between personality traits, coping and response to COVID-19 stress variables**,** and SDQ subscales are presented in Table 9. Extraversion, Agreeableness, Openness to Experience, and Conscientiousness are all positively correlated with each other and negatively correlated with Neuroticism, except for Extraversion and Agreeableness.

As can be seen in Table 10, Openness to Experience is not related to any of the SDQ subscales when controlling for demographic factors and coping and response to COVID-19 stress variables. Extraversion is positively and significantly related to Hyperactivity/Inattention

and Prosocial Behavior. Neuroticism is positively and significantly related to Total Difficulties score, Emotional Symptoms, and Conduct Problems. Agreeableness was negatively and significantly related to Total Difficulties score, Conduct problems, and Hyperactivity/Inattention. Conscientiousness is negatively and significantly related to Total Difficulties score, and Hyperactivity/Inattention.

Over and above the contribution of demographics and coping and response to COVID-19 stress variables, the personality traits, explain 60% of the variance of total difficulty score, 51% of Emotional Symptoms, 54% of Conduct Problems, 54% of Hyperactivity/Inattention, 22% of Peer Relationship Problems, and 39% Prosocial Behavior.

Table 9

Means, standard deviations, and correlations between demographics variables, coping and stress responses, and personality traits in preschoolers.

	MEAN (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1 Child Gender	-	-																			
1.1 Male																					
Female		REF																			
2.Job Status	-		-																		
2.1.Part-time		-02																			
No Job		REF																			
3.Social Interactions	-																				
3.1.Largely		-11	.02																		
No Change		REF		-																	
4.Sibling Issue	-				-																
4.1 No		.08	.05	-.21**																	
Yes		REF																			
5.PCC	.31 (.14)	.20	.06	.07	.23*	-															
6.SCD	.32 (.13)	-.01	.07	-.06	.11	.02	-														
7.DC	.13 (.12)	-.10	-.08	-.09	-.21*	-.46**	-.43**	-													
8.IEC	.10 (.10)	-.05	-.14	.01	-.13	-.42**	-.47**	.04	-												
9.IDC	.09 (.07)	-.03	-.04	-.01	-.00	-.54**	-.39**	.14	.49**	-											
10.Openness	4.17 (.63)	.10	.03	-.06	.13	.17	.39**	-.05	-.32**	-.29**	-										
11.Extraversion	4.29 (.75)	.14	.05	.03	.00	.17	.42**	-.15	-.39**	-.42**	.52**	-									
12.Neuroticism	2.84 (.83)	-.11	-.03	.12	-.16	-.21*	-.23*	-.01	.41**	.23*	-.34**	-.36**	-								
13.Agreeableness	3.28 (.66)	.01	.20*	-.16	.30**	.27**	.15	-.14	-.26*	-.18	.24*	-.00	-.38**	-							
14.Conscientiousness	3.66 (.63)	.16	.12	-.04	.19*	.26*	.18	-.12	-.26*	-.31**	.41**	.26**	-.40**	.58**	-						
15.Emotional Symptoms	2.58 (2.55)	-.18	-.01	-.01	-.03	-.28**	-.24*	.01	.48*	.32*.	-.31**	-.42**	.65**	-.20*	-.37**	-					
16.Conduct Problems	2.31 (1.44)	-.01	-.10	.20*	-.36**	-.21*	-.23*	.05	.30**	.24*	-.22*	-.12	.49**	-.62**	-.42**	.39**	-				
17.hyperactivity/ inattention	5.65 (2.43)	-.04	-.25*	.10	.17	-.14	-.08	.05	.25*	.06	-.14	.13	.23*	-.58**	-.58**	.20*	.42**	-			
18.Peer relationship problems	4.12 (1.64)	-.19*	-.01	-.04	-.05	-.10	-.17	.01	.27*	.21*	-.25*	-.32**	-.30**	-.19	-.30**	.50**	.27**	.13	-		
19.Prosocial Behaviour	7.74 (2.10)	.11	.07	.08	.33**	.23*	.24*	-.27**	-.17	-.24*	.33**	.37**	-.17	.24*	.39**	-.15	-.22*	-.21*	-.22*	-	
20.Total Difficulties	14.66 (5.68)	-.16	-.14	.07	-.21*	-.27*	-.25*	.04	.47**	.29**	-.33**	-.25**	.60**	-.55**	-.61**	.78**	.69**	.66**	.64**	-.28**	

PCD:Primary Control Coping, SCD: Secondary Control Coping, DC: Disengagement Coping, IEC: Involuntary Engagement Coping, and IDC: Involuntary Disengagement Coping.
** p< 0.01 * P<0.05

Table 10

Hierarchical regression analysis (standardized beta weights) of personality traits in relation to SDQ subscales, controlled for demographics and coping and stress responses variables for preschoolers.

	Total Difficulty			Emotional			Conduct			Hyperactivity			Peer			Prosocial		
	Beta	95% CI		Beta	95% CI		Beta			Beta	95% CI		Beta	95% CI		Beta	95% CI	
Gender	N/A			N/A			N/A			N/A			-.09	-.97	.37	N/A		
Male													REF					
Female																		
Job Status	N/A			N/A			N/A						N/A			N/A		
Part-time										-.10	-1.92	.40						
No Job										REF								
Social Interactions	N/A			N/A						N/A			N/A			N/A		
Largely							.11	-.16	.93									
No Change							REF											
Sibling Issue										N/A			N/A					
No	.09	-.73	2.86	N/A			-.20*	-1.76	-.14							-.02	-1.03	.77
Yes	REF						REF									REF		
PCC	.01	-7.16	8.39	-.05	-4.70	2.83	.05	-1.64	2.80	N/A			N/A			.21	-.74	7.06
													N/A			.13	-2.10	6.61
SCC	-.00	-8.76	8.62	.01	-3.93	4.44	-.04	-2.88	1.93	N/A								
DC	N/A			N/A			N/A			N/A			N/A			N/A		
IEC	.20*	.27	23.76	.18	-.87	10.50	.01	-3.02	3.45	.18*	.14	8.67	.08	-2.75	5.37	.16	-2.21	9.55
IDC	-.00	-15.80	15.58	.02	-6.86	8.35	.14	-.1.68	7.19	N/A			.00	-5.15	5.28	.09	-5.13	10.61
Openness	.02	-1.53	2.05	.06	-.62	1.18	-.00	-.51	.47	.02	-.64	.84	-.06	-8.17	.49	.08	-.60	1.19
Extraversion	.02	-1.36	1.78	.-.10	-1.11	.41	.04	-.34	.52	.30**	.35	1.67	-.18	-1.01	.19	.34*	.23	1.81
Neuroticism	.32**	1.02	3.58	.54**	1.07	2.30	.21*	.03	.74	-.03	-.64	.45	.12	-.23	.74	.07	-.43	.84
Agreeableness	-.21*	-3.61	-.16	.15	-.23	1.43	-.47**	-1.53	-.56	-.27**	-1.78	-.25	-.01	-.71	.62	.16	-.30	1.42
Conscientiousness	-.30**	-4.63	-.88	-.18	-1.62	.15	.03	-.42	.59	-.47**	-2.6	-1.04	-.12	-1.03	.38	.16	-.36	1.61

PCD:Primary Control Coping, SCD: Secondary Control Coping, DC: Disengagement Coping, IEC: Involuntary Engagement Coping, and IDC: Involuntary Disengagement Coping.
N/A: not applicable
** p< 0.01* P<0.05

Note: Total difficulty: R^2=.06 for block 1(F(1,99)=5.40; p>.05); ΔR^2: .20 for block 2(F_{change}(5,95)=5.54; p<.001). ΔR^2=.33 for block 3 (F_{change}(10,90)=12.68; p<.001). Emotional Problems: R^2=.23 for block 1(F(4,96)=6.04; p<.001); ΔR^2: .28 for block 2(F_{change}(9,91)=8.85; p<.001). Conduct: R^2=.20 for block 1(F(2,98)=10.78; p<.001); ΔR^2: .08 for block 2(F_{change}(6,94)=2.22; p>0.05). ΔR^2=.25 for block 3 (F_{change}(11,89)=7.07; p<.001). Hyperactivity/inattention: R^2=.05 for block 1(F(1,99)=4.89; p<.01); ΔR^2: .05 for block 2(F_{change}(2,98)=4.65; p<.01). ΔR^2=.44 for block 3 (F_{change}(7,97)=15.72; p<.001). Peer problems: R^2=.02 for block 1(F(1,99)=

2.41; p>.05); ΔR^2: .07 for block 2($F_{change}(5,95)=3.77$; p<.05). ΔR^2=.09 for block 3 ($F_{change}(10,90)=1.99$; p>.05). Prosocial: R^2=.14 for block 1($F(1,99)=.16$; p>0.05); ΔR^2: .11 for block 2 ($F_{change}(5,95)=2.60$; p<.05). ΔR^2=.17 for block 3 ($F_{change}(10,90)=3.83$; p<.05).

7–18-year-old children

The means, standard deviations, and correlations between personality traits, coping and response to COVID-19 stress variables**,** and SDQ subscales are presented in Table 11. Extraversion, Agreeableness, Openness to Experience, and Conscientiousness are all positively correlated with each other and negatively correlated with Neuroticism.

As can be seen in Table 12, Openness to Experience is negatively related to Hyperactivity/Inattention when controlling for demographic factors and coping and response to COVID-19 stress variables. Extraversion was negatively and significantly related to Total Difficulty score, Conduct Problems, and Peer Relationship Problems and also positively related to Hyperactivity/Inattention. Neuroticism was positively and significantly related to total difficulty score and Hyperactivity/Inattention. Agreeableness was negatively and significantly related to Conduct Problems and positively related to Prosocial behaviors. Conscientiousness was negatively and significantly related to Total Difficulty score, and Hyperactivity/Inattention.

Over and above the contribution of demographics and coping and response to COVID-19 stress variables, the personality traits, explained 46% of the variance of the Total Difficulty score, 17% of Emotional Symptoms, 40% of Conduct Problems, 11% of Hyperactivity/Inattention, 28% of Peer Relationship problems, and 27% Prosocial behavior.

Table 11

Means, standard deviations and correlations between demographics variables, coping and stress responses and personality traits in 7–18-year-old children.

	MEAN (SD)	1	2	3	4.1	4.2	5	6	7.1	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	21
1.Parent's Age	37.56 (5.98)																								
2.Child's Age	12.55 (3.47)	.11**																							
3.Income Change	-																								
Decrease		-.06	.03																						
No change		REF																							
4.Job Status	-																								
4.1.Part-time		-.04	.01	.14**	-																				
4.2.Student		.01	-.14**	-.15**	-.15**																				
No Job																									
5.Domestic Issues	-																								
Yes		-.35**	.07	.25**	.14**	-.38**																			
No		REF																							
6.Social Interactions	-																								
Largely		-.07	-.00	.09*	.04	-.13**	.20**																		
No Change		REF																							
7.Sibling Issue																									
Yes		-.10*	.07	-.02	-.00	-.07	.14**	.02																	
No		REF																							
8.PCC	.16 (.03)	.17**	-.03	-.09*	-.04	.30**	-.46**	-.12**	-.14**																
9.SCC	.21 (.03)	.23**	-.03	-.13**	-.08*	.24**	-.52**	-.08*	-.14**	.30**															
10.DC	.15 (.02)	-.09*	.01	.01	.01	-.01	.12**	.03	.02	-.31**	-.26**														
11.IEC	.25 (.03)	-.13**	.02	.13**	.06	-.26**	.46**	.10*	.16**	-.51**	-.66**	-.07													

12.IDC	.20 (.03)	-.23**	.04	.08*	.05	-.29**	.46**	.08*	.11**	-.57**	-.56**	-.01	.24**																
13.Openness	40.47 (6.34)	.15**	-.11**	-.11**	-.09*	.28**	-.47**	-.12**	-.12**	.39**	.35**	-.12**	-.32**	-.36**															
14.Extraversion	40.98 (6.62)	.17**	-.16**	-.13**	.06	.30**	-.49**	-.10**	-.13**	.37**	.33**	-.13**	-.26**	-.36**	.45**														
15.Neuroticism	38.36 (5.92)	-.15**	.00	.03	.00	-.27**	.28**	.03	.12**	-.23**	-.32**	.04	.32**	.22**	-.13**	-.21**													
16.Agreeableness	41.22 (6.96)	.18**	-.09*	-.19**	-.09*	.43**	-.55**	-.16**	-.16**	.39**	.37**	-.06	-.34**	-.40**	.47**	.42**	-.22**	-											
17.Conscientiousness	39.91 (6.10)	.09*	-.00	-.07	-.08*	.15**	-.26**	-.09*	-.16**	.27**	.19**	-.06	-.20**	-.22**	.29**	.25**	-.15**	.33**											
18.Emotional Symptoms	4.64 (2.06)	-.14**	.02	.06	-.01	-.21**	.31**	.10*	.11**	-.19**	-.35**	.06	.30**	.22**	-.15**	-.21**	.20**	-.19**	-.15**	-									
19.Conduct Problems	4.34 (2.22)	-.23**	.11**	.17**	.13**	-.37**	.56**	.06	.12**	-.38**	-.35**	.11**	.28**	.40**	-.31**	-.42**	.22**	-.47**	-20**	.25**									
20.hyperactivity/inattention	4.99 (2.02)	-.09*	-.00	.00	.00	-.13**	.11**	.02	.01	-.16**	-.17**	.06	17**	.12**	-.17**	-.05	.18**	-.11**	-.23**	.16**	.12**								
21.Peer relationship problems	4.70 (2.24)	-.20**	.01	.18**	.12**	-.28**	.49**	.11**	.03	-.30**	-.33**	.05	.30**	.30**	-.32**	-.35**	.20**	-.36**	-.14**	.23**	.33**	.09*							
22.Prosocial Behaviour	5.51 (2.11)	.16*	-.09*	-.19**	-.16**	.31**	-.41**	-.10*	-.05	.28**	.26**	-.01	-.26**	-.28**	.33**	.31**	-.14**	.44**	.16*	-.10*	-.32**	-.08*	-.24**	-					
23.Total Difficulties Score	18.66 (5.44)	-.26**	.05	.16**	.10**	-.40**	.59**	.12**	.11**	-.41**	-.47**	.11**	.42**	.42**	-.38**	-.42**	.32**	-.46**	-.28**	.64**	.69**	.52**	.67**	-.30**	-				

PCD: Primary Control Coping, SCD: Secondary Control Coping, DC: Disengagement Coping, IEC: Involuntary Engagement Coping, and IDC: Involuntary Disengagement Coping.
** p< 0.01 * P<0.05

Table 12

Hierarchical regression analysis (standardized beta weights) of personality traits in relation to SDQ subscales, controlled for demographics and coping and stress responses variables for 7–18-year-old children

	Total Difficulty			Emotional			Conduct			Hyperactivity			Peer			Prosocial		
	Beta	95% CI		Beta	95% CI		Beta	95% CI		Beta	95% CI		Beta	95% CI		Beta	95% CI	
Parent's Age	-.04	-.10	.01	-.02	-.03	.02	-.03	-.04	.01	-.05	-.04	.00	-.02	-.03	.01	.03	-.01	.03
Child's Age	N/A			N/A			.04	-.01	.07	N/A			N/A			-.03	-.06	.02
Income Change									.									
Decrease	.01	-.54	.85	N/A			.02	-.19	40	N/A			.05	-.09	.56	-.07	-.62	.00
Increase	REF																	
Job Status																		
Part-time	-.01	-.90	.59	N/A			.02	-.19	.45	N/A			.03	-.19	.51	-.07	-.67	.00
Student	-.14**	-5.07	-1.67	-.09*	-1.67	-.07	-.10**	-1.78	-.29	-.08	-1.56	.04	-.05	-1.33	.29	.08	.-.01	1.53
No Job	REF																	
Domestic Issues																		
Yes	.25**	2.52	5.44	.12*	.05	1.41	.28**	1.20	2.46	-09	-1.21	.15	.27**	1.09	2.48	-.09	-1.26	.05
No	REF																	
Social Interactions																		
Largely	-.03	-.30	1.13	-.01	-.39	.28	N/A			N/A			.02	-.22	.46	.05	-.07	.57
No Change	REF																	
Sibling Issue																		
Yes	-.01	-.80	.55	.04	-.14	.49	.03	-.16	.42	N/A			N/A			N/A		
No	REF																	
PCD	-.63*	-223.92	-.95	.01	-7.013	9.60	-.30	-70.78	26.04	-.06	-12.89	4.07	-.01	-9.18	7.47	-.00	-8.71	7.42
SCD	-.81*	-231.69	-10.31	-.19**	-18.93	-2.77	-.30	-66.24	29.85	-.10	-13.97	2.34	-.01	-8.81	7.52	-.06	-11.69	3.83
DC	-.42	-213.67	8.88	N/A			-.15	-63.23	33.38	N/A			N/A			N/A		
IEC	-.59	-207.04	15.34	.08	-3.08	13.36	-.30	-67.86	28.68	.01	7.72	8.92	.06	-4.33	12.27	-.10	-14.12	1.62
IDC	-.53	-206.80	14.66	.00	-8.43	9.20	-.14	-58.85	37.28	-.03	-11.55	6.31	.04	-5.99	11.84	-.08	-14.03	2.86
Openness	-.03	-.09	.03	.04	-.01	.04	.05	-.00	.04	-.12**	-.07	-.01	-.05	-.05	.01	.06	-.06	.05
Extraversion	-.08*	-.13	-.00	-.05	-.04	.01	-.13**	-.07	-.01	.10*	.00	.06	-.10*	-.06	-.00	.08	-.00	.05
Neuroticism	.07*	.00	.13	.04	-.01	.04	.01	-.02	.03	.11**	.01	.06	.03	-.01	.04	.02	-.01	.03
Agreeableness	-.05	-.10	.01	.05	-.01	.04	-.16**	-.08	-.02	.04	-.01	.04	-.06	-.05	.00	.23**	.04	.10
Conscientiousness	-.09**	-.14	-.02	-.06	-.05	.00	.00	-.02	.02	-.19**	-.09	-.03	.03	-.01	.04	-.02	-.03	.02
Openness x age	-.04	-.02	.00	-.02	-.01	.00	-.03	-.01	.00	-.06	-.01	.00	.00	-.00	.00	-.00	-.00	.00
Extraversion x age	-.02	-.02	.01	.06	-.00	.01	-.01	-.00	.00	-.12*	-.01	-.00	.02	-.00	.01	.02	-.00	.00
Neuroticism x age	-.04	-.02	.00	-.05	-.01	.00	.00	-.00	.00	-.03	-.01	.00	-.01	-.00	.00	.00	-.00	.00
Agreeableness x age	-.00	-.00	.00	.00	-.00	.00	.04	.00	.00	-.01	-.00	.00	-.05	-.00	.00	-.02	-.00	.00
	.06*	.00	.03	.07	-.00	.01	.00	-.00	.00	.06	-.00	.01	.03	-.00	.01	.03	-.00	.01

Conscientiousness x age

PCD: Primary Control Coping, SCD: Secondary Control Coping, DC: Disengagement Coping, IEC: Involuntary Engagement Coping, and IDC: Involuntary Disengagement Coping.
N/A: not applicable ** p< 0.01 * P<0.05

Note: Total difficulty: R^2=.38 for block 1(F(7,600)=53.58; p<.001); ΔR^2: .05 for block 2(F_{change}(12,595)=10.17; p<.001). ΔR^2=.02 for block 3 (F_{change}(17,590)=5.5; p<.001). ΔR^2: .00 for block 4 (F_{change}(22, 592)= 1.38; p> .05). Emotional Problems: R^2=.11 for block 1(F(5,602)=15.22; p<.001); ΔR^2: .15 for block 2(F_{change}(9,598)=8.04; p<.001). ΔR^2=.15 for block 3 (F_{change}(14,593)=1.33; p>0.05). ΔR^2: .01 for block 4 (F_{change}(20,587)= 1.70; p> .05). Conduct: R^2=.34 for block 1(F(7,600)=43.62; p<.001); ΔR^2: .02 for block 2(F_{change}(12,595)=4.67; p<.001). ΔR^2=.02 for block 3 (F_{change}(17,590)=5.46; p<.001). ΔR^2: .01 for block 4 (F_{change}(20,587)= .66; p> .05). Hyperactivity/inattention: R^2=.02 for block 1(F(3,604)=5.44; p=.001); ΔR^2: .04 for block 2(F_{change}(7,600)=4.00; p<.05). ΔR^2=.06 for block 3 (F_{change}(12,595)=8.00; p<.001). ΔR^2: .02 for block 4 (F_{change}(16,591)= 2.78; p< .05). Peer problems: R^2=.25 for block 1(F(6,601)= 33.27; p<.001); ΔR^2: .01 for block 2(F_{change}(10,597)=2.36; p>.05). ΔR^2=.01 for block 3 (F_{change}(15,592)=2.74; p<.05). ΔR^2: .00 for block 4 (F_{change}(21,586)= .80; p> .05). Prosocial: R^2=.21 for block 1(F(7,600)=22.05; p<.001); ΔR^2: .01 for block 2(F_{change}(11,596)= 3.09; p<.05). ΔR^2=.04 for block 3 (F_{change}(16,591)=7.55; p<.001). ΔR^2: .00 for block 4 (F_{change}(21,586)= .27; p> .05).

Moderating effect of age among 7–18-year-old children

A moderated hierarchical multivariate regression analysis was conducted in order to determine whether the age of the children moderated the relationship between personality traits and SDQ variables. The final block of the moderated hierarchical multivariate regression analysis (personality traits and age interaction effects) is shown in Table 12. The results of the moderated regression analysis showed that age did not moderate the relationship between personality traits and SDQ measures except for significant age-Extraversion interaction effect on the Hyperactivity/Inattention variable ($\beta = -.12$, $t = -2.56$, $p < .05$) and significant age-Conscientiousness interaction effect on the Total Difficulty variable ($\beta = .06$, $t = 1.99$, $p < .05$).

The overall model (with personality traits- age interactions added to the last block) were not statistically significant for Total Difficulty variable ($F_{change}(22, 585) = 1.38$, $p > .05$), Emotional Symptoms ($F_{change}(20, 587) = 1.73$, $p > .05$), Peer Relationship problems ($F_{change}(21, 586) = .80$, $p > .05$) and, Prosocial Behaviors ($F_{change}(21, 586) = .27$, $p > .05$). However, the final model was statistically significant for Hyperactivity/Inattention ($F_{change}(21, 586) = 2.78\ 0$, $p < .05$).

Discussion

Preschool Children

The results of preschoolers' data show that over and above the contribution of demographics and coping and response to COVID-19 stress, personality traits predicted substantial variance in the effects of COVID-19 on the mental health of preschoolers in Canada which will be discussed in greater detail in the following section.

Among the five coping and response to COVID-19 stress factors, Involuntary Engagement Coping (or stress reactivity) was the only variable that was significantly associated with SDQ subscales of the Total Difficulties score and Hyperactivity/Inattention (see Table 10). Involuntary Engagement Coping is characterized by involuntary emotional and physiological stress for example through intrusive thoughts, rumination, impulsive actions, and physiological arousal, out of one's control. Previous studies have also shown associations between maladaptive stress response of Involuntary Engagement Coping with greater psychopathology (Singer et al., 2000) and mental issues such as anxiety, depression, internalizing problems, and aggression (Blöte et al., 2022; Dufton et al., 2010; Wolff et al., 2009). Moreover, children who are highly reactive experience greater illness rates in situations of increased stress (Boyce et al., 1995) similar to the COVID-19 situation happening now.

Mental Health and Personality Traits in Preschoolers

Neuroticism

Among the big 5 personality traits, Neuroticism predicted the most SDQ difficulty subscales (Total Difficulty, Emotional Symptoms, and Conduct Problems) among these preschoolers. Neuroticism is a personality trait characterized by a disposition to experience negative emotions which manifests itself through feelings of anxiety, anger, sadness, and tension (John, Naumann, & Soto, 2008). In Study 1, Neuroticism predicted the Total Difficulties score, namely the sum of Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, and Peer Relationship Problems scores. Neuroticism has long been linked to psychopathology and evidence suggests that Neuroticism reflects a common vulnerability contributing to the development and maintenance of a variety of mental illnesses (Sauer-Zavala et al., 2107). Generally, Neuroticism has been found to be a risk factor for developing emotional disorders

such as depression and anxiety (Agh-Yousefi & Maleki, 2011; Andrés et al., 2016; Lahey, 2009). To explain the vulnerability to emotional problems, some studies have shown that anxiety sensitivity, intolerance of uncertainty and worry, and rumination could be vulnerability markers related to Neuroticism (Broeren et al., 2011; Sexton et al., 2003). Also, Neuroticism could also be a predictor of conduct disorder as according to Eysenck's biological theory of personality, Neuroticism is associated with higher psychobiological reactivity in the face of frustration and greater sympathetic arousal (Eysenck, 1963). Consequently, Neuroticism tends to follow a susceptibility to stress, inefficiency in dealing with frustration, and difficulty controlling impulses (Abbasi, 2016), in this case, in a situation like the COVID-19 pandemic.

Agreeableness

Agreeableness, recognized as an important facet of mental health, showed negative associations with Total Difficulties, Conduct Problems, and Hyperactivity/Inattention among the preschoolers in this study. Children with high scores in Agreeableness tend to be cooperative, considerate, empathic, trustworthy, courteous, well-regulated, caring, friendly, and compliant, and exhibit good interpersonal skills (Kochanska, & Kim, 2020). Generally, higher scores in Agreeableness in children and adolescents have been associated with improved developmental outcomes, and lower scores in Agreeableness have been associated with multiple symptoms of psychopathology and externalizing and internalizing behavior problems (Laursen et al., 2010; Laursen et al., 2002). Studies have also shown a negative association between high scores of Agreeableness and bullying, aggressive and delinquent behaviors, and social problems (Bollmer et al., 2006; Ehrler et al., 1999; Nigg et al., 2002). Previous studies have also shown negative associations between Agreeableness and Hyperactivity and Inattention symptoms (Gomez & Corr, 2014; Nigg et al., 2002).

Conscientiousness

Conscientiousness negatively predicted Total difficulty and Hyperactivity among preschool children. Conscientiousness is characterized by restraining impulses, effortful attention, planned behavior, organization, and goal-oriented behavior (Krieger et al., 2020). In general, individuals who score higher in Conscientious tend to experience less stress and mental health issues when compared to individuals who score lower in Conscientiousness (Wehner et al., 2006). Previous studies have also found a link between low Conscientiousness and Attention-Deficit Hyperactivity Disorder (ADHD) symptoms in some children and adolescents (Cukrowicz et al., 2006; De Pauw, & Mervielde, 2011; Martel, et al., 2009; Nigg et al., 2002). The inhibitory aspect of Conscientiousness is associated with self-regulation and impulse control which could possibly be indicative of some kind of top-down regulating mechanism (DeYoung, 2010).

Extraversion

Extraversion, a trait that has shown strong correlations with mental health outcomes, showed positive associations with Hyperactivity/Inattention and Prosocial Behaviors. Typically, a child with a tendency to Extraversion is likely to be externally focused, and socially active and could be described as outgoing, talkative, assertive, and energetic (Smith et al., 2021). The findings on the associations between Extraversion and Hyperactivity/Inattention have been inconsistent across the literature. Even though some studies have found no significant associations between Hyperactivity/Inattention and Extraversion in children, adolescents, and adults (De Pauw, & Mervielde, 2011; Gomez, & Corr, 2014; Martel et al., 2008), some have shown strong links between hyperactive-impulsive symptoms and Extraversion (Gomez, & Corr, 2014; Martel, 2009; Tackett, et al., 2012). Moreover, a study by Gomez and Corr (2014)

indicated that positive emotionality (similar to FFM/Extraversion) was associated with inattention, but not with hyperactivity-impulsivity. A possible explanation for the inconsistency of the associations between ADHD symptoms and Extraversion could be that the relationship may be masked when hyperactive, inattention, and impulsive symptoms are not analyzed separately. Moreover, a possible explanation of the positive association between Extraversion and Hyperactivity/Inattention could be related to the COVID-19 situation and the consequences. For instance, children who score higher on Extraversion, usually enjoy social situations, like playing in groups and spending time with their friends but as a result of COVID-19 and the containment measures, they had to spend more time at home, as a result, they might display this suppressed social energy as hyperactivity and inattention symptoms. However, more research is needed to verify this speculation.

Extraversion was the only predictor of Prosocial Behavior in preschoolers. This result is in line with previous studies showing this positive association in children and adolescents (Gómez Tabares, & Narvaez Marin, 2022; Tariq, & Naqvi, 2020). A possible explanation could be that Extraversion is usually considered a very positive trait (Salmon, 2012), and individuals who score higher on Extraversion usually experience more warmness and positivity (Nguyen et al., 2103), greater social/emotional responsivity (O'Connor & Cuevas, 1982), and more positive affect (Morrone et al., 2000), which could be manifested in Prosocial Behavior in children.

Openness to Experience

Openness to Experience did not predict any of the mental health domains in preschoolers.

7–18-year-old children

In 7-18-year-olds, the Total Difficulty score of children was predicted positively by Neuroticism and predicted positively by Extraversion and Conscientiousness. Conduct problems

are negatively predicted by Extraversion and Agreeableness. Hyperactivity/Inattention was positively predicted by Extraversion and Neuroticism and negatively predicted by Openness to Experience and Conscientiousness. Peer Relationship Problems are negatively predicted by Extraversion and Prosocial Behavior was positively predicted by Agreeableness. Emotional Symptoms are not predicted by any of the personality traits.

Among the five coping and response to COVID-19 stress factors, Primary Control Coping and Secondary Control Coping are significantly associated with some SDQ subscales (see table 12). Primary Control Coping is negatively associated with Total Difficulties score, and Secondary Control Coping is negatively associated with Total Difficulties score and Emotional Symptoms. Adaptive coping responses in children include Primary Control Coping (problem-solving, emotional expression, and emotional modulation), and Secondary Control Coping (acceptance, cognitive restructuring, positive thinking, and distraction) (Connor-Smith et al. 2000). Primary Control Coping and Secondary Control Coping are associated with significantly less psychosocial problems, with Secondary Control strategies particularly beneficial for stressful situations that are beyond one's control (such as COVID-19 situation) (Compas et al., 2017). This is consistent with previous research showing that lower levels of Primary Control Coping and Secondary Control Coping are linked with higher amounts of internalizing symptoms, depression, anxiety, distress, and negative affect in youth (Bettis et al., 2016; Connor-Smith, & Compas, 2004; Evans et al., 2015).

Moreover, results of moderated regression analysis showed that children’s age did not moderate the relationship between personality traits and SDQ variables except for except for a significant interaction effect between age and Extraversion on Hyperactivity/Inattention and a significant interaction effect between age and Conscientiousness on Total Difficulty Score. Our

results suggest that the effect of personality traits on SDQ variables is generally consistent across 7–18-year-old children, except for two significant interaction effects.

The first significant negative interaction effect was between age and Extraversion on the Hyperactivity/Inattention variable. This may indicate that younger children who score high on Extraversion trait are more likely to exhibit Hyperactivity/Inattention behaviors compared to older children who score high on Extraversion trait. A possible explanation could be that younger children who score high on Extraversion trait might exhibit more Hyperactivity/Inattention symptoms, however as they age, they might develop more effective self-regulation skills and exhibit fewer Hyperactivity/Inattention symptoms. The second positive interaction effect was between age and Conscientiousness on the total Difficulty Score. This may indicate that older children who score high on Conscientiousness are more likely to exhibit more emotional and behavioral difficulties compared to younger children who score high on Conscientiousness. It is important to note that the interaction effect between age and conscientiousness on the Total Difficulty Score of the SDQ was very weak ($\beta = .06$, $p = .04$).

Mental Health and Personality Traits in 7–18-year-old children

Extraversion

Extraversion appears to be the strongest predictor of mental health variables in 6-18-year-old children, showing negative associations with Total Difficulty score, Conduct Problems, and Peer Problems and positive associations with Hyperactivity/Inattention. Extraversion is generally linked with higher states of good health (Jokela et al., 2013), as well as mental health (Carver & Scheier, 2014). In the context of the pandemic, this could be explained by the connection found between a higher level of Extraversion and active coping strategies in the form of active

problem-solving (Karimzade & Besharat, 2011). Moreover, Extraversion plays a significant role in receiving social support or seeking help during difficult times, such as during the pandemic (Burešová et al., 2020).

There are mixed results regarding the relationship between Extraversion and Conduct Problems. Eysenck and Eysenck (1985) suggested that individuals who score higher on Extraversion are less likely to form conditioned responses than more Introverted individuals, therefore, they are less able to take advantage of aversive conditioning, less sensitive to conditioned stimuli for punishment and are more prone to exhibit antisocial behavior. They also suggested that children with conduct disorder score higher on Extraversion (Eysenck & Eysenck, 1985). More recent studies have also found associations between lower scores of Extraversion with antisocial delinquent behaviors (Krishna, 1993; Komulainen, 2015; Morizot, 2015). However, there are also studies showing no evidence to support Eysenck's claim that higher scores in Extraversion are associated with delinquent and antisocial behaviors (Cale, 2006; Fonseca & Yule, 1995; Homann, 2019). A possible explanation for the negative association of Conduct Problems and Extraversion in our participants could be related to the COVID-19 situation. For instance, more introverted children who had a few friends at school lost connection with them during the pandemic due to school closures and more Introverted children usually do not reach out to other people (such as siblings and other family members) to fulfill their social needs. It is possible that they manifest their loneliness as aggressive behavior and fighting with others. In contrast, more extroverted children are more likely to reach out to family and friends to satisfy their interpersonal needs in times of school closure. However, more research is needed to test this hypothesis.

As explained in the Study 1 discussion, results are mixed regarding the associations between Extraversion and Hyperactivity/Inattention. The positive relationship between

Extraversion and Hyperactivity/Inattention could be explained in the context of the global pandemic, and more Extroverted children and adolescents might manifest their suppressed social energy (as a result of social restriction) as Hyperactivity and Inattention symptoms.

Our results also showed that Extraversion is negatively and significantly associated with Peer Relationship Problems. Our findings are in line with earlier studies finding that adolescents who score higher in Extraversion tend to form and maintain friendships and wider social networks, and to be socially competent (Selfhout et al., 2010). Extraversion is associated with peer acceptance and friendship (Jensen-Campbell et al., 2002), better social interactions (Cheng, Furnham, 2002), sociability, and social interest (Elphick, Halverson, & Marszal-Wisniewska, 1998).

Conscientiousness

Conscientiousness predicted Total Difficulty and Hyperactivity/Inattention in 7–18-year-old children, as well as in preschoolers. This is in line with previous studies showing that Conscientiousness is associated with Inattention in children (Martel et al., 2008, 2009) and Hyperactivity-Impulsivity in adolescents (Martel et al., 2009). As explained in Study 1 discussion, a possible explanation could be that Hyperactivity/Inattention could be associated with executive control and Conscientiousness, indicative of underlying top-down regulatory processes (Nigg, 2010).

Neuroticism

Neuroticism is positively associated with Total Difficulty score and Hyperactivity/Inattention in 7–18-year-olds. Overall, Neuroticism is directly related to psychopathology, and individuals who score higher in Neuroticism are more likely to develop Axis I psychopathology, particularly the common mental disorders including mood, anxiety,

substance use disorders, and also schizophrenia, bipolar disorder, and ADHD (Gale et al., 2016). Our results are consistent with previous studies showing associations between Neuroticism and Hyperactivity/Inattention (Martel 1t al., 2010; Krieger et al., 2020). High Neuroticism has also been linked with the persistence of hyperactivity and inattention during adolescence (Miller et al., 2008).

Agreeableness

Agreeableness showed negative associations with Conduct Problems and Positive associations with Prosocial Behaviors. The concept of Prosocial Behavior overlaps substantially with the construct of Agreeableness and it is even sometimes considered a form of Agreeableness (Graziano, & Eisenberg, 1997). Prosocial tendencies contribute to responsible and helpful behavior, constructs defining Agreeableness (Caspi et al., 2005). Agreeableness has been consistently associated with Prosocial Behaviors during childhood (Graziano et al., 1997) and adolescence (Shiner, 2000). Our results regarding the negative associations of Agreeableness with Conduct Problems are in line with previous studies (Bollmer et al., 2006; Ehrler et al., 1999; Nigg et al., 2002). Some studies have also shown that Agreeableness in childhood could predict Aggressive behavior and Conduct symptoms in adolescence (Gleason et al., 2008; Shiner, 2000).

Openness to Experience

Openness to Experience is negatively and significantly associated with Hyperactivity/Inattention in 6-18-year-olds. Openness to Experience refers to the degree to which an individual actively seeks out new experiences and accepts and explores new situations (Pervin, 2002). Generally, individuals who score higher on Openness to Experience are more likely to experience higher psychological well-being (Jacobsson et al., 2021). There are some studies in adults showing a negative relationship between Openness to Experience and

Hyperactivity/Inattention (Blanken et al., 2021; Smith, & Martel, 2019), and some showing no associations (Nigg et al., 2002; Krieger et al., 2020). We only found one study on 8 -12-year-old children, showing that children with Hyperactivity/Inattention symptoms were consistently rated as having lower Openness to Experience (Casher, 2016). A possible explanation for this negative association is that Openness to Experience is generally related to higher performance of children in school and on cognitive tests and is also related to some elements of intellect (Nave et al., 2017).

General Conclusion

As of today, more than 6.6 million people have died from the coronavirus COVID-19 outbreak (Worldometers, 2022) and the global COVID-19 pandemic and the consequent economic recession and social restrictions have adversely affected the mental health of many people including children. Studies have reported various mental health problems among children and adolescents exposed to the COVID-19 pandemic, including anxiety, stress, depression, panic, irritation, impulsivity, loneliness, fatigue, and confusion (Hossain et al., 2021, Jiao et al., 2020, Theberath et al., 2022).

There are some studies showing the contribution of personality traits to well-being of adults during the pandemic (Shokrkon & Nicoladis, 2021; Lo et al., 2022; Odachi et al., 2022), however, our study seems to be the first study investigating this relationship in children. The results of our two studies showed that personality traits in children and adolescents contribute to their mental health status during the pandemic. In preschoolers, Neuroticism and Agreeableness predicted the most Difficulty subscales of SDQ, and in 6-18-year-old children, Extraversion predicted the most Difficulty subscales of SDQ. Also, Openness to Experience was the weakest predictor of mental health status in Canadian youth. Moreover, in preschoolers among the mental

health subscales, the Total Difficulty score and Hyperactivity/Inattention seem to have the strongest associations with personality traits and Peer Relationship Problems have the weakest associations. In 7–18-year-olds, Total Difficulty scores and Conduct Problems are most strongly associated with personality traits, and Hyperactivity/Inattention is least strongly associated with personality traits.

In comparing the results of preschoolers and 7–18-year-old children, we can observe different patterns. Specifically, in 7–18-year-old children, Extraversion is associated negatively with 3 Difficulty subscales of SDQ, however, this association is not observed in preschool children. A possible explanation could be related to the experience of schooling that older children had. For example, it could be that more Extraverted school-aged children found more friends at school and maintained their friendships during the pandemic using the social media, as a result, they were able to better maintain their positive mental health compared to more Extraverted preschoolers who did not have the experience of schooling.

There are some limitations to the current study that should be considered. Despite aiming for participants from all over Canada, the majority of our sample resided in Alberta (the province where the study was conducted). The second limitation of this study is that our data were collected only at one point in time during the second year of COVID-19, and since it was summer, people were more likely to spend time outdoors which could affect the results of our study. These limitations could limit the generalizability of our results.

Regardless of the mentioned limitations, our study has important implications, as it is necessary to understand how personality traits contribute to the mental health and well-being of children in order to provide them with mental health care that is tailored to their personality traits. The results of our study could help public health services provide mental health services that are personality-appropriate during and after this pandemic. More individually appropriate

child and adolescent mental health treatment at all phases of the pandemic is an unmet urgent need for long-term mental health impacts of children and adolescents.

Chapter 5

Discussion, Implications, and Recommendations

This chapter's purpose is to follow up with the results by summarizing the results, drawing conclusions based on those results, identifying limitations of the study, and providing implications, and recommendations for future research.

Summary of the Results

The COVID-19 pandemic and its consequences including social distancing measures, economic hardships, and disruptions to daily routines have profoundly impacted the lives of people around the world (Capaldi et al., 2021; Gan et al., 2022; Grover et al., 2020). Particularly, the mental health of individuals has been negatively impacted due to the pandemic, contributing to increased stress, anxiety, and depression around the world (Bao et al., 2019; WHO, 2020a,b). Certain populations, like children, may also be susceptible to psychological distress. Personality traits could play an important role in how individuals experience a crisis (a pandemic in this case), ultimately affecting their mental health.

Through this thesis, I sought to explore how personality traits (using FFM as a framework) impact the mental health of Canadian youth and adults during the COVID-19 pandemic. I found that Neuroticism and Extraversion personality traits were associated with the positive mental health of adults (Emotional, psychological, and social well-being) in the first year of the COVID-19 pandemic in the summer of 2020. We then replicated the results of our first study and found similar results a year later in the second year of the COVID-19 pandemic (summer of 2021). We also expanded our first study and found that personality traits of Agreeableness, Openness to Experience, and Conscientiousness were also positively and significantly related to the Emotional, psychological, and social well-being of adults in the second year of the pandemic.

Moreover, children and adolescents have also experienced a significant disruption of their routines due to school closures and restricted outdoor activities. Social distancing measures also significantly reduced students' interactions, which might have adverse effects on their mental health. Therefore, we explored the association of the Big Five personality traits with the mental health of 2-18-year-old children using SDQ measures. We found that Neuroticism was positively, while Agreeableness and Conscientiousness were negatively associated with the Total Difficulty score in preschoolers. In 6-18-year-old children, we found positive associations between Neuroticism and negative associations between Extraversion and Conscientiousness with the Total Difficulty score.

Hypothesis 1 and 2

I found support for hypothesis 1: Neuroticism negatively impacts the well-being of Canadian adults and Extraversion positively impacts it during the first year of the pandemic. In agreement with my hypothesis, the results showed that after controlling for demographic variables, personality traits of Neuroticism and Extraversion were significantly associated with the mental health of Canadians during the first year of the COVID-19 pandemic in 2020, with Extraversion positively related to emotional, psychological, and social well-being and Neuroticism negatively related to them.

I also found support for hypothesis 2: the personality trait of Neuroticism was negatively and Extraversion was positively associated with the well-being of Canadian adults in the second year of the COVID-19 pandemic (2021). A year later into the pandemic, in 2021, our results still showed that Extraversion was positively and Neuroticism was negatively associated with the mental health of Canadian adults.

Our results are in line with previous studies before (Albuquerque et al., 2012; Diener et al., 199; Kotov et al., 2010; Lahey et al., 2009; Otonari et al., 2012) and during the pandemic (Aschwanden et al., 2020; Modersitzki et al., 2020; ADD) showing that Neuroticism is negatively associated with mental health variables and Extraversion is positively associated with them.

Hypothesis 3

I found support for hypothesis 3: Agreeableness, Openness to Experience, and Conscientiousness are positively associated with the mental health of Canadians during the pandemic (after controlling for demographic variables and coping and response to COVID-19 stress variables).

Consistent with my hypothesis, the results showed that Agreeableness, Openness to Experience, and Conscientiousness were positively and significantly associated with the mental health of Canadians after controlling for demographics and Response to COVID-19 Stress variables. Our results are in line with studies before (Ahmad Marzuki, 2013; DeNeve & Cooper, 1998; Schmutte & Ryff, 1997; Steel et al., 2008) and after the pandemic (Anglim et al., 2020; Hölscher, 2021; Liu et al., 2022; Zhang et al., 2021) showing the positive association between Agreeableness, Openness to Experience, and Conscientiousness with the positive mental health of adults.

Hypothesis 4

I found partial support for hypothesis 4: Extraversion, Agreeableness, Openness to Experience, and Conscientiousness are negatively associated with Total Difficulty score, Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, and Peer Relationship Problems (using SDQ measure) and Neuroticism is positively related to them (after controlling

for demographic variables and coping and response to COVID-19 stress variables). Also, Extraversion, Agreeableness, Openness to Experience, and Conscientiousness are positively associated with Prosocial Behaviour and Neuroticism is negatively associated with it in preschoolers.

Our results showed that, as hypothesized, after controlling for demographics and Response to COVID-19 Stress, Neuroticism was positively and Agreeableness and Conscientiousness were negatively associated with the Total Difficulty score in preschoolers. Among the Big 5 personality traits, only Neuroticism was associated with Emotional symptoms, Neuroticism was positively and Agreeableness was negatively associated with Conduct Problems, Agreeableness, and Conscientiousness were negatively associated with Hyperactivity/Inattention, and Extraversion was positively associated with prosocial behavior. In contradiction to my hypothesis, none of the Big 5 personality traits were significantly associated with Peer Relationship Problems. Also, inconsistent with our hypothesis, Extraversion was positively associated with Hyperactivity/Inattention in preschoolers.

Hypothesis 5

I found partial support for hypothesis 5: Personality traits are associated with the mental health of 7–18-year-old children during the COVID-19 pandemic with Extraversion, Agreeableness, Openness to Experience, and Conscientiousness negatively associated with Total Difficulty score, Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, Peer Relationship Problems (using SDQ measure) and Neuroticism positively related to them (after controlling for demographic variables and coping and response to COVID-19 stress variables). Also, Extraversion, Agreeableness, Openness to Experience, and Conscientiousness are

positively associated with Prosocial Behaviour and Neuroticism is negatively associated with it in 7–18-year-old children.

Our results showed that, as hypothesized, after controlling for demographics and Response to COVID-19 Stress, the Big 5 personality traits except for Openness to Experience and Agreeableness associated with Total Difficulty score, Agreeableness, and Extraversion were negatively associated with Conduct Problems, Neuroticism, and Extraversion were positively and, Openness to Experience, and Conscientiousness were negatively associated with Hyperactivity/Inattention, Extraversion was negatively associated with Peer Relationship Problems and only Agreeableness was positively associated with Prosocial behavior. Inconsistent with my hypothesis, none of the Big 5 personality traits were significantly associated with Emotional Problems. Also, in contradiction to my hypothesis (similar to preschoolers' study), Extraversion was positively associated with Hyperactivity/Inattention in 6-18-year-old children.

Results from the current study support the existing research in the area of mental health and personality, which identified similar associations between mental health and personality in preschoolers and older children (Mulder & van Aken, 2014; Tackett, 2006) and adults (Kotov et al., 2010; Shi et al., 2018;). However, the current findings extend the prior research by investigating these associations during a global health crisis.

Hypothesis 6

I found partial support for hypothesis 6: The relationship between personality traits (Neuroticism, Extraversion, Agreeableness, Openness to Experience, and Conscientiousness) and SDQ variables (Total Difficulty score, Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, Peer Relationship Problems and Prosocial Behavior) in 7–18-year-old

children is not moderated by age (while controlling for demographic variables and coping and response to COVID-19 stress variables).

Our results showed that age did not moderate the relationship between personality traits and SDQ variables in 7–18-year-old children except for a significant interaction effect between age and Extraversion on Hyperactivity/Inattention and a significant but weak interaction effect between age and Conscientiousness on Total Difficulty Score.

Implications

The results of our study were consistent with previous research findings, which suggested that certain personality traits could be considered risk factors for mental health issues. The present study offers several implications for mental health research, prevention, and diagnosis, and also treatment of mental health issues in adults and children. Firstly, understanding the relationship between personality traits and mental health can assist in identifying individuals who might be at an increased risk of mental health issues and allow for earlier intervention. It could also assist with prevention efforts. By identifying individuals with certain personality types, it is possible to help them develop coping skills and skills they can use to manage their mental health better.

Secondly, since the results of our study showed that different individuals with different personality traits are experiencing the pandemic differently, thus, they may need mental health services that are more specifically tailored to their personality type. Our findings could help healthcare providers to develop more targeted interventions for prevention or treatment. Furthermore, an understanding of the relationship between personality traits and mental health may contribute to the improvement of treatment outcomes, since it is possible that individuals with certain personality traits respond better to certain types of therapies. Tailoring treatment

plans based on the specific needs of each patient could lead to potentially enhancing treatment effectiveness and lowering the likelihood of relapse.

Thirdly, by identifying personality traits that could put children at risk for mental health problems, healthcare professionals and caregivers can take steps to intervene early and prevent the development of more severe mental health problems and also tailor treatment plans for children with mental health issues. As well, our results could be helpful for teachers since they can play an essential role in detecting early signs of mental health problems in children. With an understanding of the link between personality traits and mental health, teachers can be alert to the possibility that children with certain personality traits may be at risk for mental health problems.

Lastly, the results of this study could have important implications for the long-term mental health outcomes of the COVID-19 pandemic since it is possible that the mental health effects of the pandemic persist long after the pandemic is over. Personality traits could play a role in individuals' long-term mental health outcomes, with some individuals experiencing more significant and persistent effects due to their personality traits. Our results could help mental health professionals to consider personality traits when developing treatment plans for individuals who are struggling with the long-term effects of the pandemic.

Limitations and future directions

There are some limitations to this research that need to be considered in interpreting the results of this study. Regarding the studies 1 and 2, despite our effort to recruit representative participants from a wide age range, occupations, and genders, the sample was not completely representative of the general population which may limit the generalizability of our findings.

Since around 41% of our participants were students in both studies with a mean age of 26.47 years for the first study and 24.02 years for the second study. Also, about 80% of our first study and 73% of our second study participants were female. Secondly, although the study was aimed at participants from across Canada, the majority of our sample resides in Alberta (where the study was conducted). The third limitation of our first and second studies is that the data of each study was gathered only at one point in time during the summer when people were more likely to spend time outside. During those times, outside gatherings were subject to fewer public health restrictions than inside gatherings, which could have contributed to better mental health during the summer months rather than during other seasons.

It is also important to note that the measurements used to assess personality and well-being in the first and second studies were the short version of the measurements. The short version of the tests was selected so that we could collect data from a large number of participants who completed the tests online. Approximately 75%- 79% of people who started answering the questions finished all the questions, and we believe many people would not have finished the questions if we had used the longer versions. Nevertheless, we ensured that our measurements had acceptable psychometric properties, for instance, MHC-SF had shown great internal consistency (> .80) and discriminant validity across different countries (Lamars et al., 2012; Keyes et al., 2008). Also, the IPIP Big-Five Factor Markers scale has been widely used and demonstrated good construct, criterion, convergent, and discriminant validity (Gow et al., 2005; Guenole & Chernyshenko, 2005; Lim & Ployhart, 2006). Regarding the third study on children and adolescents, the same concerns remain about the representativeness of the sample since most of our participants resided in Alberta. Also, the parent report questionnaires were mostly filled

out by mothers (80% of preschoolers and 58% of 6-18-year-old children) which again might limit the generalizability of our findings.

Another limitation of our study is that we had to use different questionnaires to measure mental health in children and adults which makes the comparison of the results challenging. In adults, we measured mental health by investigating their psychological, emotional, and social well-being using the Mental Health Continuum (MHC-SF). Meanwhile, in children and adolescents, we used the parent report of the Strengths and Difficulties Questionnaire (SDQ), a behavioral screening questionnaire widely used to assess children's mental health. However, both tests have shown good validity and reliability (Croft et al., 2015; Lamers et al., 2010). A reason we chose SDQ to measure mental health for our youth population was that SDQ parent report covers a wide range of emotional and behavioral problems, including hyperactivity, emotional symptoms, conduct problems, and peer problems which makes this test a comprehensive tool for assessing a child's overall well-being. Also, since we were using parent reports, we wanted to measure external symptoms (such as hyperactivity or conduct problems) that are more observable and measurable, thus allowing parents to more accurately report their child's behavior.

There is also a limitation to our study in that we used self-report measurements to assess individuals' personality traits and mental health. Even though this is still the standard practice, we acknowledge the possibility of bias, measurement error, and social desirability effects. Furthermore, our study used a cross-sectional sample, preventing us from establishing causal relations. However, the associations between personality traits and mental health were roughly

replicated in three samples (two adult samples and one youth sample), suggesting that these trends are consistent.

Despite these limitations, this study adds to the growing body of literature on the impact of COVID-19 on mental health and makes important contributions to a better understanding of the associations between the Big 5 personality traits and the mental health of children and adults in a time of global health crisis. Our results could also be a promising direction for future personality and mental health research. Future research should explore the longitudinal associations of personality traits and mental health outcomes during the pandemic and investigate the role of specific personality facets in mental health outcomes. Future research should also investigate personality and mental health in the context of the implementation of intervention and prevention programs aimed at mental health disorders, such as designing efficient mental health interventions more specific to each personality trait.

Conclusion

We used a sample of Canadian youth and adults to investigate the relationship between the big five personality traits and mental health during the COVID-19 pandemic since the pandemic and its consequences have had a significant impact on different aspects of people's lives including their mental health worldwide The results of our studies support previous research suggesting a relationship between personality traits and mental health in both children and adults before and during the pandemic.

This dissertation has provided evidence of a relationship between the Big Five personality traits and mental health during the COVID-19 pandemic suggesting that using a five-factor model of personality could help identify individuals at risk for mental health problems during a global pandemic. Our findings have considerable implications for mental health

professionals and policymakers who are working to support individuals during the pandemic and its aftermath. By identifying the influence of certain personality traits on mental health outcomes, our findings have significant implications for the development of targeted interventions that could assist individuals in coping with the pandemic and its associated stressors. In addition, the results of this study add to the existing literature on the impact of the COVID-19 pandemic and its consequences on mental health outcomes. This study emphasizes the importance of considering personality traits in exploring how individuals respond to adversity and the role of individual differences in determining mental health outcomes.

Since our results are consistent with pre-pandemic research suggesting a relationship between personality traits and mental health, it is possible that the pandemic did not fundamentally change the underlying psychological processes that link personality traits to mental health outcomes. For instance, individuals who score high in Neuroticism might be more prone to experiencing negative emotions when under stress or uncertain circumstances, whether or not those stressors are related to the pandemic. Furthermore, individuals who score high in Conscientiousness are probably more likely to engage in adaptive coping strategies when facing stress, regardless of the source of that stress. There is still a need for further research to better understand the complex interplay between personality traits, mental health , and the COVID-19 pandemic.

Overall, this dissertation contributes to the growing body of research on the impact of the COVID-19 pandemic on mental health and highlights the importance of considering personality traits in exploring mental health outcomes during and after the pandemic. By understanding the role that personality traits play in mental health outcomes during the pandemic, this study offers

valuable insights into the development of effective interventions to support individuals during and after this challenging time.

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