Self-Perceived Changes in Personality and Identity Due to the COVID-19 Pandemic

Grace Gatt[1], Angelo Marmolejo[1*], Sabryna Nguyen[1], Jessica Polsoni[1], Serena Singh[1]

Abstract

This present study seeks to understand how undergraduate students at McMaster University perceive changes to their personality and sense of identity as a result of the COVID-19 pandemic. Two main research questions are addressed in this paper: (1) how have the sociocultural influences of the pandemic changed undergraduate students' personality and identity, and (2) do these changes vary between different years of study? The study consisted of 58 participants, all undergraduate students studying at McMaster University. Participants completed a survey containing questions pertaining to their own perception of potential changes in personality, behaviour, and identity, as a result of being a university student during the COVID-19 pandemic. Results indicated significant changes in personality traits and identity, which can be attributed to the effects of the COVID-19 pandemic. There are many real-life applications and ways to implement the study's findings as our society navigates a new, post-COVID reality.

Introduction

The COVID-19 pandemic has significantly reshaped every sphere of life, from political and economic, to the social spheres. The changes that have occurred to the ways in which people socialize are of particular interest to the present study. For many undergraduate students, the COVID-19 pandemic began during transitional years of life best known for parties, travel, meeting new people, and the exploration of oneself. The focus of the present study is on the level of impact of the COVID-19 pandemic on the identities and personalities of McMaster undergraduate students. Notably, the pandemic has impacted students tremendously within the context of social settings and the way they view themselves. Researching this topic will allow for a better understanding of the McMaster community before and during the pandemic. These research findings will help us learn the ways in which identity and personality traits have been affected in undergraduate students, providing the ability to apply the findings to other individuals.

Personality can be defined for the purposes of this study using the big five personality traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism. These traits can be recognized by the acronym OCEAN and will be referred to this way

---

[1] Undergraduate Student, Honours Social Psychology Program, Faculty of Social Sciences, McMaster University, Hamilton, Ontario, Canada

[*] While I serve on the editorial board for the journal, there are no conflicts of interest in publication as all grading and final selection of papers eligible for publication were conducted at arms-length, with Dr. Clancy evaluating all final thesis papers and independently contacting the groups who were eligible for publication.

throughout this paper. Additionally, identity will be defined as one's sense of being in a social context and how they perceive themselves.

Two research questions are addressed in this study: (1) how have the sociocultural influences of the pandemic changed undergraduate students' personality and identity, and (2) do these changes vary between different years of study? These questions are based on anecdotal observations made by the group, as we have collectively noticed that the pandemic has shifted the personalities and identities in ourselves and others. Undergraduate students are currently developing their identity and personality in university. This sudden and dramatic change in the environment has caused major shifts in identity and personality formation (Hvalshagen et al., 2021). We believed first- and second-year undergraduate students may not have had the chance for personality maturation, or the opportunity to learn how to present themselves in this social environment (Klimstra et al., 2013). On the other hand, third- and fourth-year undergraduate students have already had the opportunity to develop and solidify their personalities and identities, and therefore would be less affected by the shift to an online social environment (Klimstra et al., 2013).

We hypothesized that upper-year undergraduate students would have minimal changes in their personality. Upper-year undergraduate students could potentially be more introverted and lower in neuroticism due to their secured identity and personality as a result of further established relationships and identity. Furthermore, we hypothesized that lower-year undergraduate students would be more extraverted and higher in neuroticism because they have not formed their social identity and social relationships at university. The changes in these traits are amplified because of the lack of transition from high school to university caused by the COVID-19 pandemic. Overall, our research questions are driven by the anecdotal observations we have made based on the shifts in undergraduate students' personalities and identities due to the overwhelming influence of the COVID-19 pandemic.

This paper consists of 6 subsequent sections. The theoretical frameworks section reviews the three most dominant theories in this study, which are social identity theory, social cognitive theory, and OCEAN personality traits. The literature review section is an overview of the pre-existing research in the topic area, how it relates to the research questions, and what is still lacking in the field. The methodology section reviews the methods that were utilized, ethical issues, challenges, timelines, and plans for data analysis. The results section provides a brief overview of the statistical findings, followed by the discussion, which contains an in-depth analysis of those findings. The conclusion will address some of the potential limitations and insights of this study, before summarizing our findings.

Theoretical Frameworks

Our research draws upon three main social psychological concepts, including social identity theory, social cognitive theory, and the big five personality trait model. Social identity theory argues that individuals develop a sense of self-concept within groups through status and intergroup relationships (Tajfel, 1978; Abrams & Hogg, 2010). Social cognitive theory posits that when an individual witnesses a social action, they become socialized and internalize these characteristics, using them as a template for future behaviour (Bandura, 1977, 1986, 2005). The OCEAN traits exemplify the five

fundamental dimensions of openness, conscientiousness, extraversion, agreeableness, and neuroticism that can describe any individual's personality (McCrae & John, 1992).

Social Identity Theory

Social identity theory was introduced in the early 1970s by Henri Tajfel and colleagues. They sought to understand thought processes and behaviours within intergroup relationships and social identity (Tajfel, 1978; Abrams & Hogg, 2010). Social identity theory is a person's understanding of who they are within the context of their status in a group. Membership within a group contributes to an individual's self-esteem and identity within both themselves and society (Abrams & Hogg, 2010). According to social identity theory, an individual's identity is shaped based on their status within a group and their group membership (Abrams & Hogg, 2010). Individuals will behave in a manner that coincides with their group identity, in order to maintain membership (Abrams & Hogg, 2010). Social identity theory has made significant contributions to the research of social psychology by providing insight on group behaviours and processes (Abrams & Hogg, 2010).

Tajfel (1978) and his colleagues conducted multiple minimal-group studies throughout history that contributed to social identity theory. One study was designed to allow for participants to be assigned to a random and meaningless group; within these groups participants would have to give points to either their own or other groups (Abrams & Hogg, 2010). Even though the group was random with various social backgrounds, it was discovered that the participants would give more points to the in-group members than the out-group members (Abrams & Hogg, 2010). This experiment determined that even being assigned to a random group can cause individuals to favour the membership and feel more connected to members in the group rather than outsiders (Abrams & Hogg, 2010).

Social identity theory correlates with our research because the COVID-19 pandemic has decreased the number of social interactions and activities that previously bound groups of people together. As a result of the COVID-19 pandemic, undergraduate students may have a decreased sense of membership within the university student identity. Having a sense of social identity through group membership can help individuals relate to others, but also understand themselves better. This is crucial during the COVID-19 pandemic, as many students are lacking the understanding of their identity that is typically learned through university (Abrams & Hogg, 2010). Overall, social identity theory is important when evaluating the changes in identity among students during the COVID-19 pandemic. Communication and interaction with others have been limited, thus resulting in a reduction of identity development.

Social Cognitive Theory

Social cognitive theory was proposed by Albert Bandura (1977), which focuses on the socio-cognitive development of an individual through the perceptions of their environment and how they adapt to the environment around them. This theory highlights how being exposed to characteristics or traits in the environment can contribute to individual socialization (Bandura, 1977). Socialization happens through observation where individuals are watching the actions, behaviours, and social characteristics of those around them and begin to internalize these traits into their character (Bandura, 1977). As

a result of internalizing observed characteristics, people become socialized, understand the social norms of their environment, and learn how to appropriately act (Bandura, 1977).

A prominent and historical example of social cognitive theory is the bobo doll experiment performed by Dr. Albert Bandura (1961). This experiment consisted of multiple children being placed within an observational role and required to watch two sets of adults that were either passive or aggressive toward the doll (Bandura et al., 1961). They were then asked to interact with the doll; two reactions were subsequently observed (Bandura et al., 1961). The first set of children who watched the passive interaction with the doll interacted passively with the doll through hugging, talking, and other non-aggressive behaviours (Bandura et al., 1961). The second set of children who watched the aggressive interaction with the doll acted aggressively with the doll, mirroring the way the adults previously interacted with it (Bandura et al., 1961). Therefore, Bandura et al. (1961) proposed that one learns how to interact with the environment and the people around them by observing behaviours and internalizing them as a form of socialization.

This theory correlates with the research questions of our study as it examines how the changes in the socio-cognitive environment, due to the COVID-19 pandemic, have affected the characteristics and actions of undergraduate students at McMaster University. Undergraduate students need to perceive and observe the actions of their peers in order to fit into the role of a university student in a university environment. The disruptions that resulted from the COVID-19 pandemic shifted many environments to online formats, including schools, which may have prevented students from being properly socialized into their role as university students. This is because students are not able to observe the characteristics of their peers or socialize.

OCEAN Personality Traits

Personality traits can be organized into five basic dimensions: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (McCrae & John, 1992). Openness includes creativity, intellectual interests, and needs for variety and experience (McCrae & John, 1992). Conscientiousness is described as a dimension that constrains impulsive behaviour and can mean an individual is diligent and thorough (McCrae & John, 1992). Extraversion can be identified with these components: adventurousness, ambition, energy, and positive affectivity (McCrae & John, 1992). Agreeableness involves characteristics such as altruism, emotional support, and nurturance (McCrae & John, 1992). Neuroticism describes the tendency to experience distress, self-consciousness, tension, frustration, and guilt (McCrae & John, 1992). For research, the five-factor model can be utilized in questionnaires with scales to measure constructs of personality (McCrae & John, 1992). The model provides a framework for the examination of individuals' personality. Graziano and Ward (1992) proposed that the big five analysis of personality should be extended into the study of personality development. Although their research focused on young adolescents, the same conclusions can be drawn regarding other transitional periods of life, specifically within learning institutions.

This present study utilizes the OCEAN traits to examine the changes between undergraduate students' self-perception of their personality before and after the COVID-19 pandemic. According to Graziano and Ward (1992), academic competence is highly correlated with high ratings of conscientiousness, while social competence is highly

correlated with high ratings of extraversion. This is relevant because of the changes sustained in undergraduate students' personalities as a result of the COVID-19 pandemic. These changes may have an impact on their performance in school and their social abilities. The five traits allow for analysis as to whether the pandemic has caused any variation in the self-perception of students' personality.

Literature Review

The literature review will examine research studies looking at topics such as measures of personality, pandemic effects on identity and personality, psychological disturbance and mental health decline, and the relationship between personality traits and adaptation. In addition to these topics, we will also review the limitations of the literature and how this literature may affect the research findings.

Measures of Personality

Kekäläinen et al. (2021) surveyed a cohort of Finnish women aged 47-55 about their health behaviours before and after emergency conditions, in relation to personality. This study made use of a modified short form of the Eysenck Personality Inventory (EPI), which included 9 items for extraversion and 10 for neuroticism. Depressive symptoms were also measured by using the Centre for Epidemiological Studies Depression Scale, which included 20 items about depressed mood (Kekäläinen et al., 2021). In general, Kekäläinen et al. (2021) found that depressive symptoms were the strongest at the beginning of the pandemic, before people had adjusted to the changes. They also found that lower rates of extraversion and higher rates of neuroticism were connected with depressive symptoms.

Adding to the theme of personality, Anglim & Horwood (2021) researched the impact of COVID-19 on subjective and psychological well-being from a sample of undergraduate psychology students in Melbourne, Australia during the second wave of the pandemic and pre-COVID. To analyze well-being, the researchers used three measures, the big five personality traits, SWB (life satisfaction, positive affect, and negative affect) and PWB (positive relations, autonomy, environmental mastery, personal growth, purpose in life, and self-acceptance) (Anglim & Horwood, 2021). Adolescents were experiencing lower levels of well-being during the pandemic, and furthermore, the effect of personality on well-being was slightly weaker during the pandemic. Anglim and Horwood (2021) found that personality had an impact on socio-economic factors, but socio-economic factors did not have a direct impact on personality.

These studies provide relevant data on personality and well-being pre-COVID and post-COVID, which allows for further insight on changes to personality given the social context of the pandemic. While our study does not directly examine mental health or well-being, the findings of these studies allow for a deeper understanding of these issues, and the factors that impact them.

Pandemic Effects on Identity and Personality

Godinic et al. (2020) make use of social identity theory to infer the effects that the COVID-19 pandemic may have had on personality. Groups provide people with social identity; group membership is especially important during times of stress. Identity can be referred to as self-definition as part of a wider community, and is therefore directly linked

with poverty, social exclusion, and marginalization. Uncertain times, such as a pandemic, have a significant impact on people's identities. Therefore, if one considers themselves a healthy, extraverted worker to a specific organization, anything that threatens this membership will also threaten identity (Godinic et al., 2020). The more rigidly an individual identifies with their social or work roles, the more identity disturbance they will experience. Identity disturbance can be defined by the DSM-5 as having an "unstable self-image or sense of self with a lack of clear aims and internal preferences." Cognitive dissonance may even occur if the way an individual perceives their self-image is contested by the uncertainty brought about by the pandemic (Godinic et al., 2020).

Increased isolation and distancing mandates have caused individuals to feel more alone than ever, especially for those who are extraverted (Anglim & Horwood, 2021). Anglim & Horwood (2021) describe extraverts as feeling energized by social interactions and enjoying being around people, and as a result, the lockdown has decreased their sense of identity. Not being able to have these interactions strips an extravert of their identity because they are not able to socialize, learn, or feel the same as pre-COVID. Folk et al. (2020) examined the effects of the pandemic on extraverts and concluded that there was a correlation between extraversion and decreased energy during the lockdowns. Throughout the pandemic, individuals have been restricted when it comes to the activities and recreations that once helped shape their identity with all the emergency health guidelines.

Kekäläinen et al. (2021) found that in Finnish women aged 47-55, higher scores of extraversion and lower scores of neuroticism were connected with lower levels of depression, and increases in leisure time and physical activity. Those who presented higher neuroticism scores reported eating less frequently, and higher extraversion scores were also associated with a change in eating behaviour (either healthier or unhealthier). Those with higher extraversion scores were more inclined to eat regularly, decrease alcohol consumption, and report healthy eating habit changes. Interestingly, extraversion was positively correlated with higher consumption of vegetables, and lower rates of emotional eating (Kekäläinen et al., 2021).

Furthermore, Hvalshagen et al. (2021) investigated the personality and identity conflicts experienced by undergraduate students attending a private post-secondary institution in the United States during the shift from in-person to online studies due to the COVID-19 pandemic. The study found that online learning deteriorated their student identity due to the absence of support for this role in their home environment and the numerous competing identities they faced at home (Hvalshagen et al., 2021). This prevented them from engaging in their normal identities at home, such as child, sibling, or wage earner (Hvalshagen et al., 2021). The study found that this identity conflict resulted in a lack of motivation to do schoolwork and fulfill any of their identities as well as they normally would, which leads to poor psychological well-being and cognitive dissonance within the student (Hvalshagen et al., 2021).

Additionally, Sutin et al. (2020) examined the effects of the COVID-19 pandemic on the big five personality traits and psychological well-being, particularly during the critical period of the pandemic. Overall, they discovered that over a six-week period, neuroticism decreased, particularly surrounding sub-traits of anxiety and depression, yet conscientiousness did not change (Sutin et al., 2020). Hence, they suggest that traits in

neuroticism, especially anxiety, caused people to direct their focus more to the pandemic instead of themselves (Sutin et al., 2020).

Klimstra et al. (2013) researched personality traits and interpersonal identity of individuals in late adolescence and early adulthood. According to their research, individuals between the approximate ages of 16 and 22 are in life stages characterized by changes in personality and changes towards the establishment of identity (Klimstra et al., 2013). In young adulthood, neuroticism levels tend to decrease while there are simultaneous increases in levels of agreeableness and conscientiousness (Klimstra et al., 2013). In these periods of life, individuals are expected to invest in their social roles, and because of the push towards establishing these roles, young adults are driven towards personality maturation and identity formation (Klimstra et al., 2013).

These sources directly link identity and personality with the COVID-19 pandemic. These findings have helped us in the process of analyzing our own data and coming to conclusions about our findings. Personality and identity go hand in hand with each other, as exhibited by these studies.

Psychological Disturbance/Mental Health Decline

According to Godinic et al. (2020), isolation and social distancing can cause significant deterioration to well-being and psychological state. More specifically, uncertainty can have detrimental effects on mental health, such as distress and mental exhaustion. Well-being is impacted by both prior experiences and personality traits, so when faced with a stressful/traumatic experience, people may even experience mood and anxiety disorders. Economic and job uncertainty may have a particularly significant impact on mental health and psychological well-being, as many have experienced this throughout the COVID-19 pandemic. On top of providing monetary benefits, a job also provides non-monetary benefits, such as organization, status, sense of purpose, organizational participation, medical care, insurance, and feelings of accomplishment. This uncertainty surrounding income and job security can lead to depression and isolation (Godinic et al., 2020). The pandemic further impacted and affected those with pre-existing mental illness, with an emphasis on those with personality disorders. Those individuals may experience states of dissociation linked with constant self-criticism when met with stress and may have already been experiencing identity disturbances prior to the pandemic (Godinic et al., 2020).

Anglim & Horwood (2021) discovered that the worldwide COVID-19 outbreak has impacted the routine, mental wellness, and experiences of individuals by the various lockdowns and restrictions put in place. In Melbourne, Australia, after being in lockdown for 4 months, talk of a second wave and lockdown decreased young adults' sense of wellbeing further than pre-COVID rates. These decreases were seen in positive emotions, such as being excited, interested, and enthusiastic, and an increase in negative emotions, including anxiety and sadness (Anglim & Horwood, 2021).

According to Folk et al. (2020), being unable to connect in society due to the COVID-19 pandemic has caused many individuals to feel disconnected in society, resulting in decreased mental health. It was discovered that college students reported larger declines in life satisfaction, which also contributed to their feelings of psychological distress (Folk et al., 2020). Since introverts already have fewer social interactions, the effects of the pandemic decreased the mental health of extraverts more (Folk et al., 2020).

Kekäläinen et al. (2021) found an increase in depressive symptoms in Finnish women aged 47-55 from their pre-pandemic questionnaire to their post-emergency conditions questionnaire. Lower extraversion and higher neuroticism were associated with a higher level of depressive symptoms (Kekäläinen, et al. 2021). Similarly, Muro et al. (2021) investigated the changes in mental illnesses, such as anxiety and depression, among a sample of 155 Spanish women who completed a COVID-19 quarantine. The results of this study found that higher rates of neuroticism, higher baseline depression rates, lower likelihood of following a daily routine, and lower fitness levels during quarantines or lockdowns predicted higher levels of depression and depression caseness (Muro et al., 2021). High levels of anxiety and anxiety caseness resulted from high neuroticism, longer durations of stay-at-home orders, and greater initial symptoms of anxiety at baseline (Muro et al., 2021).

Furthermore, Zhang et al. (2021) researched the correlation between personality traits and their effects on mental health as a consequence of the COVID-19 pandemic. The authors studied the experiences of medical students at Wenzhou Medical University, examining their mental health in terms of generalized anxiety disorder, depression, and their sleep health status (Zhang et al., 2021). The big five personality traits, openness, conscientiousness, agreeableness, neuroticism, and extraversion were also examined in order to determine how they were affected by the pandemic (Zhang et al., 2021). They were concerned with the implications and consequences of what the pandemic could do to personality, physicality, and psychological well-being. The pandemic has produced a high-stress environment in terms of health and mortality due to the fear of being infected with COVID-19 (Zhang et al., 2021). To add, they were also interested in how personality traits can potentially make individuals more susceptible toward the stressful conditions of the pandemic, or if one's personality made them more resilient to the stress of the pandemic (Zhang et al., 2021). Overall, they discovered that there was a correlation between personality and the risks involved in developing a psychological disorder during the COVID-19 pandemic (Zhang et al., 2021). People who were high in neuroticism were more likely to present anxiety, depression, and disordered sleep as a result of the pandemic. However, people who were high in conscientiousness, extraversion and openness, were less likely to present symptoms of depression, anxiety and sleep disorders (Zhang et al., 2021).

Although our study does not address mental decline, these studies provide relevant perspectives on the correlation between mental health, personality, and identity. These findings can help us draw conclusions on our own results about the potential effects on undergraduate students' mental well-being.

Personality and Adaptation

Muro et al. (2021) explored the effect that personality, the adoption of new routines, and physical activity have on mood changes after five weeks of a COVID-19 lockdown among a sample of 155 Spanish women who had not contracted COVID-19. This study ascertained that characteristics of increased neuroticism traits and high baseline levels of anxiety or depression led individuals to struggle more with adapting to the abrupt disruption of their lifestyle, leading to them experiencing worse moods throughout and after lockdowns (Muro et al., 2021). However, the ability to establish new routines and regular participation in physical activities act as a protective factor and can boost

psychological well-being during lockdowns (Muro et al., 2021). The individual's personality allows them to be flexible enough to adapt their lifestyle to the unfamiliar conditions of a lockdown while still maintaining their identity. This results in less disruption to their life if they are able to establish and stick to a new routine (Muro et al., 2021). Additionally, the consistency of physical activity is known to boost mood and well-being, which can be especially helpful in such distressing times; having a routine allows for some consistency and structure in unpredictable times (Muro et al., 2021). Building upon this, Kekäläinen et al. (2021) found that, although there was an increase in depressive symptoms, the increase was most prominent during the beginning of emergency conditions. The participants then adapted to the circumstances causing a slight decrease in depressive symptoms (Kekäläinen et al., 2021).

Rettew et al.'s (2020) study examined how personality traits can be correlated with adaptation to the COVID-19 pandemic, particularly surrounding their health and well-being. They noticed how some people were able to maintain their well-being during the pandemic while others' well-being declined (Rettew et al., 2020). Based on a personality assessment and daily rating of mood, the authors discovered that while well-being decreased, so did their stress (Rettew et al., 2020). In addition, they found that within one's personality traits, they were able to adapt to the COVID-19 pandemic (Rettew et al. 2020). If neuroticism was lower, their well-being was greater, and if extraversion, agreeableness, and conscientiousness were higher, their well-being would be greatly maintained and adapted to the pandemic (Rettew et al., 2020). Overall, this paper provides insight on personality traits that can be a sign of whether they will adapt better to situations like the COVID-19 pandemic (Rettew et al., 2020).

While our study did not directly assess adaptation to the circumstances brought about by the COVID-19 pandemic, these resources provide us with the ability to infer about the role of personality on adaptation. This allows for further insight on how different populations reacted to the circumstances, and how they adapted to the significant changes brought about by the COVID-19 pandemic.

Literature Limitations

Godinic et al. (2020) determined specific ties between work identity and personality changes, leading to mental health decline in the face of economic uncertainty. A limitation to this study is that it is uncertain whether this would be a common experience across the globe. In a capitalistic society, work identity and job security would have a great deal of impact on personality and mental health because the society values those things highly. However, this may not be the case in cultures where having a strong work identity is not valued as highly, and where other types of identities may be emphasized. Therefore, more research should be done about the effects of identity, personality, mental health, and economic uncertainty across multiple cultures.

Kekäläinen et al. (2021) noted very interesting findings throughout their study, specifically because their analysis was longitudinal, however, there are still several limitations. To begin, the cohort used in this study were all from a very specific age group: 51 to 59 years of age. Furthermore, the cohort was only women who had higher education and a healthy lifestyle when compared to the rest of the population of Finland. This makes it highly unlikely that the results of the study would be representative of the public due to lack of gender, age, education, and lifestyle diversity. The authors also mention that

pandemic-related restrictions differed during the time of the study between countries, as well as within countries. Therefore, the results were very specific to central Finland at the time. This study is a great baseline for research to be conducted in the future about personality traits and changes in health behaviour due to the COVID-19 pandemic. Future researchers could benefit from using it as an example to conduct studies with a more diverse sample population.

One of the main limitations of the Rettew et al. (2020) study is that the population was of a small sample size of university students, particularly only from one university, so extrapolating the results is difficult for the general population. In addition to that, it is possible that the COVID-19 pandemic was not the main cause of one's faulty or improved adaptation, as there could have been a possible extraneous variable (Rettew et al., 2020). The final limitation is that these results of the study were conducted using self-report scales, which of course can have some subjective bias and a lack of objectivity to the results, leading to some validity and reliability errors (Rettew et al., 2020).

One of the main limitations of the Sutin et al. (2020) study is that there was some selection bias, especially surrounding the neuroticism trait, which in turn may have affected the results. In addition, the measure of the changes in one's personality traits were measured during the beginning or acute period of the pandemic, creating questions regarding the impact of the initial stages of the pandemic affected these changes or whether it was the later stages (Sutin et al., 2020). Another limitation presents itself through the definition of the difference between quarantine and isolation, and whether there was a difference in the effects to one's personality traits (Sutin et al., 2020). One of the final limitations is that there could have been an additional, unknown variable or situation that could have produced these results (Sutin et al., 2020).

The Zhang et al. (2021) study was cross-sectional with a sample size of only medical students at Wenzhou Medical University, which may cause some difficulties extrapolating the data to the general population. In addition to this limitation, the results and data were collected through self-report measures, leading to the possibility of objectivity not being fully present (Zhang et al., 2021).

Anglim & Horwood (2021) provided significant contributions to the understanding of well-being during the COVID-19 pandemic, however, there are still limitations with their research. One limitation is that this study was a between-subjects design (Anglim & Horwood, 2021). As a result, there is the possibility that extraneous variables may have influenced the study's results. Another limitation of this study was within the administration of tests as some of the surveys were optional, and therefore the results may be lacking validity (Anglim & Horwood, 2021).

As with most research studies, the Muro et al. (2021) study investigating the psychological impact of COVID-19 lockdowns on adult women has limitations to keep in mind. This study was conducted on 155 Spanish women, making it harder to generalize the findings to others due to the relatively small sample size and the specific characteristics of the participants that are not representative of the greater population (Muro et al., 2021). Additionally, the education, employment, and socioeconomic status of all the participants were relatively the same, again preventing the sample from being representative of an entire society and therefore imposing problems with generalizability (Muro et al., 2021). Additionally, the personality assessment used for this study is a condensed version of the big five personality inventory, which can limit the reliability of

personality assessments as it does not go into depth for each of the categories (Muro et al., 2021). This results in a vague understanding of the individual's personality rather than an in-depth analysis, which would be more accurate and reliable.

The Hvalshagen et al. (2021) article has similar limitations with generalizability of the study findings, as this study only focused on a very specific population. This specific group of participants is not representative of all undergraduate students' experiences with the transition to online learning due to the COVID-19 lockdowns. Additionally, it is important to note that the United States' approach to the pandemic and their lockdown rules are different than those of Canada's, and therefore there is an inconsistency in students' experiences because they will vary from country to country, making it difficult to generalize the findings to all undergraduate students (Hvalshagen et al., 2021).

Similar to the articles above, Folk et al. (2020) focuses only on college students and therefore has risks of generalizability. Another significant limitation includes the lack of a measure of well-being prior to the pandemic (Folk et al., 2020). The personality survey before the pandemic left out an extraversion measure, therefore changes within this measure were unable to be evaluated (Folk et al., 2020).

The study by Klimstra et al. (2013) focuses primarily on personality maturation and identity formation from establishing social roles in the context of intimate relationships, so the information may not apply in the context of the COVID-19 pandemic. Furthermore, the study relied solely on self-reports, and therefore holds the risk of bias (Klimstra et al., 2013). Another limitation of this study is that the majority of participants were women, so the findings may not be applicable to the greater population (Klimstra et al., 2013).

While there are limitations to all sources, the literature still gives relevant and reliable insight into personality, identity, adaptation, mental health, and the COVID-19 pandemic. All studies have limitations, as does ours, however these limitations are crucial in understanding next steps for future research and allowing us to know where our boundaries are.

Methodology

This research was approved by the McMaster Research Ethics Board (MREB#: 0327).

Participants

58 undergraduate students (n = 58) at McMaster University who are 18 years of age or older were asked to complete an anonymous online survey. All types of undergraduates were welcome to take the survey, regardless of being a domestic or international student.

Sampling method/design

The method that was used to collect research on our topic was a cross-sectional, quantitative methodological approach, utilizing an online anonymous survey hosted on the MREB approved platform, LimeSurvey. The sampling technique used was snowball sampling, a subtype of convenience sampling. At all stages, data collected and analyzed was anonymous and unidentifiable. Participants were able to withdraw from the survey at any point before the submission of their responses. They were informed of their right to withdraw from the project at the beginning of the survey. The survey consisted of 42 questions and responses, recorded on a Likert scale. Participants specified their level of agreement for each statement on a five-point scale.

Each OCEAN trait had three defining sub-traits, in which participants were asked to rank how much they related to the statement. Openness sub-traits include   engagement in new activities, adventurousness, and creativity. Conscientiousness sub-traits include self-perception of being thoughtful and goal oriented, self-regulated, and being a good planner. Extraversion sub-traits include how much one enjoys socializing through events, social media, and social gatherings. Agreeableness sub-traits include how often one feels they exhibit or feel trust in others, selflessness, and kindness to others. Neuroticism sub-traits include a sense of worry, nervousness, and management of stress.

Recruitment

Each participant (undergraduate students, regardless of year) was recruited through physical flyers in person at McMaster University buildings. They were also recruited through digital means, including digital flyers through Facebook MSU student-run groups, MSU student-run clubs' social media pages, and program societies' social media pages (i.e., Facebook and Instagram). Every group member emailed their designated student-run groups as outlined in the ethics protocol. Physical flyers went through the McMaster Student Union, MSU printing services, and MSU Underground for approval and permission was granted to be posted on the McMaster campus. Additionally, MSU clubs were contacted for permission to post our digital recruitment poster on their social media feed.

Data analysis

Following the research proposal and ethics approval, data collection for this study began on November 15th, 2021, and ceased on February 18th, 2022. Analysis of data collected was done on Jamovi, a software approved by McMaster University. Codes were created for both questions and responses, which were later converted in Jamovi when calculating statistical data. The research group completed this data analysis together. All data was kept confidential, and data deletion occurred on April 30th, 2022.

Demographics

The participant demographics include the age, gender, current year of study, year of study when the COVID-19 pandemic hit, and participants' faculties. 12 participants (20.7%) were 18 years of age, 16 (27.6%) were 19 years of age, 8 (13.8%) were 20 years of age, 15 (25.9%) were 21 years of age, 2 (3.4%) were 22 years of age, 2 (3.4%) were 23 years of age, 1 (1.7%) was 24 years of age, 1 (1.7%) was 28 years of age, and a final 1 (1.7%) was 37 years of age. 8 (13.8%) participants identified as male, 48 (82.8%) identified as female, 1 (1.7%) identified as agender, and 1 (1.7%) identified as non-binary. The years of study include 14 (24.1%) first-years, 17 (29.3%) second-years, 5 (8.6%) third-years, 19 (32.8%) fourth-years, 2 (3.4%) fifth-years, and 1 (1.7%) participant did not specify. When the pandemic hit, 9 (15.5%) were first-years, 18 (31%) were second-years, 4 (6.9%) were third-years, 12 (20.7%) were in grade eleven, and 15 (25.9%) were in grade twelve. 11 (18.9%) participants were in the faculty of science, 3 (5.2%) were in the faculty of business, 4 (6.9%) were in the faculty of engineering, 4 (6.9%) were in the faculty of health sciences, 14 (24.1%) were in the faculty of humanities, 20 (34.5%) were in the faculty of social sciences, and 2 (3.4%) of participants did not specify.

Challenges & Risks

A challenge that occurred while collecting and analyzing data was that the study did not receive the desired number of responses. While the risk of graduate and medical students taking the survey was low, it occurred once during data collection, despite our intentions to study undergraduates and advertising only to this population.

Some survey questions posed the risk of potentially making participants uncomfortable or triggered as they were asked to reflect upon their experiences prior to and during the COVID-19 pandemic. However, the psychological risks to participants were no greater than those in everyday life. There were social risks to the survey, such as if a participant chose to take it in a public space, another person could have seen their responses, which could potentially be embarrassing or distressing for the participant. With that being said, the participants who engaged in this survey provided their implied consent by reading over the preamble and selecting a button indicating their consent to proceed with the survey.

The survey was edited to minimize the possibility of participants becoming uncomfortable or triggered. Furthermore, participants were informed that they could exit the survey at any point should they become uncomfortable or distressed. Participants were advised to complete the survey in a private setting, as to maintain their confidentiality and anonymity. The research posed no risks greater than those in everyday life.

Outline

The results section includes 13 figures presenting our statistical findings. Within the discussion section, the topics will be discussed in the following order: changes in personality, followed by changes in identity, variances in years of study, university, and personal experience. Finally, we will be discussing the validity of our hypotheses and research questions.

Results

This section summarizes and emphasizes significant findings, drawing upon a number of tables and graphs that depict the results from the survey questions. The main findings include higher neuroticism scores presently than prior to the COVID-19 pandemic, and lower openness, extraversion, and conscientiousness scores at the present time. Participants overwhelmingly indicated that their behaviour and personality has changed as a result of the COVID-19 pandemic, and that their university experience has been disrupted.

Figure 1 shows the paired sample t-test for participant's OCEAN personality traits before (measure A) and during (measure B) the pandemic. In this table, statistical significance is shown if measure B is greater than measure A, demonstrating that these traits have increased since the onset of the pandemic. On the right side of the table, the p-value indicates statistical significance. For two neuroticism traits, "worry" and "nervousness," $p = < 0.001$, indicating that participants score higher in trait neuroticism now than they did before the pandemic, and that lower neuroticism is related to current pandemic conditions.

Figure 1
Measures of Personality – All Years (Measure A < Measure B)

Paired Samples T-Test

			statistic	df	p
A - New Activity	B - New Activities	Student's t	4.65	57.0	1.000
A - Adventure	B - Adventure	Student's t	6.14	57.0	1.000
A - Creativity	B - Creativity	Student's t	4.13	57.0	1.000
A - Thoughtful/Goal-Oriented	B - Thoughtful/Goal-Oriented	Student's t	1.93	56.0	0.971
A - Self-Regulated	B - Self-Regulated	Student's t	1.55	57.0	0.937
A - Planner	B - Planner	Student's t	1.17	57.0	0.876
A - Socializing Events	B - Social Events	Student's t	5.96	57.0	1.000
A - Social Media	B - Social Media	Student's t	1.66	56.0	0.949
A - Social Gathering	B - Social Gatherings	Student's t	5.33	56.0	1.000
A - Trust	B - Trust	Student's t	6.17	57.0	1.000
A - Selflessness	B - Selflessness	Student's t	1.37	57.0	0.912
A - Kindness	B - Kindness	Student's t	2.38	57.0	0.990
A - Worry	B - Worry	Student's t	−8.60	57.0	<.001
A - Nervous	B - Nervous	Student's t	−7.30	57.0	<.001
A - Stress	B - Stress	Student's t	3.40	57.0	0.999

Note. $H_a \mu_{\text{Measure 1 - Measure 2}} < 0$

Figure 2 shows the paired sample t-test for participants' OCEAN personality traits before (measure A) and during (measure B). In this table, statistical significance is calculated if measure A is greater than measure B, demonstrating that these traits have decreased since the onset of the pandemic. On the right side of the table, the p-value indicates statistical significance. For all openness traits, two of three extraversion traits, and one neuroticism trait, $p = < 0.001$. Furthermore, for the conscientiousness trait, "thoughtful/goal oriented," $p = 0.029$, and for the agreeableness trait, "kindness," $p = 0.01$. This indicates that participants scored higher before the pandemic than they do now, and that these findings are significant. For the extraversion trait, "socializing through social media," $p = 0.051$, meaning that there was a drastic change, however it is not statistically significant.

Figure 2
Measures of Personality – All Years (Measure A > Measure B)

Paired Samples T-Test

			statistic	df	p
A - New Activity	B - New Activities	Student's t	4.65	57.0	<.001
A - Adventure	B - Adventure	Student's t	6.14	57.0	<.001
A - Creativity	B - Creativity	Student's t	4.13	57.0	<.001
A - Thoughtful/Goal-Oriented	B - Thoughtful/Goal-Oriented	Student's t	1.93	56.0	0.029
A - Self-Regulated	B - Self-Regulated	Student's t	1.55	57.0	0.063
A - Planner	B - Planner	Student's t	1.17	57.0	0.124
A - Socializing Events	B - Social Events	Student's t	5.96	57.0	<.001
A - Social Media	B - Social Media	Student's t	1.66	56.0	0.051
A - Social Gathering	B - Social Gatherings	Student's t	5.33	56.0	<.001
A - Trust	B - Trust	Student's t	6.17	57.0	<.001
A - Selflessness	B - Selflessness	Student's t	1.37	57.0	0.088
A - Kindness	B - Kindness	Student's t	2.38	57.0	0.010
A - Worry	B - Worry	Student's t	−8.60	57.0	1.000
A - Nervous	B - Nervous	Student's t	−7.30	57.0	1.000
A - Stress	B - Stress	Student's t	3.40	57.0	<.001

Note. $H_a \mu_{\text{Measure 1 - Measure 2}} > 0$

Figure 3 shows the paired sample t-test for lower year's OCEAN personality traits before (measure A) and during (measure B). In this table, statistical significance is calculated if measure B is greater than measure A, demonstrating that these traits have decreased since the onset of the pandemic. On the right side of the table, the p-value indicates statistical significance. For two neuroticism traits, "worry" and "nervousness," *p* = < 0.001, indicating that participants score higher in trait neuroticism now than they did before the pandemic, and that lower neuroticism is related to current pandemic conditions.

Figure 3
Measures of Personality – Lower Years (Measure A < Measure B)

Paired Samples T-Test

			statistic	df	p
A - New Activity	B - New Activities	Student's t	2.456	30.0	0.990
A - Adventure	B - Adventure	Student's t	4.321	30.0	1.000
A - Creativity	B - Creativity	Student's t	3.455	30.0	0.999
A - Thoughtful/Goal-Oriented	B - Thoughtful/Goal-Oriented	Student's t	3.024	29.0	0.997
A - Self-Regulated	B - Self-Regulated	Student's t	2.123	30.0	0.979
A - Planner	B - Planner	Student's t	2.244	30.0	0.984
A - Socializing Events	B - Social Events	Student's t	3.941	30.0	1.000
A - Social Media	B - Social Media	Student's t	0.536	29.0	0.702
A - Social Gathering	B - Social Gatherings	Student's t	3.713	29.0	1.000
A - Trust	B - Trust	Student's t	5.017	30.0	1.000
A - Selflessness	B - Selflessness	Student's t	2.188	30.0	0.982
A - Kindness	B - Kindness	Student's t	2.468	30.0	0.990
A - Worry	B - Worry	Student's t	−5.997	30.0	<.001
A - Nervous	B - Nervous	Student's t	−5.887	30.0	<.001
A - Stress	B - Stress	Student's t	3.049	30.0	0.998

Note. H_a $\mu_{\text{Measure 1 - Measure 2}} < 0$

Figure 4 shows the paired sample t-test for lower year's OCEAN personality traits before (measure A) and during (measure B). In this table, statistical significance is calculated if measure A is greater than measure B, demonstrating that these traits have decreased since the onset of the pandemic. On the right side of the table, the p-value indicates statistical significance. For two openness traits, two extraversion traits, and one agreeableness trait, *p* = < 0.001. Furthermore, for all the conscientiousness traits, one of the openness traits, and two of the agreeableness traits, *p* = < 0.05. This indicates that participants scored higher before the pandemic than they do now, and that these findings are significant.

Figure 4

Measures of Personality – Lower Years (Measure A > Measure B)

Paired Samples T-Test

			statistic	df	p
A - New Activity	B - New Activities	Student's t	2.456	30.0	0.010
A - Adventure	B - Adventure	Student's t	4.321	30.0	<.001
A - Creativity	B - Creativity	Student's t	3.455	30.0	<.001
A - Thoughtful/Goal-Oriented	B - Thoughtful/Goal-Oriented	Student's t	3.024	29.0	0.003
A - Self-Regulated	B - Self-Regulated	Student's t	2.123	30.0	0.021
A - Planner	B - Planner	Student's t	2.244	30.0	0.016
A - Socializing Events	B - Social Events	Student's t	3.941	30.0	<.001
A - Social Media	B - Social Media	Student's t	0.536	29.0	0.298
A - Social Gathering	B - Social Gatherings	Student's t	3.713	29.0	<.001
A - Trust	B - Trust	Student's t	5.017	30.0	<.001
A - Selflessness	B - Selflessness	Student's t	2.188	30.0	0.018
A - Kindness	B - Kindness	Student's t	2.468	30.0	0.010
A - Worry	B - Worry	Student's t	−5.997	30.0	1.000
A - Nervous	B - Nervous	Student's t	−5.887	30.0	1.000
A - Stress	B - Stress	Student's t	3.049	30.0	0.002

Note. $H_a \mu_{Measure\ 1 - Measure\ 2} > 0$

Figure 5 shows the paired sample t-test for upper year's OCEAN personality traits before (measure A) and during (measure B). In this table, statistical significance is calculated if measure B is greater than measure A, demonstrating that these traits have decreased since the onset of the pandemic. On the right side of the table, the p-value indicates statistical significance. For two neuroticism traits, "worry" and "nervousness," *p* = < 0.001, indicating that participants score higher in trait neuroticism now than they did before the pandemic, indicating that neuroticism is related to current pandemic conditions.

Figure 5

Measures of Personality – Upper Years (Measure A < Measure B)

Paired Samples T-Test

			statistic	df	p
A - New Activity	B - New Activities	Student's t	5.181	26.0	1.000
A - Adventure	B - Adventure	Student's t	4.444	26.0	1.000
A - Creativity	B - Creativity	Student's t	2.371	26.0	0.987
A - Thoughtful/Goal-Oriented	B - Thoughtful/Goal-Oriented	Student's t	−0.610	26.0	0.274
A - Self-Regulated	B - Self-Regulated	Student's t	0.000	26.0	0.500
A - Planner	B - Planner	Student's t	−0.901	26.0	0.188
A - Socializing Events	B - Social Events	Student's t	4.647	26.0	1.000
A - Social Media	B - Social Media	Student's t	2.101	26.0	0.977
A - Social Gathering	B - Social Gatherings	Student's t	3.792	26.0	1.000
A - Trust	B - Trust	Student's t	3.633	26.0	0.999
A - Selflessness	B - Selflessness	Student's t	−0.941	26.0	0.178
A - Kindness	B - Kindness	Student's t	0.570	26.0	0.713
A - Worry	B - Worry	Student's t	−6.310	26.0	<.001
A - Nervous	B - Nervous	Student's t	−4.400	26.0	<.001
A - Stress	B - Stress	Student's t	1.615	26.0	0.941

Note. $H_a \mu_{Measure\ 1 - Measure\ 2} < 0$

Figure 6 shows the paired sample t-test for upper year's OCEAN personality traits before (measure A) and during (measure B). In this table, statistical significance is calculated if measure A is greater than measure B, demonstrating that these traits have decreased since the onset of the pandemic. On the right side of the table, the p-value indicates statistical significance. For two of three openness traits, two of three extraversion traits, and one agreeableness trait, $p = < 0.001$. Furthermore, for the conscientiousness trait, "creativity," $p = 0.013$, and for the extraversion trait, "socializing through social media," $p = 0.023$. This indicates that participants scored higher before the pandemic than they do now, and that these findings are significant. For the neuroticism trait, "stress," $p = 0.059$, meaning that there was a drastic change, however it is not statistically significant.

Figure 6
Measures of Personality – Upper Years (Measure A > Measure B)

Paired Samples T-Test

			statistic	df	p
A - New Activity	B - New Activities	Student's t	5.181	26.0	<.001
A - Adventure	B - Adventure	Student's t	4.444	26.0	<.001
A - Creativity	B - Creativity	Student's t	2.371	26.0	0.013
A - Thoughtful/Goal-Oriented	B - Thoughtful/Goal-Oriented	Student's t	−0.610	26.0	0.726
A - Self-Regulated	B - Self-Regulated	Student's t	0.000	26.0	0.500
A - Planner	B - Planner	Student's t	−0.901	26.0	0.812
A - Socializing Events	B - Social Events	Student's t	4.647	26.0	<.001
A - Social Media	B - Social Media	Student's t	2.101	26.0	0.023
A - Social Gathering	B - Social Gatherings	Student's t	3.792	26.0	<.001
A - Trust	B - Trust	Student's t	3.633	26.0	<.001
A - Selflessness	B - Selflessness	Student's t	−0.941	26.0	0.822
A - Kindness	B - Kindness	Student's t	0.570	26.0	0.287
A - Worry	B - Worry	Student's t	−6.310	26.0	1.000
A - Nervous	B - Nervous	Student's t	−4.400	26.0	1.000
A - Stress	B - Stress	Student's t	1.615	26.0	0.059

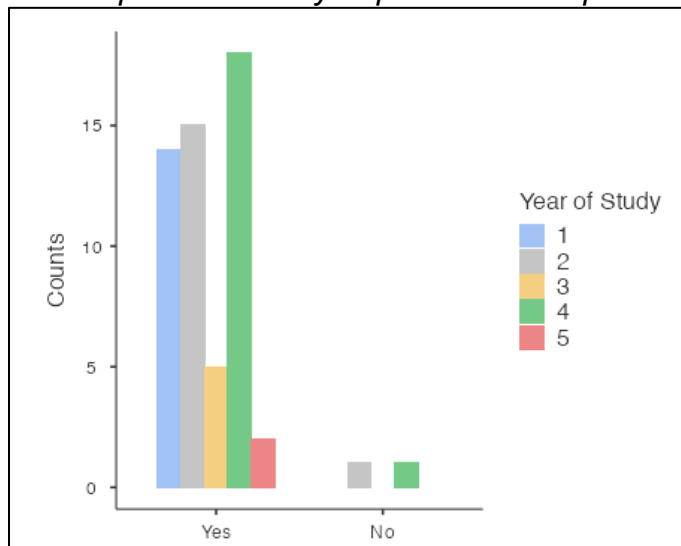*Note.* H_a μ Measure 1 - Measure 2 > 0

In Figure 7, participants were asked whether they believe their behaviour changed due to the pandemic. The bar graph displays the distribution of each participant's year and the counts of which indicated yes or no. This graph indicates that there is no difference in responses between upper and lower years. 93% of participants said yes, their behaviour has changed due to the COVID-19 pandemic, and 7% said no.

Figure 7
Bar Graph – Changes in Behaviour due to Pandemic
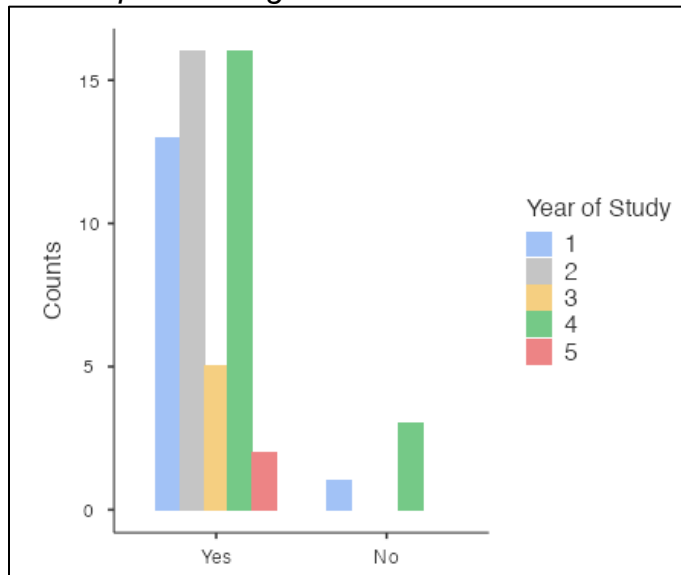
In Figure 8, participants were asked whether they believe their university experience was disrupted due to the pandemic. The bar graph displays the distribution of each participant's year and the counts of which indicated yes or no. 96.5% of participants said yes, their university experience was disturbed due to the COVID-19 pandemic, and 3.5% said no.

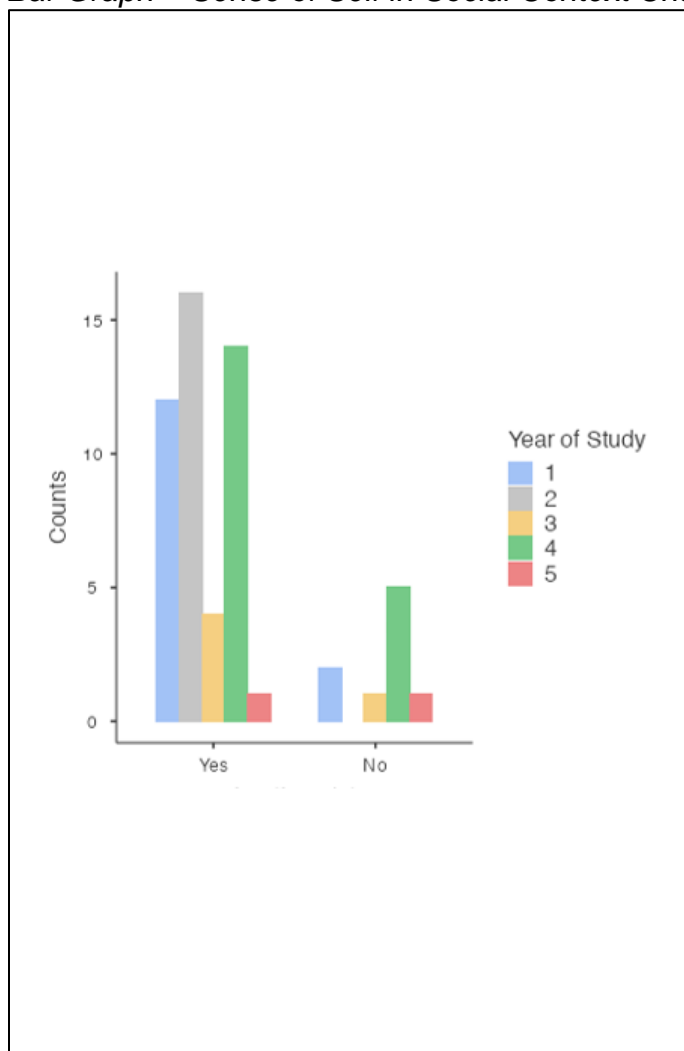**Figure 8**
Bar Graph – University Experience Disrupted due to Pandemic

In Figure 9, participants were asked whether they believe their sense of self in a social context changed due to the pandemic. The bar graph displays the distribution of each participant's year and the counts of which indicated yes or no. This graph indicates that there is some variation in response between upper and lower years. 84.2% of participants

said yes, their sense of self in a social context has changed due to the COVID-19 pandemic, and 15.8% said no. First- and second-years scored the highest in feeling like their sense of self within a social context has changed. 100% of second-years, followed by 85.7% of first-years said yes. While upper years were slightly less, 80% of third-years, 73.7% of fourth-years, and 50% of fifth-years believed the COVID-19 pandemic has changed their sense of self in a social context.
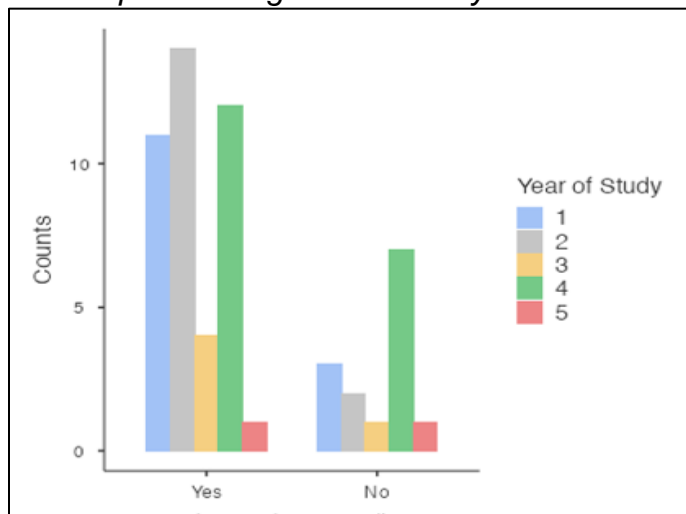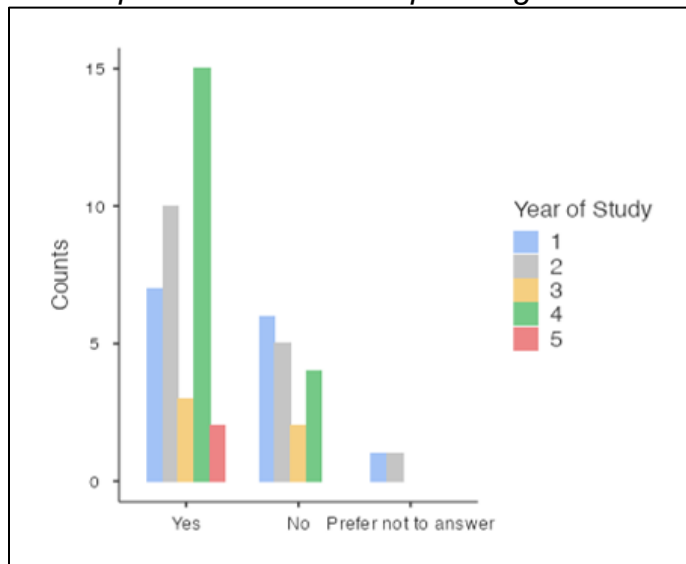
Figure 9
Bar Graph – Sense of Self in Social Context Changed Due to Pandemic

In Figure 10, participants were asked whether they believe their personality changed due to the pandemic. The bar graph displays the distribution of each participant's year and the counts of which indicated yes or no. This graph indicates that there is some variation in response between all years. 75.4% of participants said yes, their personality has changed due to the COVID-19 pandemic, and 24.6% said no. Of those who indicated no change, 36.8% of fourth-years indicated that their personality did not change as opposed to 21.4% of first-years. Furthermore, of those who indicated that their personality did change, there was a relatively even distribution in between lower- and upper-years.

Figure 10
Bar Graph – Changed Personality due to Pandemic

In Figure 11, participants were asked whether they are comfortable expressing themselves in a social setting. This was defined to participants as wearing the clothes and makeup they want, speaking to and socializing with who they want. The bar graph displays the distribution of each participant's year and the counts of which indicated yes or no. This graph indicates that there is significant variation in response between all years, and a small number of individuals preferred not to answer this question. 66.7% of participants said their comfort of expressing themselves in a social context has changed due to the COVID-19 pandemic, 29.8% said no, and 3.5% preferred not to answer. 78.9% of fourth-years indicated that they are comfortable expressing themselves in a social context, whereas 50% of first-years indicated that they are comfortable expressing themselves in a social context.
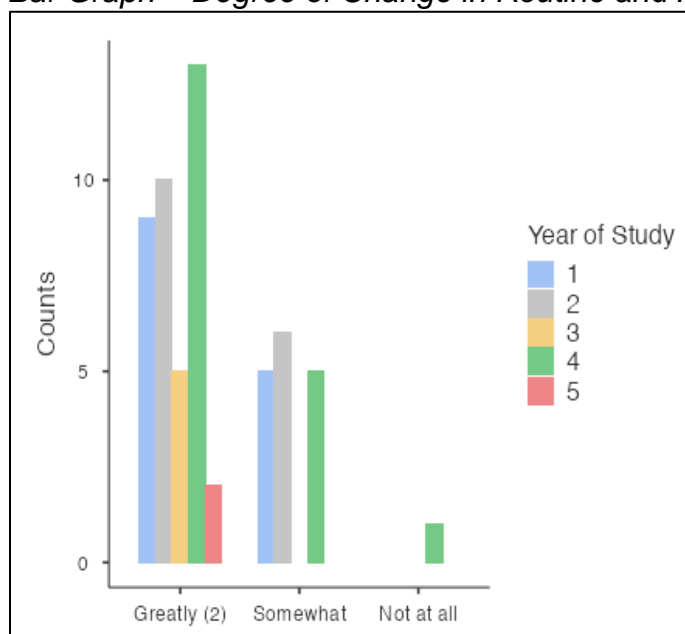
Figure 11
Bar Graph – Comfortable Expressing Self in Social Setting

In Figure 12, participants were asked about the degree to which they believe their routines and habits changed as a result of the pandemic. The bar graph displays the distribution of each participant's year and the counts of which indicate different degrees of change. 68.4% of participants indicated that their routines and habits were greatly impacted by the pandemic, 29.8% indicated that their routines and habits were somewhat impacted, and 1.8% indicated that their routines and habits were not impacted at all. This graph indicates that there is significant variation in response between upper- and lower-years. Of those who indicated their routines and habits changed greatly, the breakdown is as follows: 64.3% of first-years, 62.5% of second-years, 100% of third-years, 68.4% of fourth-years, and 100% of fifth-years. The breakdown for those who indicated that their routines and habits somewhat changed is as follows: 35.7% of first-years, 37.5% of second-years, and 26.3% of fourth-years. Only 5.3% of fourth-years indicated that there was no change in their routines and habits.

Figure 12
*Bar Graph – Degree of Change in Routine and Habits*

In Figure 13, participants were asked about the degree to which they believe their interests and past-times changed due to the pandemic. The bar graph displays the distribution of each participant's year and the counts of which indicate different degrees of change. 55.2% of participants indicated that their interests and past-times were greatly impacted by the pandemic, 39.7% indicated that their interests and past-times were somewhat impacted, and 5.2% indicated that their interests and past-times were not impacted at all. This graph indicates that there is significant variation in response between all years. The breakdown of variance for those who indicated their interests and past-times greatly changed is as follows: 71.4% of first-years, 52.9% of second-years, 40% of third-years, and 57.9% of fourth-years. For those who indicated their interests and past-times somewhat changed, the breakdown is as follows: 28.6% of first-years, 35.3% of

second-years, 60% of third-years, 42.1% of fourth-years, and 100% of fifth-years. Only 11.8% of second-years indicated that their interests and past-times did not change at all.

Figure 13
Bar Graph – Degree of Change in Interests and Past-times
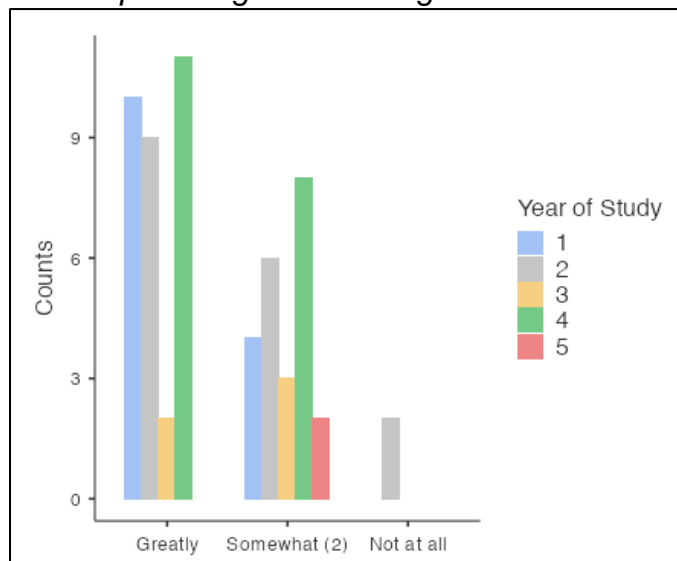
Discussion
Research Questions and Hypotheses
This study sought to explore the sociocultural influences of the pandemic on the personality and identity of McMaster undergraduate students. We hypothesized that there would be a significant change in students' perception of their identities and personality as a direct result of the pandemic. Furthermore, we were curious if there would be any variation in the years of study. We hypothesized that first- and second-years would be higher in extraversion and neuroticism, and that third- and fourth-years would be lower in extraversion and neuroticism.

Changes in Identity
Our findings suggest that undergraduate students sustained a great amount of change to their identities and behaviour as a result of the COVID-19 pandemic. Students were asked whether they felt that their university experience was disrupted due to the pandemic, and as displayed in Figure 8, 96.5% of students indicated that their experience was disrupted. This points to the validity of our hypothesis that the pandemic was a major factor in the changes displayed in Figure 7, and Figures 9, 11, 12, and 13. In Figure 7, students were asked if they thought their behaviours had changed due to the pandemic. 93% of students indicated that their behaviours had changed, which reflect personality and identity. Kekäläinen et al. (2021) found that higher rates of extraversion and lower rates of neuroticism are associated with higher rates of leisure time and physical activity. While the present study did not ask participants about specific behaviours, the Kekäläinen et al. (2021) article shows that there is a significant link between behaviours and personality traits.

Furthermore, in Figure 12, 68.4% of students indicated that their routines and habits changed a great amount as a result of the pandemic, and in Figure 13, 55.2% of students indicated that their interests and past-times changed greatly as a result of the pandemic. These factors are heavily linked with identity as supported by previous research. Godinic et al. (2020) found that individuals will feel more identity disturbance in conjunction with more rigidity in self-identification of social or professional roles. Furthermore, Anglim & Horwood (2021) found that social isolation has negatively impacted extraverts, stripping them of their social identities. The findings of the current study's ratings of the personality traits conscientiousness and extraversion coincide with these two previous studies, as all show evident changes in identities.

In Figure 9, 84.2% of students believe that their sense of self in a social context changed due to the pandemic. 73.7% of fourth-years indicated that their sense of self in a social context did not change, compared with 85.7% of first-years, which is consistent with our hypotheses. Furthermore, in Figure 11, 78.9% of fourth-years indicated that they are comfortable expressing themselves in a social context, through wearing the clothes and makeup they want, and speaking with whom they want. 50% of first-years indicated that they are comfortable expressing themselves in a social context, which is also consistent with our hypothesis that first-years would have a less developed sense of identity.

Hvalshagen et al. (2021) found that the transition from in-person to online learning deteriorated their student identity. Those effects are evident in this study as it proves the longevity of the changes in their identity. Anglim and Horwood (2021) found that COVID-19 impacted routine, which consequently impacted individuals' mental health. Through this, we can infer that the undergraduate students in our study also had changes in their mental health as a result of the COVID-19 pandemic. Routines, interests and pastimes of participants in the current study were impacted due to the pandemic, similarly to these past studies.

Changes in Personality

In terms of personality, students were asked to self-report if they believe their personality has changed due to the pandemic. In Figure 10, 75.4% of students indicated that their personality had changed. Consistent with our findings, 36.8% of fourth-years indicated that their personality did not change, as opposed to 21.4% of first-years. This suggests that fourth-year students have a more established personality.

As seen in Figure 2, the p-value for all openness traits was < 0.001 when measure A is greater than measure B, meaning that people were higher in openness prior to the pandemic, concurring with the hypothesis. For lower and upper years, this trend persists, where two of three openness traits had a p-value of < 0.001 prior to the pandemic. Since openness decreased throughout the pandemic, it could indicate that individuals have suffered from a type of fatigue or an unwillingness to communicate with others. This may be predicated upon the fear of contracting COVID-19 or engaging in events that could risk their well-being in these times.

The conscientiousness sub-trait "thoughtful and goal-oriented" had a p-value of 0.029 when measure A is greater than measure B, as displayed in Figure 2. This indicates that this trait was higher prior to the pandemic. For lower years, all of the consciousness traits had a p-value of < 0.05, as displayed in Figure 4. This indicates that they scored higher

in conscientiousness prior to the pandemic. As displayed in Figure 6, the conscientiousness trait "creativity" had a p-value of 0.013, indicating that upper years were more creative prior to the pandemic. This decrease in creativity could be due to the lack of change in the environment given the isolation, individuals could not develop new ideas due to the lack of an interactive environment.

In Figure 2, two out three extraversion traits had a p-value of < 0.001. This trend continues for lower- and upper-years (see Figures 4 and 6), indicating that they were more extraverted before the pandemic. This finding partially confirms our hypotheses, as we thought that upper years would be lower in extraversion post-pandemic. However, we also hypothesized that lower years would be higher in extraversion post-pandemic as a result of having missed out on the opportunity to socialize with others, discover themselves, and establish an identity during their first year in university. Therefore, this invalidates our hypothesis.

In Figure 2, the agreeableness trait "kindness" had a p-value of 0.010. In Figure 4, the agreeableness trait "trust" had a p-value of < 0.01, and the remaining agreeableness traits were < 0.05, indicating that lower years were more agreeable prior to the pandemic. In Figure 6, the agreeableness trait "trust" had a p-value of < 0.01, indicating that upper years were more trusting prior to the pandemic. It is possible that these changes are due to the uncertain nature of the pandemic, regarding laws and rules, as well as fears of contracting COVID-19.

In Figure 1, when measure B is greater than measure A, the neuroticism traits "worry" and "nervousness" have a p-value of < 0.01, indicating that participants are higher in neuroticism now than before the pandemic. Stress has a p-value of < 0.01, as displayed in Figure 1, indicating that undergraduate students are less stressed now than they were before the pandemic. The same trend continues in lower years (see Figures 3 and 4) and upper years. However, in Figure 6, stress has a p-value of 0.059, meaning that there was a change for upper years, but it was not statistically significant. This finding contradicts our hypothesis because we believed that all students would be higher in all neuroticism traits post-pandemic. However, there could be multiple factors influencing lower stress levels in undergraduate students since the onset of the pandemic.

Sutin et al. (2020) found that neuroticism decreased over a 6-week period, however conscientiousness did not change. Our results contradict these findings, in which both conscientiousness and neuroticism did increase. Interestingly, only two out of three sub-traits of neuroticism increased, with the sub-trait of stress decreasing over the course of the pandemic. Klimstra et al. (2013) found that in young adults, levels of neuroticism decrease while levels of agreeableness and conscientiousness increase due to the expectation of young adults to invest in their social roles. This may indicate that undergraduate students in our study may have difficulty socializing moving forward out of the pandemic, as participants reported sub-traits of neuroticism increasing and sub-traits of agreeableness staying the same.

Changes in personality can have significant impacts on mental health. Although the current study did not directly focus on mental health, past literature can be used to presume the relationship between our results and mental health. Kekäläinen et al. (2021) found that lower rates of extraversion and higher rates of neuroticism were associated with increased depressive symptoms. Furthermore, Muro et al. (2021) discovered that high levels of neuroticism were linked with high rates of anxiety. Undergraduate students

in our study indicated lower extraversion and higher neuroticism as a result of the pandemic. It could be deduced that undergraduates in the current study may also be dealing with higher rates of depression and anxiety. High levels of conscientiousness, extraversion, and openness were protective against the stress of the pandemic, whereas high levels of neuroticism were more likely to lead to increased stress (Zhang et al., 2021).

Furthermore, a study by Rettew et al. (2020) found that participants' well-being would be higher, and they were more able to adapt to the stress of the pandemic if neuroticism was lower and extraversion, agreeableness, and conscientiousness were higher. The majority of undergraduate students reported lower levels of conscientiousness, extraversion, and openness as well as higher levels of neuroticism. It would be easy to assume that undergraduate students would be more stressed, however, upon examination of data, we found that stress levels decreased over the course of the pandemic (see Figure 1). The investigation of well-being is beyond the scope of this study, however, we can deduce that undergraduate students may have lower levels of well-being moving out of the COVID-19 pandemic due to OCEAN trait reports.

Variances in Years of Study and Experience

Regarding the differences in year of study and experience, we have discovered a lack of significant difference between the years of study, particularly among those in first and fourth year. Initially, we believed that first-year students would be more likely to be extraverted and high in neuroticism due to the lack of social identity within a university setting and their desire to establish one. Furthermore, we believed that fourth-year students would be more likely to be lower in neuroticism and extraversion, as they have established their social identity given their exposure to a normal first year university experience. However, this was not the case, as fourth-years displayed similar levels to first-years in extraversion and neuroticism (see Figures 3 to 6). This may have occurred due to a failure to consider how the pandemic may not have been so impactful in certain periods of life. First-year students are initially transitioning to university, thus resulting in high levels of neuroticism and extraversion; this can also be applied to fourth-year students, as they are transitioning out of university. Undergraduate students are attempting to re-establish their social identities throughout the life transitions of being a university student. This means that while the COVID-19 pandemic may have been an influential factor on personality and identity changes, it is possible that other life factors were equally or more influential.

Conclusion

Limitations

As with all research, there are several limitations involved with this study. To begin, the sample size was a small number of 58 participants, and therefore internal validity may be weak. Since the sample population is specific to McMaster undergraduate students, it will remain unknown without further research if the findings could be replicated. However, we believe that these findings could be generalized to undergraduate students at other universities and other individuals at different life stages who do not attend university. Furthermore, authenticity is questioned especially when reviewing anonymous online surveys. There is potential for people to answer dishonestly, or to answer in a way they believe we want to see, which can skew the findings. When conducting quantitative

research, such as our survey, there could be important details that are potentially missed. This is especially true considering that the survey consists primarily of closed-ended questions, offering participants no chance to elaborate or offer their own unique input. Although the COVID-19 pandemic has been tumultuous, the uncertainty still exists whether these changes could have happened regardless, as it is normal for social identity and personality to evolve over time. This applies particularly during major transitional periods of life. In addition, it should be noted that correlation does not equal causation, given that there are other extraneous factors that could have caused these traits in identity and personality to change. For example, the present study did not investigate the relationship these changes have in correlation with mental illness, due to the institution's ethical guidelines. Furthermore, the difference in stress levels (see Figures 1 to 6) before and after the pandemic could have been due to certain issues not addressed, such as socioeconomic issues, transportation, or accessibility of academics. Therefore, we cannot conclude if the responses of the participants in this study have been influenced by these factors.

Significant Insights

This research project can provide significant insight into how university students' personalities were affected by the COVID-19 pandemic. Knowing how a worldwide pandemic impacted individuals' ongoing perceptions of themselves can help us, as social scientists, understand what cognitive processes and behavioural attributes are most affected by these external circumstances. Being able to understand the correlation between the COVID-19 pandemic and changes to personality or identity can help provide insight as to why there is a surge in issues on mental health and well-being at a global scale. Additionally, investigating the findings of our study has the potential to provide a deeper understanding for the participants, who have recently been experiencing changes to their lifestyles, behaviours, thoughts, and personality. This allows participants to gain a comprehensive understanding of their identity transformation and the cognitive dissonance they may be experiencing.

This study can provide many practical applications, such as interventions, policies, and new social supports and services. Therefore, should another extraordinary circumstance occur, society will have better insight on how to cope and enact the proper support for individuals. For example, accessibility in higher education could be improved with hybridized education. Telemedicine has been helpful throughout the pandemic in alleviating some of the barriers in access to services. It should be further improved upon and promoted so that more individuals may access and utilize it. University students experience significant pressure while balancing school and work, without the added stress of contracting COVID-19. A general policy should be implemented in workplace environments and educational institutions to provide additional opportunities for leaves of absence specific to COVID-19.

These findings also provide a foundation for future researchers to expand upon the topic. It may be crucial to determine if the changes in personality and identity that have resulted due to the COVID-19 pandemic would be maintained or return to baseline levels. It would be beneficial to set further research in motion, as society has now begun its return to normal and COVID-19 restrictions are being phased out.

Summary and Concluding Thoughts

The COVID-19 pandemic has caused sudden and drastic changes to the way people are able to live their lives. These changes have been predominantly disruptive to social aspects of life, which are crucial to the self-discovery that occurs in the first few years of university as a result of the newfound freedom and independence. This research explored the impact that the COVID-19 pandemic continues to have on the personality and identity of undergraduate students at McMaster University. The research findings suggest that it is crucial to understand the implications of disrupted transitional periods of life because of the impact on personality and identity development. Without a strong sense of personality and identity, cognitive dissonance, mental turmoil, and disruption to life may occur. It is the duty of researchers and social scientists to identify ways for individuals to mitigate these effects and maintain a stable self-concept. Therefore, our findings contribute to the growing body of literature on both avenues of research: the study of personality and identity development and the impacts of the COVID-19 pandemic.

References

Abrams, D., & Hogg, M. A. (2010). Social identity and self-categorization. *The SAGE Handbook of Prejudice, Stereotyping and Discrimination*, 179–193. https://doi.org/10.4135/9781446200919.n11

Anglim, J., & Horwood, S. (2021). Effect of the COVID-19 pandemic and big five personality on subjective and psychological well-being. *Social Psychological and Personality Scienc*e, 12(8), 1527–1537. https://doi.org/10.1177/1948550620983047

Bandura, A. J. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, N.J: Prentice-Hall.

Bandura, A. (2005). The evolution of social cognitive theory. *Great minds in management*, 9-35.

Bandura, A., Ross, D., & Ross, S. A. (1961). Transmission of aggression through imitation of aggressive models. *The Journal of Abnormal and Social Psychology,* 63(3), 575-582. https://doi-org.libaccess.lib.mcmaster.ca/10.1037/h0045925

Folk, D., Okabe-Miyamoto, K., Dunn, E., Sonja Lyubomirsky, S. (2020). Did social connection decline during the first wave of COVID-19?: The role of extraversion. *Collabra: Psychology*, 6(1): 37. https://doi.org/10.1525/collabra.365

Godinic, D., Obrenovic, B., & Khudaykulov, A. (2020). Effects of economic uncertainty on mental health in the COVID-19 pandemic context: social identity disturbance, job uncertainty and psychological well-being model. *Int. J. Innov. Econ. Dev*, 6(1), 61-74.

Graziano, W. G., & Ward, D. (1992). Probing the big five in adolescence: Personality and adjustment during a developmental transition. *Journal of Personality*, *60*(2), 425–439. https://doi.org/10.1111/j.1467-6494.1992.tb00979.x

Hvalshagen, M., Nittala, L., Sullivan, N., Raman, R., & Zolbanin, H. M. (2021). When worlds collide: Framing students' challenges with stay-at-home learning during COVID-19 through the lens of conflicting role identities. *Communications of the Association for Information Systems*, *48*, 227–235. https://doi-org.libaccess.lib.mcmaster.ca/10.17705/1CAIS.04829

Kekäläinen, T., Hietavala, E.-M., Hakamäki, M., Sipilä, S., Laakkonen, E. K., & Kokko, K. (2021). Personality traits and changes in health behaviors and depressive symptoms during the COVID-19 pandemic: A longitudinal analysis from pre-

pandemic to onset and end of the initial emergency conditions in Finland. *International Journal of Environmental Research and Public Health*, *18*(15), 7732. MDPI AG. http://dx.doi.org/10.3390/ijerph18157732

Klimstra, T., Luyckx, K., Branje, S., Teppers, E., Goossens, L., & Meeus, W. (2013). Personality traits, interpersonal identity, and relationship stability: Longitudinal linkages in late adolescence and young adulthood. *Journal of Youth & Adolescence*, 42(11), 1661–1673. https://doi-org.libaccess.lib.mcmaster.ca/10.1007/s10964-012-9862-8

Lingyu Zhang, Jiaying Wu, Chuying Deng, Meimei Zhang, Changjin Li, & Qi Wang. (2021). Mental health and personality implications among medical students during the outbreak of the COVID-19 pandemic. *Social Behavior & Personality: An International Journal*, *49*(8), 1–11. http://libaccess.mcmaster.ca.libaccess.lib.mcmaster.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=sph&AN=151809788&site=eds-live&scope=site

McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality*, *60*(2), 175–215. https://doi.org/10.1111/j.1467-6494.1992.tb00970.x

Muro, A., Feliu-Soler, A., & Castellà, J. (2021). Psychological impact of COVID-19 lockdowns among adult women: the predictive role of individual differences and lockdown duration. *Women & Health*, *61*(7), 668–679. https://doi-org.libaccess.lib.mcmaster.ca/10.1080/03630242.2021.1954133

Rettew, D. C., McGinnis, E. W., Copeland, W., Nardone, H. Y., Bai, Y., Rettew, J., Devadenam, V., & Hudziak, J. J. (2021). Personality trait predictors of adjustment during the COVID pandemic among college students. *PLoS ONE*, *16*(3), 1–11. https://doi-org.libaccess.lib.mcmaster.ca/10.1371/journal.pone.0248895

Sutin, A. R., Luchetti, M., Aschwanden, D., Lee, J. H., Sesker, A. A., Strickhouser, J. E., Stephan, Y., & Terracciano, A. (2020). Change in five-factor model personality traits during the acute phase of the coronavirus pandemic. *PLoS ONE*, *14*(8), 1–13. https://doi-org.libaccess.lib.mcmaster.ca/10.1371/journal.pone.0237056

Tajfel, H. (1978). *Differentiation between social groups: Studies in the social psychology of intergroup relations*. European Association of Experimental Social Psychology by Academic Press