

# The Impacts of Belongingness on The Well-Being of International Students in Canada During Covid-19: The Mediating Role of Perceived Stress and Acculturation Stress

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## Abstract

**Background/Aim:** The COVID-19 pandemic has had a significant negative impact globally, causing prolonged stress, isolation, and health and mental health challenges. International students in Canada were particularly vulnerable due to being far from home, facing language barriers, lacking support networks, and dealing with academic and financial stress, which led to increased mental health issues and reduced well-being for this group. This current study examined the effects of belongingness on well-being of international students in Canada during pandemic COVID-19. The aim of this quantitative study was to: (a) examine the relationships among belonging, perceived stress, acculturation stress, and well-being. (b) explore the potential moderating effect of perceived stress and acculturation stress on the relationship between feelings of belonging and well-being.

**Materials and Methods:** 186 international students were recruited in the universities in Canada to complete the online informed consent form, and the online questionnaires, including the World Health Organization Five, the Satisfaction with Life Scale, the General Belongingness Scale, the UCLA Loneliness Scale, the Perceived Stress Scale, the Acculturative Stress Scale and the demographic information. Participants took about 40 minutes and were given either one bonus mark or \$10 Amazon gift card.

**Results:** Correlational analyses revealed that well-being was positively correlated with belonging, with acceptance belonging, and significantly negatively associated with rejection belonging, loneliness, perceived stress, and acculturation stress. Belonging and acceptance belonging positively predicted well-being. A mediational model indicated that perceived and acculturation stress mediate the link between belongingness and psychological well-being.

**Conclusions:** The findings revealed that belonging is a positive predictor to well-being and highlight the need for prevention efforts to help international students reduce loneliness, perceived stress and acculturation stress, and increase acceptance belonging which could improve life satisfaction and well-being of international students in Canada during COVID-19.

**Keywords:** COVID-19; belongingness; perceived stress; acculturation stress; wellbeing; life satisfaction

## Introduction

### Mental Health on International Students under COVID-19 in Canada

The horrible epidemic pandemic COVID-19 represent a prolonged stress sequence and generated great negative impact on economic, sociocultural,

educational system, health and mental health, employment and work in each country during the imposed lockdown [1, 2, 3, 4, 5]. College and university students experience mental health problems under COVID-19 pandemic [5]. One review of prevalence studies suggested that depression is evident in about 3 in 10 students [6]. One recent investigation found across seven countries, including Canada, that the prevalence in the total sample was 61.3% for high stress while depression was found in 40.3%, and generalized anxiety symptoms was found in 30% of the university students during COVID-19 pandemic [7]. This horrible epidemic of coronavirus has been a serious challenge for every adult, and children, including the vulnerable population of international students under pandemic outbreak in Canada. International students in this emergency pandemic situation experienced a variety of challenges and adversities [8, 9], they had to deal with many unprecedented changes and risks which severely impact their mental health and psychological well-being such as unsafe situations hampered their studies, interrupted their daily routines and hobbies to protect their psychological well-being [10, 8, 9, 11]. Especially in this emergency pandemic situation, they had to deal with many unprecedented changes and risks which severely impact their mental health and psychological well-being such as unsafe situations hampered their studies, travel restrictions, vaccination protocols, schools were shut down, rapid transition to remote working, moving to the online studies, struggles to keep social distancing with shared dwellings, expensive cost for the flights, financial pressures, loss their part-time jobs, interrupted their daily routines, and hobbies to protect their psychological well-being [12].

### **Belongingness and Well-being of International Students in Canada during COVID-19**

Belongingness is recognized as a protective factor linked with positive feelings and psychological well-being [13, 14, 15]. It refers to a human emotional need to affiliate with and be accepted by group members, fostering deep connections with others, places or experiences [16]. This sense of belonging results in various benefits, including feelings of safety, love, improved coping abilities, and enhanced health [17, 18, 19, 21] developed a measurement for belongingness. There are two factors: acceptance/inclusion and rejection/exclusion of belongingness. [20] also claimed that dual psychological processes, based on approach and avoidance, are relied upon to achieve goals (e.g., belongingness). Acceptance/inclusion belonging, which is an approach-based process, strongly predicted life satisfaction and happiness, whereas rejection or exclusion belonging, which is an avoidance-based process, strongly predicted depression [21]. Research indicates that a sense of belonging within a university context is positively correlated with life satisfaction [22]. Studies have found that belongingness and social connectedness are strong predictors of overall health and mental well-being [23]. Conversely, a lack of direct social support, diminished feelings of belonging, and separation from close family and friends due to migration and isolation can increase an individual's risk of mental health problems and elevate the likelihood of experiencing acculturation stress [24], which may lead to higher rates of depression and anxiety [25, 15, 26, 27]. Recent research by [13] indicates that underrepresented racial and ethnic minority students, as well as first-generation students, reported a relatively lower sense of belonging compared to their peers. The study highlights that the sense of belonging among college students is a crucial predictor of subjective mental health and positive emotions. The sense of belonging among university students has been significantly underrated, as many lost their social connections and experienced a dwindling in social contact

during the COVID-19 pandemic [28], [29]. Social connections and interactions were dramatically reduced due to pandemic-related restrictions, which decreased social engagement and heightened feelings of stress, loneliness, anxiety, and depression, ultimately leading to diminished well-being [28, 29]. This situation increased students' need to connect with others [30]. Many university and college students reported experiencing social isolation, which further heightened their feelings of anxiety and depression [13]. A recent qualitative study [29] interviewed 20 Canadian university students during the COVID-19 pandemic and generated several common themes collectively such as students expected social connections at university, there was a lack of sense of belonging and well-being, virtual studies lead to a decline in social connectedness, and advocating faculty roles to enhance the sense of belonging during pandemic COVID-19 was crucial. Students who experience a strong sense of belonging to their neighborhoods, institutions, and communities during the COVID-19 pandemic are more likely to interact with others and less likely to feel lonely [30]. This sense of belonging contributes to positive feelings that enhance well-being [31], thereby allowing individuals to cope better with stress, develop healthy relationships, and reduce the likelihood of social rejection, feelings of insignificance, and loneliness during the COVID-19 pandemic [30]. Conversely, a lack of belonging is associated with loneliness, social isolation, depression, anxiety, hopelessness, and suicidal behaviours [13, 32, 33]. Promoting a sense of belonging can benefit both mental health and academic outcomes. This study focuses on how belongingness influences the psychological well-being among international students in Canada amid the COVID-19 pandemic, with the aim of providing insights for future interventions that promote the well-being among international students in Canada.

### **Perceived Stress, Loneliness and Well-being of International Students**

Perceived stress refers to the feelings or thoughts that an individual has about the amount of stress they are under at a given point in time or over a given period [34] and how individuals interpret or view their circumstances as stressful, unpredictable, or beyond their control [35]. The COVID-19 pandemic has had a profoundly negative impact globally, widely perceived as a significant stressor on the world [36]. It is seen as an overwhelming threat that has generated a pervasive fear of infection [37]. International students in Canada, a particularly vulnerable group, have faced major stressors, including the lockdown, restriction measures of social distancing and quarantine amid the COVID-19 pandemic, contributing to their mental illness and increased uncertainty, isolation, and decreased social connections [38, 39, 40, 41, 42]. Many reported significant financial burdens and struggling to meet basic needs due to job losses, reduced employment opportunities, the transition to online learning, being physically separated from their family, and the exclusion from government social programs [38, 41, 42]. These challenges have heightened perceived stress and made cultural adaptation in Canada more difficult, often leading to negative associations that correlate with poorer mental health outcomes for these students [43]. A recent systematic qualitative synthesis review [22] identified five primary themes affecting international students during COVID-19: unprecedented learning barriers; stalled transnational mobility; heightened financial, social, and cultural challenges; exacerbated racism and racial discrimination; and increased mental health risks. Moreover, one recent cross-sectional study [44] found that international students in Canada (36.5%) experienced higher perceived stress, and 64.4% of samples reported moderate to

severe anxiety and depression symptoms based on 177 samples during the COVID-19 pandemic. These stressors have been linked to poorer mental health, particularly higher levels of depression and anxiety [44]. The COVID-19 pandemic significantly altered how people socialize. With profound psychological and social impacts, the pandemic has brought loneliness to the forefront as a major concern for both individuals and society. Loneliness is defined as a lack of meaningful relationships with others, presenting as a cognitive discrepancy between the “social relationships that we have and those that we want” [45]. Loneliness stems from the absence of imperative social relations [46] and adversely impacts the mental health, well-being, and quality of life of people in Canada [47, 48, 49]. For international students in Canada, social distancing, quarantine, and lockdown policies—which are major strategies to combat the virus—and limited social interactions lead to heightened feelings of social isolation, loneliness, and uncertainty about their future [47, 50, 48]. Students who experienced social isolation and lacked a sense of belonging at their institutions were more prone to feelings of loneliness [51]. A study by [50] of 117 International students in British Columbia found that most participants felt less socially connected and more isolated due to the pandemic. The majority strongly disagreed with statements about forming deeper connections and using online counselling services during this period. Moreover, a study by [52] found that international students in Canada reported that their well-being was impacted during the pandemic due to increased limitations on socialization and a decreased social network presence.

### Acculturation Stress and Well-Being of International Students

When individuals bring their social norms, belief systems and values with them when migrating to another country, they must undergo the process of acculturation to adapt to a dominant host society [54, 53]. During this process, they may face challenges or dilemmas that conflict with their original culture, norms, upbringing, or beliefs, making it more difficult to adjust to the new society. As a result, they often feel pressure to integrate while simultaneously struggling to maintain their identity and reassess their values or beliefs [56, 55]. The acculturation process has negative impacts and deleterious effects on mental health and overall health, contributing to issues such as anxiety, depression, social isolation, marginalization, and identity confusion [58, 57, 54]. Acculturation stress can also lead to a decline in overall health. However, it can be mitigated by protective factors such as positive coping strategies for personal growth and a sense of belongingness [59]. Even before COVID-19, international students often encountered numerous challenges and adjustment difficulties when moving to a new country. During this acculturation process, they experience a variety of stressors such as language barriers, cultural and ethnic conflicts, homesickness, lack of social support, financial burden, separation from family, lack of social networks and family support [57, 61, 62, 60]. Challenges in navigating this transition can heighten feelings of loneliness, stress, anxiety and mental health issues [64, 63]. However, international students are less likely to utilize professional support services provided by their host institutions to alleviate these difficulties [66, 65].

### Importance of this Current Study

There is great documented literature that has shown that international students are more likely to have cultural adjustment problems due to cultural shocks, language barriers, lack of support networks and social connections, academic stress and financial pressures associated with pursuing an academic study in a foreign country resulting in diminished

well-being [68, 67]. However, they were facing more stressors under the COVID-19 pandemic, including restrictive measures such as social distancing and quarantine to prevent the spread of the virus, safety concerns, and future uncertainty. These stressors decreased their social connections, increased their feelings of loneliness and led to negative impacts on their health and mental health [7, 70]. 4. Given the tremendous negative impact of the COVID-19 pandemic, the purpose of this study aims to explore the relationships of belongingness (including acceptance and rejection belonging), loneliness, perceived stress, acculturation stress, and psychological well-being on international students in Canada amidst the COVID-19 pandemic, and to determine how COVID-19 has impacted international students' psychological well-being and to identify the effects of belonging as a resilience factor and risk factors (i.e., perceived stress, acculturation stress, loneliness) on psychological well-being of the vulnerable population international students living in Canada during COVID-19. This study will provide initial empirical evidence on psychological well-being, with a specific focus on acculturation stress, perceived stress, and loneliness, and will probe the role of belongingness on the psychological well-being of international students in Canada during the COVID-19 pandemic. To our knowledge, no quantitative research has been reported thus far that focuses specifically on the protective roles of belonging in international college and university students. Few studies have explored the role of belongingness on the well-being of the international student population in Canada during COVID-19 and its relationships with risk factors. We expected belongingness, as a resilience factor, to be significantly negatively associated with loneliness, perceived stress, and acculturation stress and to positively predict psychological well-being. Moreover, we proposed a mediation framework and estimated the mediating effects of perceived stress and acculturation stress in the relationships between belongingness and psychological well-being.

### It was hypothesized that:

- The sense of belonging would be positively associated with psychological well-being and negatively linked with the risk factors for poor well-being, such as perceived stress, acculturation stress, and feelings of loneliness.
- Belongingness would be the significant positive predictor for the outcomes of psychological well-being.
- The effects of the demographic factors, including gender, income, and living conditions, would differ on the risk factors (e.g., perceived stress, acculturation stress, and loneliness) and resilience factors (e.g., belonging and well-being). For example, female international students would report higher perceived stress, loneliness, and poorer mental health than males under COVID-19.
- Potential mediators of belongingness on psychological well-being in this study would be identified, such as acculturation stress and perceived stress among international students in Canada during the COVID-19 pandemic.

## 2. Methods

### 2.1. Participants

A final sample of 186 international students (aged 17-35 years,  $M = 24.02$ ,  $SD = 3.70$ , 84 females, 97 males) was recruited online. The recruitment flyer and the research project link were shared on the faculty research webpages of Brandon University, as well as with faculties from other Canadian Universities, through emails, Reddit, WeChat, or other apps.

Participants for this study were recruited from April to mid-July 2022 in Canada. After clicking the research link, participants were provided with informed consent. Selecting “Continue” was an agreement to participate in the study, after which participants completed an online survey that took approximately 40 minutes to finish. As a token of appreciation, participants received a \$10 Amazon gift card. Table 1 displayed participants’ sociodemographic information.

## 2.2. Measures

The survey was developed using Lime Surveys and included the following measures: a demographic questionnaire that collected information on participants’ country origins, age, gender, education, income, marital status, employment status, length of residence in Canada, English proficiency, COVID-19 history, family situations under the COVID-19 pandemic, year of university enrollment, programs and living arrangements which were considered as potential covariates.

## Key Outcome Variables

The World Health Organization-5 (WHO-5, 1998) consists of five items that assess emotional and psychological well-being over the past two weeks on a 6-point Likert Scale, ranging from 0 (never) to 5 (always). The total score, calculated by multiplying the raw sum by 4, ranges from 0 (worst) to 100 (best); a score of 100 represents the best possible mental well-being. It has high reliability in this current study ( $\alpha = 0.88$ ). The Satisfaction with Life Scale (SWLS, 71) is a 5-item scale that measures global cognitive judgments on life satisfaction. Each item was presented on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). A sum of all scores (ranging from 5 to 35) reflects levels of life satisfaction, with higher scores indicating greater satisfaction. It has strong reliability in the current sample ( $\alpha = 0.87$ ).

## Key Predictor Variables

The General Belongingness Scale (GBS, 21) is a 12-item self-report measure that assesses a general sense of belonging, rated on a 7-point Likert scale, ranging from “1: strongly disagree” to “7: strongly agree”. It consists of two factors (acceptance/inclusion and rejection/exclusion). Total scores range from 12 to 84, with higher scores indicating a stronger sense of belonging. It has strong internal reliability in the current study ( $\alpha = .85$ ). The UCLA Loneliness Scale (Version 3, 62) is a 20-item scale designed to assess subjective feelings of loneliness and social isolation. Responses are given on a 4-point Likert scale, ranging from 1 (never) to 4 (often). The total score ranges from 20 to 80, with higher scores reflecting a greater level of loneliness. It has acceptable internal consistency in this current sample ( $\alpha = 0.66$ ). The Perceived Stress Scale (PSS, 72) consists of 10 items, rated on a 5-point Likert scale, ranging from 0 (Never) to 4 (Very often). Items measure the extent to which an individual has perceived life as unpredictable, uncontrollable, and stressful. The reliability of the current sample showed acceptable internal reliability ( $\alpha = 0.65$ ). The Acculturative Stress Scale (ASSIS; 73) comprises 36 items, each rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). They assess levels of acculturative stress (e.g., “I feel sad living in unfamiliar surroundings.”). ASSIS showed strong internal reliability in the current sample ( $\alpha = 0.95$ ).

## 2.3. Procedures

This online quantitative study, conducted via LimeSurvey, utilized a snowball sampling process. The recruitment information and the research project link were shared on the faculty research webpages of BU, group

lists of international students at BU, WeChat groups, and some community networks. Participants were given informed consent after clicking the research link. After clicking “Continue” as an agreement to participate in the research, participants were directed to the online survey package that took approximately 40 minutes. Participants anonymously completed the survey online after providing a signed consent form. The snowball sampling process continued until a sufficient sample size was reached. A \$10 Amazon gift card was offered to participants as compensation. Participants were recruited in the summer of 2022 in Canada.

## 2.4. Data Cleaning and Analysis

The data analysis was conducted in IBM SPSS 26. Missing values (approximately 1% in total data points) were replaced with the mean score for each scale or subscale, calculated individually for each participant. Participants who completed at least 80% of the items were considered valid and included in the final analysis for that scale<sup>74</sup>. To clear the data, we first screened data and explored the data to assess the normality of each outcome variable, using skewness and kurtosis values reported in the histograms and normal Q-Q plots. Outliers were identified using Stem-and-Leaf Plots. The Winsorizing procedure was applied. Outliers that were more than 2.5 standard deviations from the group mean were replaced with the nearest minimum or maximum values [76,74, 75]. After applying the Winsorizing procedure, the skewness and kurtosis of all the variables were examined for normality. Base-10 Logarithmic transformations were applied to scales that did not originally meet normal distribution criteria (Skewness  $\geq .80$  or Kurtosis score  $\geq 2$ ). This included the PSS (Perceived Stress), which was initially skewed (Skewness = -1.142; Kurtosis = 6.053) but showed an approximately normal distribution after transformation (Skewness = -.237; Kurtosis = 1.124). Similar transformations were performed for GBS (General Belongingness), where the skewness was reduced from .98 to -.182 after transformation, and ASSIS (Acculturation Stress), which improved from an original skewness of -.799 to -.071. A Shapiro-Wilk test for the residuals of these variables ( $p > .05$ ) [77, 93], along with visual inspection of histograms, normal Q-Q plots, and box plots, confirmed that the distributions were approximately normal (Shapiro-Wilk = .222, Kolmogorov-Smirnov = .200,  $p > .05$ ) [77]. The following variables were used in the data analysis: Log10 winsorizing belongingness, Winsorizing loneliness, Winsorizing perceived stress, and Log10 Acculturation stress. Second, no violation of homogeneity and collinearity were detected based on Levene’s test. Third, all outcome variables were centred to reduce multicollinearity [94] before being included in the regression models. We first conducted univariate analysis of variance (ANOVAs) models on two psychological well-being outcome scores stratified by sociodemographic variables (Table 1). The means and standard deviation of the variables are displayed in Table 2. These analyses aimed to describe the sample’s mean and standard deviation, as well as to identify potential sociodemographic predictors to be used as covariates in subsequent regression models. Secondly, we performed correlational analyses of belongingness, perceived stress, acculturation stress, loneliness, life satisfaction and well-being (Table 3). Following convention 78, variables with a  $p \leq 0.20$  from the ANOVAs were identified as potential covariates for the corresponding multiple linear regression models (Tables 1). Next, we performed a series of regression analyses to examine how belongingness, perceived stress, acculturation stress, and loneliness were related to life satisfaction and well-being (Table 4 and Table 5). Standard multiple regression analyses were conducted with life satisfaction and well-being as the dependent

variable and belongingness, along with certain demographic variables ( $p \leq 0.20$ ) as independent variables. The mediation effects of perceived stress and acculturation stress were also examined in the regression model. All analyses were conducted using SPSS REGRESSION to evaluate assumptions.

### 3. Results

#### 3.1. Sample Demographic Characteristics and Group Differences in Outcome Variables

The sample characteristics and the group differences in outcome variables are presented in Table 1. Based on the univariate ANOVA results, the variables with a  $p$ -value  $\leq 0.20$  were identified as potential sociodemographic covariates for inclusion in subsequent regression models. For the WHO-5, these variables included age, marital, education, income, living conditions, and whether a family member had COVID-19. For the SWLS, the relevant covariates were living conditions, cohabitation status, country of origin, years in school, and type of international program. We first reported the sample characteristics and group differences in key psychosocial measures, using analysis of variance (ANOVAs) or  $t$ -tests (Table 1).

| Variables                           | Categories              | Sample Size N (%) | WHO-5 M(SD)   | F     | P            | SWLS M(SD)    | F     | P            |
|-------------------------------------|-------------------------|-------------------|---------------|-------|--------------|---------------|-------|--------------|
| <b>Age</b>                          | > 25 years old          | 58 (31.2)         | 2.325 (1.164) | 5.112 | <b>.025</b>  | 4.317 (.928)  | .150  | 0.699        |
|                                     | $\leq$ 25 years old     | 121 (65.1)        | 2.771 (1.274) |       |              | 4.388 (1.236) |       |              |
| <b>Gender</b>                       | Male                    | 97 (52.7)         | 2.541 (1.221) | 0.419 | 0.658        | 4.257 (0.884) | 0.560 | 0.572        |
|                                     | Female                  | 84 (45.2)         | 2.714 (1.340) |       |              | 4.433 (1.432) |       |              |
|                                     | Transgender             | 2 (0.5)           | 2.500 (1.280) |       |              | 4.100 (0.424) |       |              |
|                                     |                         |                   |               |       |              |               |       |              |
| <b>Marital status</b>               | Single                  | 138 (74.7)        | 2.718 (1.312) | 1.864 | <b>.103</b>  | 4.404 (1.217) | 0.559 | 0.731        |
|                                     | Separated               | 4 (2.2)           | 1.750 (1.500) |       |              | 4.550 (0.998) |       |              |
|                                     | Divorced                | 4 (2.2)           | 2.655 (1.247) |       |              | 4.500 (0.416) |       |              |
|                                     | Widowed                 | 9 (4.8)           | 1.556 (.881)  |       |              | 4.111 (0.481) |       |              |
|                                     | Common law              | 2 (1.1)           | 2.310 (.438)  |       |              | 3.700 (0.424) |       |              |
|                                     | Married                 | 28 (15.1)         | 2.607 (1.031) |       |              | 4.093 (1.131) |       |              |
|                                     |                         |                   |               |       |              |               |       |              |
| <b>Education</b>                    | High school             | 62 (33.3)         | 2.843 (1.329) | 4.782 | <b>0.001</b> | 4.306 (1.495) | 1.013 | 0.402        |
|                                     | Bachelor's degree Above | 48 (25.8)         | 2.909 (1.387) |       |              | 4.517 (0.841) |       |              |
|                                     | Bachelor                | 13 (7.0)          | 2.385 (1.387) |       |              | 3.800 (1.695) |       |              |
|                                     | College diploma         | 57 (30.6)         | 2.344 (1.123) |       |              | 4.304 (0.775) |       |              |
| <b>Income</b>                       | Low                     | 47 (25.3)         | 3.090 (1.310) | 2.655 | <b>0.017</b> | 4.339 (1.629) | 0.290 | .941         |
|                                     | Lower than middle       | 43 (23.1)         | 2.224 (1.356) |       |              | 4.261 (0.967) |       |              |
|                                     | Middle                  | 48 (25.8)         | 2.813 (0.982) |       |              | 4.313 (1.023) |       |              |
|                                     | Over middle             | 21 (11.8)         | 2.234 (1.380) |       |              | 4.600 (0.802) |       |              |
|                                     | high                    | 7 (3.8)           | 2.286 (1.380) |       |              | 4.057 (0.412) |       |              |
|                                     | Very High               | 9 (4.8)           | 2.624 (0.484) |       |              | 4.378 (0.891) |       |              |
| <b>Employment</b>                   | Part-time               | 70 (37.6)         | 2.580 (1.387) | 0.572 | 0.634        | 4.334 (1.379) | 0.537 | 0.658        |
|                                     | Full-time               | 88 (47.3)         | 2.669 (1.224) |       |              | 4.416 (0.949) |       |              |
|                                     | Unemployment            | 22 (11.8)         | 2.710 (1.161) |       |              | 4.064 (1.172) |       |              |
| <b>Living (situation) condition</b> | Self-purchase           | 36 (19.4)         | 2.449 (1.363) | 2.029 | <b>0.112</b> | 4.757 (.890)  | 2.526 | <b>0.059</b> |
|                                     | Renting                 | 101 (54.3)        | 2.809 (1.121) |       |              | 4.189 (1.245) |       |              |
|                                     | Home stay               | 28 (15.1)         | 2.214 (1.424) |       |              | 4.450 (1.136) |       |              |
|                                     | others                  | 12 (6.5)          | 2.833 (1.030) |       |              | 4.050 (1.059) |       |              |
| <b>Who is Living with</b>           | Parents/siblings        | 37 (19.9)         | 2.541 (1.216) | 0.471 | 0.798        | 4.065 (1.112) | 1.503 | <b>0.191</b> |
|                                     | children                | 14 (7.5)          | 2.357 (1.277) |       |              | 4.243 (1.115) |       |              |
|                                     | friends'                | 64 (34.9)         | 2.660 (1.271) |       |              | 4.409 (1.067) |       |              |
|                                     | relatives               | 11 (5.9)          | 3.091 (1.300) |       |              | 4.418 (1.208) |       |              |
|                                     | Others                  | 26 (14.0)         | 2.678 (0.968) |       |              | 4.114 (1.357) |       |              |
| <b>Religion</b>                     | Have religion           | 118 (63.4)        | 4.224 (.899)  | .379  | .477         | 4.657 (.987)  | 1.119 | 1.300        |
|                                     | No religion             | 65 (34.9)         | 4.321 (.884)  |       |              | 4.819 (.815)  |       |              |
| <b>Country origin</b>               | Asia                    | 37 (19.9)         | 2.865 (1.357) | .797  | .573         | 4.119 (1.402) | 2.653 | <b>0.017</b> |
|                                     | American                | 120 (64.5)        | 2.486 (1.259) |       |              | 4.524 (0.924) |       |              |
|                                     | Africa                  | 13 (7.0)          | 2.769 (1.641) |       |              | 3.858 (1.978) |       |              |
|                                     | Europe                  | 9 (4.8)           | 2.778 (.441)  |       |              | 3.378 (0.587) |       |              |
|                                     | Australia               | 1 (0.5)           | 3.000 (0.000) |       |              | 3.400 (0.000) |       |              |
|                                     | Oceania region          | 1 (0.5)           | 2.000 (0.000) |       |              | 4.400 (0.000) |       |              |
|                                     | Other place             | 4 (2.2)           | 3.405 (1.078) |       |              | 5.100 (1.361) |       |              |



|  |                                     |           |               |       |              |               |       |              |
|--|-------------------------------------|-----------|---------------|-------|--------------|---------------|-------|--------------|
| <b>Year of school</b>                    | First year                          | 21 (11.3) | 2.601 (1.562) | 1.375 | .236         | 4.181 (1.724) | 2.913 | <b>0.015</b> |
|  | Second year                         | 46 (24.7) | 2.505 (1.165) |       |              | 4.182 (0.869) |       |              |
|  | Third year                          | 52 (28.0) | 2.635 (1.138) |       |              | 4.465 (1.026) |       |              |
|  | Fourth year                         | 33 (17.7) | 3.049 (1.226) |       |              | 4.546 (1.070) |       |              |
|  | Over 4 years                        | 9 (4.8)   | 3.405 (1.078) |       |              | 4.933 (1.371) |       |              |
|  | Graduate school                     | 11(5.9)   | 2.455 (1.508) |       |              | 3.273 (1.534) |       |              |
| <b>International program type</b>        | 1-International                     | 47 (25.3) | 2.864 (1.154) | 0.736 | 0.641        | 4.144 (1.346) | 2.565 | <b>0.15</b>  |
|  | 2- Specific Studies                 | 26 (14.0) | 2.793 (1.297) |       |              | 4.854 (1.045) |       |              |
|  | 3- Research student/Auditing        | 9 (4.8)   | 2.222 (1.297) |       |              | 3.822 (1.045) |       |              |
|  | 4- General Exchange Program         | 19 (10.2) | 2.421 (1.261) |       |              | 4.316 (0.815) |       |              |
|  | 5- Undergraduate exchange program   | 33 (17.7) | 2.595 (1.389) |       |              | 4.733 (1.006) |       |              |
|  | 6- Short-Term International student | 8 (4.3)   | 2.375 (1.302) |       |              | 4.075 (1.146) |       |              |
|  | 7- Others                           | 27 (14.5) | 2.616 (1.211) |       |              | 3.882 (1.307) |       |              |
| <b>Got COVID or not</b>                  | N/A                                 | 2(1.6)    | 2.540 (.505)  | .471  | 0.625        | 4.000 (.000)  | .647  | .525         |
|  | Yes                                 | 80(43.0)  | 2.540 (1.348) |       |              | 4.421 (1.304) |       |              |
|  | No                                  | 103(55.4) | 2.723 (1.187) |       |              | 4.245 (.961)  |       |              |
| <b>Family member has COVID-19 or not</b> | Yes                                 | 78(41.9)  | 2.452 (1.374) | 3.071 | <b>0.081</b> | 4.276 (1.342) | .907  | .342         |
|  | No                                  | 97(52.2)  | 2.795 (1.166) |       |              | 4.446 (.930)  |       |              |

**Note:** M = mean, SD = Standard Deviation. Variables with  $p \leq 0.20$  would be entered in the regression models as covariates (see Table 2 and 3).

**Table 1:** Sample characteristics and their relationship with the two outcome variables: WHO-5 and SWLS (N=186).

Next, we examined correlations among the key outcome measures (Table 2) to explore the relationships between these variables.

| <b>Variables (N=186)</b> | <b>Mean</b> | <b>SD</b> |
|--------------------------|-------------|-----------|
| Belongingness            | 4.254       | 0.887     |
| Acceptance/inclusion     | 4.530       | 1.035     |
| Rejection/exclusion      | 4.020       | 1.193     |
| Perceived stress         | 2.053       | 0.439     |
| Acculturation stress     | 3.079       | 0.733     |
| Loneliness               | 2.528       | 0.245     |
| Life satisfaction        | 4.339       | 1.158     |
| Well-being               | 2.619       | 1.271     |

**Table 2:** Means and standard deviations (SD) of belongingness, perceived stress, acculturation stress, loneliness, life satisfaction and well-being on international students in Canada under COVID-19.

Finally, hierarchical regression models (see Table 3 and Table 4) were conducted to identify significant predictors of psychological well-being, specifically WHO-5 and SWLS.

| N=186                   | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       |
|-------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. Well-being           | 1       | .315**  | .400**  | .236**  | -.397** | -.386** | -.313** | -.405** |
| 2. Life satisfaction    | .315**  | 1       | .513**  | .602**  | -.245** | -.080   | -.364** | -.570** |
| 3. Belonging            | .400**  | .513**  | 1       | .772**  | -.828** | -.484** | -.373** | -.681** |
| 4. Acceptance belonging | .236**  | .602**  | .772**  | 1       | -.283** | -.199** | -.199*  | -.530** |
| 5. Rejection belonging  | -.397** | -.245** | -.828** | -.283** | 1       | .556**  | .556**  | .561**  |
| 6. Acculturation stress | -.386** | -.008   | -.484** | -.199** | .556**  | 1       | .260**  | .384**  |
| 7. Perceived stress     | -.313** | -.364** | -.373** | -.232** | .360**  | .260**  | 1       | .445**  |
| 8. Loneliness           | -.405** | -.570** | .772**  | -.530** | .561**  | .384**  | .445**  | 1       |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

**Table 3:** Correlation analyses among general belonging, acceptance belonging, rejection belonging, acculturation stress, perceived stress, loneliness, life satisfaction, and well-being in entire group.

| Model               | Predictions                                     | $\beta$ | $R^2$ | $F$      |
|---------------------|---|---------|-------|----------|
| <b>Step 1 Model</b> |   |         | 0.211 | 4.743*** |
|                     | Belongingness                                   | .296**  |       |          |
|                     | Loneliness                                      | -.188†  |       |          |
|                     | Age<br>> = 25yrs (reference)<br>< 25yrs         | .187†   |       |          |
|                     | Marital status<br>Married (reference) Single    | -.083   |       |          |
|                     | Income<br>> middle (reference)<br>< middle      |         |       |          |
|                     | Education<br>< college (reference)<br>> college | .035    |       |          |
|                     | Living place<br>Purchasing (reference)<br>Not   | .032    |       |          |
| <b>Step 2 Model</b> |   |         | .266  | 5.235**  |
|                     | Belongingness                                   | .213**  |       |          |
|                     | Loneliness                                      | -.117   |       |          |
|                     | Age<br>> = 25yrs(reference)<br>< 25yrs          | .165    |       |          |
|                     | Marital status<br>Married (reference) Single    | -.050   |       |          |
|                     | Income<br>>middle(reference)<br>< middle        | -.063   |       |          |
|                     | Education<br>< college (reference)<br>> college | .070    |       |          |
|                     | Living place<br>Purchasing (reference)<br>Not   | -.017   |       |          |
|                     | Acculturation stress                            | .232**  |       |          |
|                     | Perceived stress                                | -.137 † |       |          |

**Note:** \*  $p < 0.05$ , \*\*  $p < 0.01$ , and \*\*\*  $p < 0.001$ . †  $0.05 < p < .1$

**Table 4:** Hierarchical regression on emotional psychological well-being (i.e., WHO-5).

Each outcome was analyzed using a 2-step model. In Step 1, belongingness and loneliness, along with sociodemographic covariates, were included. In Step 2, acculturation stress and perceived stress were added as mediators. Demographic effects on life satisfaction of international students: A univariate ANOVA revealed a significant effect of country of origin on life satisfaction,  $F(3, 177) = 4.388$ ,  $p = .005$ . Students from North America ( $M = 4.520$ ,  $N = 120$ ) reported higher life satisfaction than students from Africa ( $M = 3.858$ ,  $N = 13$ ) and Europe ( $M = 3.378$ ,  $N = 9$ ). Additionally, the effect of the year in university on

life satisfaction was significant,  $F(5, 166) = 2.913$ ,  $p = .015$ . Graduate students ( $M = 3.273$ ,  $N = 11$ ) reported less life satisfaction compared to third year ( $M = 4.465$ ,  $N = 52$ ) and fourth-year students ( $M = 4.546$ ,  $N = 33$ ). Demographic effects on the psychological well-being of international students: A univariate ANOVA revealed a significant effect of income on psychological well-being,  $F(6, 179) = 2.6653$ ,  $p = .017$ . Students with near middle income ( $M = 2.224$ ,  $N = 43$ ) reported lower psychological well-being compared to those from high-income backgrounds ( $M = 3.090$ ,  $N = 47$ ).

| Model               | Predictions  | $\beta$               | $R^2$ | $F$       |
|---------------------|--|-----------------------|-------|-----------|
| <b>Step 1 Model</b> |  |                       | 0.645 | 15.023*** |
|                     | Belongingness                                      | .522***               |       |           |
|                     | Loneliness   | -.288*                |       |           |
|                     | Living condition<br>Cohabitation<br>Country origin | -.046<br>.081<br>.170 |       |           |
|                     | Year of school<br>Program type                     | -.045<br>-.003        |       |           |
| <b>Step 2 Model</b> |  |                       | 0.567 | 12.548*** |

|  |                      |         |  |  |
|--|----------------------|---------|--|--|
|  | Belongingness        | .480*** |  |  |
|  | Loneliness           | -.219   |  |  |
|  | Living condition     | -.039   |  |  |
|  | Cohabitation         | .065    |  |  |
|  | Country origin       | .166    |  |  |
|  | Year of school       | -.032   |  |  |
|  | Program type         | .018    |  |  |
|  | Perceived stress     | -.161   |  |  |
|  | Acculturation stress | .034    |  |  |

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , and \*\*\*  $p < 0.001$ .

**Table 5:** Hierarchical regression on life satisfaction (i.e., SWLS).

### 3. 2. Correlations between belonging, loneliness, perceived stress, acculturation stress, life satisfaction and well-being on international students.

The correlation analysis revealed associations between well-being and general belonging—two facets of belonging, loneliness, perceived stress, and acculturation stress (Table 2). Well-being ( $r = .400$ ,  $p < .01$ ) and life satisfaction ( $r = .513$ ,  $p < .01$ ) were significantly positively correlated with belongingness, Well-being ( $r = .236$ ,  $p < .01$ ) and life satisfaction ( $r = .602$ ,  $p < .01$ ) were significantly positively correlated with acceptance belongingness, and with life satisfaction ( $r = .315$ ,  $p < .001$ ). Rejection belongingness was significantly negatively correlated with well-being ( $r = -.397$ ,  $p < .01$ ) and life satisfaction ( $r = -.245$ ,  $p < .001$ ), perceived stress was negatively correlated with well-being ( $r = -.313$ ,  $p < .001$ ) and life satisfaction ( $r = -.364$ ,  $p < .001$ ), loneliness was significantly negatively correlated with well-being ( $r = -.405$ ,  $p < .001$ ) and life satisfaction ( $r = -.364$ ,  $p < .001$ ). Well-being was significantly negatively correlated with acculturation stress ( $r = -.386$ ,  $p < .001$ ), which was significantly positively correlated with loneliness ( $r = .384$ ,  $p < .001$ ), with perceived stress ( $r = .260$ ,  $p < .001$ ); with rejection belongingness ( $r = .556$ ,  $p < .001$ ), and significantly negatively with acceptance belonging ( $r = -.199$ ,  $p = .007$ ); with general belonging ( $r = -.484$ ,  $p < .001$ ).

### 3.3. Regression Analyses

Using a two-step model, hierarchical regression models were conducted to identify significant predictors of the two psychological well-being outcomes: WHO-5 and SWLS. In Step 1, general belongingness, acceptance belonging, rejection belonging, loneliness, and sociodemographic covariates were included. In Step 2, acculturation stress and perceived stress scores were added as mediators.

#### 3.3.1. Regression on WHO-5 Score

This regression model examined the effects of belongingness and loneliness on the WHO-5 score (i.e., emotional psychological well-being), controlling for potential demographic covariates identified in Table 1. In Step 1, general belongingness, acceptance belonging, rejection belonging, and loneliness were entered, along with the following covariates: age, marital, education, income, living conditions, and whether family members had contracted COVID-19. The model was significant,  $R^2 \text{ adj} = .166$ ,  $F(8, 142) = 4.743$ ,  $p < .001$ . The results showed that belongingness positively predicted well-being ( $\beta = .296$ ,  $p < 0.03$ ), while loneliness negatively predicted well-being marginally ( $\beta = -.188$ ,  $p = 0.052$ ) for the WHO-5 score (see Table 3). The regression analysis indicated that belonging and loneliness significantly contributed to explaining well-being in the first model, accounting for 19.3% of the variance. This effect was further enhanced by the addition of the

perceived stress and acculturation stress in the second model, which significantly improved the explained variance. The second model accounted for 26% of the variance in the WHO-5 score. Age was marginally positively associated with well-being ( $\beta = .187$ ,  $p = 0.055$ ), but other variables, including marital status ( $\beta = -0.083$ ,  $p = 0.348$ ), education level ( $\beta = 0.035$ ,  $p = 0.715$ ), income level ( $\beta = -0.051$ ,  $p = 0.592$ ), living conditions ( $\beta = 0.032$ ,  $p = 0.689$ ) and whether a family members had COVID-19 ( $\beta = -0.012$ ,  $p = 0.883$ ) did not significantly predict the WHO-5 score. In Step 2, the model was significant:  $R^2 \text{ adj} = .213$ ,  $F(2, 140) = 5.235$ ,  $p = .006$ . Belongingness ( $\beta = 0.213$ ,  $p = 0.034$ ), and acculturation stress ( $\beta = 0.232$ ,  $p = 0.007$ ) significantly predicted well-being; perceived stress ( $\beta = -.137$ ,  $p = 0.095$ ) and age level ( $\beta = 0.165$ ,  $p = 0.083$ ) showed marginally predicted well-being. However, none of the other variables significantly predicted well-being ( $p \geq 0.227$ ). The other variables such as marital status ( $\beta = -0.05$ ,  $p = 0.558$ ), loneliness ( $\beta = -.117$ ,  $p = 0.227$ ), education level ( $\beta = 0.078$ ,  $p = 0.405$ ), income level ( $\beta = -.063$ ,  $p = 0.498$ ), living conditions ( $\beta = -0.017$ ,  $p = 0.833$ ) and whether a family member had COVID-19 ( $\beta = -0.015$ ,  $p = 0.848$ ) did not emerge as significant predictors. Based on our hypothesis and the results of the regression analysis, we investigated whether perceived stress or acculturation stress mediated the impact of a sense of belonging on well-being. The prediction of belongingness on acculturation stress was significant ( $R^2 \text{ adj} = .143$ ,  $F(1, 183) = 31.621$ ,  $p < .001$ ), with belongingness positively predicting acculturation stress ( $\beta = .384$ ,  $p < 0.01$ ). The prediction of acculturation stress on well-being was also significant ( $R^2 \text{ adj} = .133$ ,  $F(1, 183) = 29.305$ ,  $p < .001$ ), with acculturation stress negatively associated with well-being ( $\beta = -.372$ ,  $p < 0.01$ ). The Sobel test confirmed full mediation of the relationship between belongingness and well-being by acculturation stress ( $Z = 3.902$ ,  $p < .001$ ). Similarly, belongingness negatively predicted perceived stress ( $R^2 \text{ adj} = .108$ ,  $F(1, 184) = 23.383$ ,  $p < .001$ ), with a significant negative association ( $\beta = -.336$ ,  $p < 0.01$ ). Perceived stress also negatively predicted well-being ( $R^2 \text{ adj} = .081$ ,  $F(1, 184) = 17.238$ ,  $p < .001$ ), with a significant negative effect ( $\beta = -.293$ ,  $p < 0.01$ ). The Sobel test confirmed that perceived stress fully mediated the relationship between belongingness and well-being ( $Z = 3.152$ ,  $p < .001$ ). Additionally, we also examined whether acceptance belonging predicted well-being. In the first step, the model was significant:  $R^2 \text{ adj} = .131$ ,  $F(8, 142) = 3.817$ ,  $p < .001$ . Acceptance belonging did not significantly predict well-being ( $\beta = .146$ ,  $p = 0.105$ ), and loneliness negatively significantly predicted well-being ( $\beta = -.294$ ,  $p < 0.001$ ). Acceptance belonging positively predicted well-being in Step 2, when controlling for perceived stress and acculturation stress. The model was significant,  $R^2 \text{ adj} = .211$ ,  $F(2, 140) = 8.262$ ,  $p < .001$ . Acceptance belonging ( $\beta = 0.176$ ,  $p = 0.042$ ), perceived stress ( $\beta = -1.998$ ,  $p = 0.048$ ), and acculturation stress ( $\beta = 3.422$ ,  $p < 0.001$ ) predicted well-being rather than loneliness ( $\beta = -.134$ ,  $p = .155$ ).



We examined whether perceived stress and acculturation stress mediated acceptance belonging or loneliness on well-being. First, we examined the direction between acceptance belongings and acculturation stress. The regression model showed significant,  $R^2 \text{ adj} = .005$ ,  $F(1, 183) = 1.934$ ,  $p < .001$ , acceptance belongings did not predict acculturation stress ( $\beta = .102$ ,  $p = .166$ ). Then, we examined the direction between acculturation stress and well-being. The regression model showed significant,  $R^2 \text{ adj} = .133$ ,  $F(1, 183) = 29.305$ ,  $p < .001$ , acculturation stress ( $\beta = .372$ ,  $p < 0.001$ ) predicted well-being. The Sobel test showed that acculturation stress did not mediate the effects of acceptance belonging on well-being ( $Z = 1.264$ ,  $p = .206$ ). Then, we examined the direction between acceptance belongings and perceived stress. The regression model showed significant,  $R^2 \text{ adj} = .034$ ,  $F(1, 184) = 7.468$ ,  $p = .007$ , acceptance belonging ( $\beta = -.197$ ,  $p = .007$ ) negatively predicted perceived stress. Then, we examined the direction between perceived stress and well-being. The regression model showed significant,  $R^2 \text{ adj} = .133$ ,  $F(1, 184) = 17.238$ ,  $p < .001$ , perceived stress negatively predicted well-being ( $\beta = -.293$ ,  $p < 0.001$ ). Sobel test showed that perceived stress mediated the effects of acceptance belonging on well-being ( $Z = 2.288$ ,  $p = .022$ ). First, we examined the direction between loneliness and acculturation stress. The regression model showed significant,  $R^2 \text{ adj} = .101$ ,  $F(1, 183) = 21.672$ ,  $p < .001$ , loneliness ( $\beta = -.325$ ,  $p < .001$ ) predicted acculturation stress. Then, we examined the direction between acculturation stress and well-being. The regression model showed significant,  $R^2 \text{ adj} = .133$ ,  $F(1, 183) = 29.305$ ,  $p < .001$ , acculturation stress ( $\beta = .372$ ,  $p < 0.001$ ) predicted well-being. The Sobel test showed that acculturation stress mediated the effects of loneliness on well-being ( $Z = -3.509$ ,  $p = .000$ ). We examined the direction between loneliness and perceived stress. The regression model showed significant,  $R^2 \text{ adj} = .134$ ,  $F(1, 184) = 29.674$ ,  $p < .001$ , loneliness ( $\beta = .373$ ,  $p < .001$ ) predicted perceived stress. Then, we examined the direction between perceived stress and well-being. The regression model showed significant,  $R^2 \text{ adj} = .081$ ,  $F(1, 184) = 17.238$ ,  $p < .001$ , perceived stress ( $\beta = -.270$ ,  $p < 0.001$ ) predicted well-being. The Sobel test showed that perceived stress mediated the effects of loneliness on well-being ( $Z = -3.301$ ,  $p = .000$ ). Moreover, we also examined whether rejection belonging predicted well-being. In the first step, by entering rejection belongingness along with the covariance variables, the model was significant:  $R^2 \text{ adj} = .536$ ,  $F(6, 60) = 13.719$ ,  $p < .001$ . Rejection belongings negatively significantly predicted well-being ( $\beta = -.323$ ,  $p = 0.014$ ), loneliness significantly predicted well-being negatively ( $\beta = -.428$ ,  $p = 0.003$ ). We also examined whether rejection belonging positively predicted well-being in Step 2, while controlling for perceived stress and acculturation stress. The model was significant,  $R^2 \text{ adj} = .550$ ,  $F(2, 58) = 1.900$ ,  $p = .159$ . Rejection belongingness ( $\beta = -.287$ ,  $p = 0.029$ ) and loneliness ( $\beta = -.315$ ,  $p = 0.037$ ) significantly predicted well-being, while acculturation stress also significantly predicted well-being ( $\beta = .228$ ,  $p = 0.013$ ). However, perceived stress ( $\beta = -.133$ ,  $p = 0.115$ ) did not predict well-being. Therefore, we examined whether acculturation stress mediated the effects of rejection of belonging/ loneliness on well-being. First, we examined the direction between rejection belongings and acculturation stress. The regression model showed significant,  $R^2 \text{ adj} = .314$ ,  $F(1, 183) = 85.179$ ,  $p < .001$ , rejection belongings ( $\beta = -.564$ ,  $p < 0.001$ ) predicted acculturation stress. Then, we examined the direction between acculturation stress and well-being. The regression model showed significant,  $R^2 \text{ adj} = .133$ ,  $F(1, 183) = 29.305$ ,  $p < .001$ , acculturation stress ( $\beta = .372$ ,  $p < 0.001$ ) predicted well-being. The Sobel test showed that acculturation stress mediated the effects of rejection belonging on well-being ( $Z = -4.658$ ,  $p = .000$ ).

### 3.3.2. Regression on SWLS Scores

This regression model examined the effects of belongingness and loneliness on life satisfaction (i.e., the cognitive component of psychological well-being), controlling for living conditions, cohabitation status, country of origin, school year, and type of international program, as identified in Table 1. In Step 1, belongingness and loneliness were entered along with these covariates. The model was significant,  $R^2 \text{ adj} = .602$ ,  $F(7, 58) = 15.023$ ,  $p < .001$ . The results showed that belongingness positively predicted life satisfaction ( $\beta = .522$ ,  $p < 0.018$ ), while loneliness negatively predicted life satisfaction ( $\beta = -.288$ ,  $p = 0.028$ ) for the SWLS score. Regression analysis indicated that belonging and loneliness made a significant contribution to explaining life satisfaction in the first model, accounting for 60.2% of the explained variance. This impact was overcome by the contribution of perceived stress, and acculturation stress in this effect was further enhanced by the addition of perceived stress and acculturation stress in the second model, which explained 60.7% of the variance in the SWLS score. Country of origin significantly positively predicted life satisfaction ( $\beta = 0.170$ ,  $p = 0.046$ ). However, other variables, including living conditions ( $\beta = -0.046$ ,  $p = 0.578$ ), cohabitation status ( $\beta = 0.081$ ,  $p = 0.325$ ), year of school ( $\beta = -0.045$ ,  $p = 0.595$ ), and type of international program ( $\beta = -0.003$ ,  $p = 0.969$ ) did not significantly predict the life satisfaction scores. In Step 2, the model remained significant:  $R^2 \text{ adj} = .607$ ,  $F(2, 56) = 1.425$ ,  $p = .029$ . However, belongingness continued to significantly predict life satisfaction ( $\beta = 0.480$ ,  $p < 0.001$ ) and loneliness ( $\beta = -.219$ ,  $p = .144$ ), while the country of origin marginally predicted life satisfaction ( $\beta = 0.166$ ,  $p = 0.054$ ). None of the other variables showed significant predictions ( $p \geq 0.101$ ). living conditions ( $\beta = -0.039$ ,  $p = 0.633$ ), cohabitation status ( $\beta = 0.065$ ,  $p = 0.471$ ), year of school ( $\beta = -0.032$ ,  $p = 0.707$ ), and type of international program ( $\beta = .018$ ,  $p = 0.826$ ), acculturation stress ( $\beta = 0.034$ ,  $p = 0.730$ ), and perceived stress ( $\beta = -.161$ ,  $p = 0.101$ ) were not significant predictors. Based on our hypothesis and the results of the regression analysis, we explored whether perceived stress or acculturation stress mediated the effect of a sense of belonging on life satisfaction. The prediction of belongingness on acculturation stress was significant ( $R^2 \text{ adj} = .143$ ,  $F(1, 183) = 31.621$ ,  $p < .001$ ), with belongingness positively associated with acculturation stress ( $\beta = .384$ ,  $p < 0.01$ ). However, the prediction of acculturation stress on life satisfaction was non-significant ( $R^2 \text{ adj} = -.005$ ,  $F(1, 183) = .000$ ,  $p = .988$ ), showing no relationship ( $\beta = .001$ ,  $p = .988$ ). Therefore, acculturation stress did not mediate the relationship between the effect of belongingness on life satisfaction. The prediction of belongingness on perceived stress was significantly negative ( $R^2 \text{ adj} = .108$ ,  $F(1, 184) = 23.383$ ,  $p < .001$ ), with belongingness reducing perceived stress ( $\beta = -.336$ ,  $p < .001$ ). The prediction of perceived stress on life satisfaction was negatively significant ( $R^2 \text{ adj} = .117$ ,  $F(1, 184) = 25.541$ ,  $p < .001$ ), and perceived stress was negatively associated with life satisfaction ( $\beta = -.349$ ,  $p < 0.01$ ). The Sobel test confirmed partial mediation by perceived stress in the relationship between belongingness and life satisfaction ( $Z = 3.902$ ,  $p < .001$ ). Additionally, we also examined whether acceptance belonging predicted life satisfaction. In the first step, the model was significant:  $R^2 \text{ adj} = .574$ ,  $F(6, 60) = 15.832$ ,  $p < .001$ . Acceptance belonging significantly predicted life satisfaction ( $\beta = .382$ ,  $p < 0.001$ ), while loneliness negatively significantly predicted life satisfaction ( $\beta = -.437$ ,  $p < 0.001$ ). In the second step, we examined whether acceptance belonging predicted life satisfaction when controlling for perceived stress and acculturation stress. The model was not significant,  $R^2 \text{ adj} = .575$ ,  $F(2, 58) = 1.049$ ,  $p = .357$ . Acceptance belonging positively predicted significant life satisfaction ( $\beta = .382$ ,  $p <$

0.001), loneliness predicted significantly life satisfaction negatively ( $\beta = -.437, p < 0.001$ ), but both perceived stress ( $\beta = -.138, p = .163$ ), and acculturation stress ( $\beta = .053, p = .602$ ) did not show significant predict life satisfaction. Therefore, neither perceived stress nor acculturation stress mediated the effects of acceptance belonging on life satisfaction. Moreover, we also examined whether rejection belonging predicted well-being negatively; in the first step, the model was significant,  $R^2 \text{ adj} = .373, F(4, 141) = 22.545, p < .001$ . Rejection belonging did not significantly predict life satisfaction ( $\beta = -.112, p = .185$ ). Loneliness significantly predicted life satisfaction negatively ( $\beta = -.566, p = 0.001$ ). In the second step, we examined whether rejection belonging predicted life satisfaction when controlling perceived stress and acculturation stress. The model was significant,  $R^2 \text{ adj} = .392, F(2, 139) = 3.279, p = .041$ . Rejection belonging did not significantly predict life satisfaction ( $\beta = -.127, p = .158$ ), loneliness ( $\beta = -.508, p < 0.001$ ), and perceived stress ( $\beta = -.161, p = .032$ ) significantly predicted life satisfaction negatively, however, acculturation stress ( $\beta = -.077, p = .313$ ) did not show significant predict life satisfaction. We examined whether perceived stress mediated the effect of loneliness on life satisfaction. First, we investigated the direction of the relationship between loneliness and perceived stress. The regression model showed significant,  $R^2 \text{ adj} = .134, F(1, 183) = 29.674, p < .001$ , loneliness ( $\beta = .373, p < 0.001$ ) predicted perceived stress. Then, we explored the direction between perceived stress and life satisfaction. The regression model showed significant,  $R^2 \text{ adj} = .117, F(1, 184) = 25.541, p < .001$ , perceived stress ( $\beta = -.349, p < 0.001$ ) predicted life satisfaction. The Sobel test showed that perceived stress mediated the effects of belongingness on well-being ( $Z = -3.694, p = .000$ ).

#### 4. Discussion

This quantitative cross-sectional study, conducted in the summer of 2022 during the COVID-19 pandemic, uniquely explored the relationships between belongingness, loneliness, perceived stress, acculturation stress, and psychological well-being among international students in Canada. The findings identified several psychosocial profiles, emphasizing the significant role of belongingness as a resilience factor, while loneliness, acculturation stress and perceived stress emerged as risk factors. These factors were found to be strong predictors of psychological well-being, including overall emotional well-being (as measured by the WHO-5) and cognitively perceived life satisfaction (as measured by the SWLS), among international students in Canada during the COVID-19 pandemic. Our findings revealed that loneliness was negatively associated with both cognitively perceived life satisfaction and emotional well-being, consistent with the previous studies [79, 80, 81, 82]. The COVID-19 pandemic has emerged as a significant source of stress, creating increased uncertainty for international students within Canada [41, 83]. Specifically, adaptive preventive measures such as social distancing, quarantine, campus closure, and lockdowns have led to feelings of social disconnection and loneliness [48, 39, 84, 85, 86]. International students, in particular, may experience social isolation, severe anxiety, and depression [83, 13, 22]. Individuals with less social engagement were found to be more susceptible to mental health issues and lower life satisfaction [81]. Recent studies [81] suggested that loneliness can be alleviated through social connection and engagement. Students with a stronger sense of belonging to their school reported fewer feelings of loneliness [87]. Therefore, promoting mental health and psychological well-being during the COVID-19 outbreak is crucial. Individuals experiencing social isolation and loneliness were less likely to participate in social activities, more likely to exhibit depressive symptoms, and consequently less

satisfied with their lives. This underscores the importance of fostering social engagement and connection to reduce loneliness and enhance psychological well-being and life satisfaction during the pandemic. Our findings indicate that belongingness can serve as a protective factor, enhancing psychological well-being. International students with a stronger sense of belongingness tended to report higher life satisfaction and improved psychological well-being during the COVID-19 pandemic. Consistent with previous studies [28, 18, 15, 19, 88, 89], we found a sense of belongingness acts as a strong protective predictor and a valuable support resource, contributing to physical health, psychological well-being and life satisfaction- a comprehensive assessment of one's feelings, attitudes, and behaviours [90, 91, 92, 18, 19]. Strong social connections have been shown to increase life satisfaction and improve quality of life [95, 89], while a lack of belongingness can contribute to anxiety and depression. A sense of belongingness can buffer students from stress, encourage greater social engagement, and help them cope with stress more effectively [96, 97], resulting in fewer mental health problems [13]. Previous research also suggests that social networks of friends and families, social support and a sense of mattering contribute significantly to an individual's well-being and life satisfaction [96, 81]. This suggests that fostering a sense of belonging is crucial for the well-being of international students during the COVID-19 pandemic, enabling them to navigate adversity and life challenges. Recent studies indicate that university students' sense of belonging has been undervalued since the pandemic, as many have lost their social connections [28]. Given that international students in Canada are a particularly vulnerable group, they may have formed fewer social connections and struggled to engage in social activities due to COVID-19 restrictions, which limited social interactions and access to services. These challenges, along with cultural and language barriers, may have further exacerbated their social disconnections. Our findings revealed a negative association between belonging and loneliness, perceived stress, and acculturation stress [30]. Additionally, life satisfaction was positively correlated with a sense of belonging. Belongingness is essential for international students to promote their psychological well-being. Our results showed that perceived stress and acculturation stress mediated the relationship between belongingness and psychological well-being. International students who experienced higher levels of stress were more likely to report lower well-being. A strong sense of belongingness significantly predicted greater well-being and life satisfaction, particularly among those who perceived lower levels of stress. The COVID-19 pandemic in the Spring of 2020 had a profound impact on many aspects of daily life, intensifying numerous challenges. International students, as a vulnerable group in Canada, faced unique difficulties, including psychological, sociocultural, and educational disruptions, as well as financial challenges during the pandemic crisis [41]. These challenges resulted in prolonged stress, anxiety, and increased concerns about managing academics, particularly due to the shift from in-person to online learning [43]. International students abroad must also contend with various acculturative stressors such as cultural differences, language barriers, homesickness, discrimination, and social and academic disintegration [5, 98]. The prolonged stress heightened perceived stress, social isolation and difficulties adjusting to the Canadian culture (acculturation stress), leading to poorer mental health [44], lower life satisfaction, and diminished well-being among international students [24]. Current research also identified income level as a positive predictor for emotional and psychological well-being. International students with higher incomes reported better psychological well-being compared to those with lower or

middle-income levels. These findings align with recent studies showing that lower income levels among international students in Canada increased their financial challenges and stress during the COVID-19 outbreak [99]. Additionally, students from North America reported greater life satisfaction than those from Africa and Europe. This may be because North American students were more likely to adapt to life in Canada, which is consistent with the previous study<sup>100</sup>. Graduate students reported lower life satisfaction compared to third and fourth-year undergraduate students, possibly due to higher academic stress among graduate students.

## 5. Limitations and Implications

It is important to consider these findings in light of several limitations. First, the results are based on cross-sectional research, and data was collected using convenient sampling, which may not accurately represent the entire population of international students in Canada and result in the sampling bias and selection bias. Second, the reliance on self-report surveys may result in interpretation biases. Third, the study's correlational design limits the ability to draw causal conclusions. Future research could benefit from employing multiple research methods to mitigate sampling biases. Despite these limitations, the study offers valuable insights for human services aimed at fostering relational and societal resilience, as well as enhancing the resilience of international students. Practitioners and policymakers should consider cultural strengths in their efforts to support international students. Special attention must be given to mental health during times of crisis. Life satisfaction has a significant impact on well-being and is closely tied to feelings of belongingness and loneliness. Universities and colleges should expand mental health counselling services, promote culturally sensitive counselling, and implement accessible support systems tailored specifically to the needs of international students. Enhancing the life satisfaction and well-being of international students through positive activities can be highly beneficial. Fostering a sense of belonging within community groups and neighbourhoods can improve their mental well-being and reduce social isolation. School programs would focus on helping students build social connections, addressing feelings of loneliness, and encouraging them to seek support for stress and mental health challenges related to isolation. This study enhances our understanding of the challenges faced by international students and educational institutions amid the COVID-19 pandemic while offering strategies to strengthen resilience and improve mental health and psychological well-being. Interventions that promote a sense of belonging can significantly enhance mental health outcomes. This study provides evidence-based recommendations for supporting international students during the COVID-19 pandemic. Future research should continue to explore institutional efforts to promote belonging, as the evidence highlights their positive impacts. Policymakers, universities, and stakeholders should prioritize fostering a sense of belonging to improve the health, mental health, well-being and overall success of international students.

## 6. Conclusions

The results enhance our understanding of the multifaceted challenges faced by international students during the COVID-19 pandemic. Our empirical findings confirm that belonging is a positive predictor of psychological well-being and life satisfaction for international students in Canada during this stressful period. The sense of belonging remains a crucial factor in their well-being, even amid the pandemic. The pandemic has introduced additional stressors for international students. We also

examined a mediational model based on general theoretical frameworks, which suggested that perceived stress and acculturation stress mediate the relationship between belonging and psychological well-being. Educators and mental health professionals can support the well-being of international students by increasing awareness of common stressors, directly addressing the challenges they face, and providing psychoeducation to foster resilience. Discussions should emphasize the importance of preventive efforts and practical strategies to help international students reduce social loneliness, perceived stress and acculturation stress. By doing so, students are more likely to experience greater life satisfaction and improved well-being during their transitions in Canada amidst the pandemic. These findings highlight the significant impact of social and cultural factors on the mental health and well-being of international students in Canada during COVID-19.

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## Authors contributions to this manuscript:

Dr. Su, developed the first manuscript draft, research design, recruiting data, data analyses, interpreted analyses, and final versions of the manuscript.

Dr. Flett, conceptualized the study, research design, and the manuscript revisions.

Chigozie Somtochi Akalonu, completed some literature reviews, editing, references check.

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