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Social Connectedness and its Relation to Perceived Stress and Loneliness

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Abstract

This study evaluated university students' levels of overall social connectedness, perceived stress, loneliness, and strength of social connection with different groups (family, friends, classmates, instructors, university community). Associations between the aforementioned factors were also investigated, and time-related changes to 2020-21 data during COVID-19. Undergraduate students (n = 100) at a university in London, Ontario, completed a questionnaire comprising the Social Connectedness Scale, questions about the strength of social connections with different groups, the UCLA Loneliness Scale, and the Perceived Stress Scale. A correlational analysis revealed significant, negative correlations between social connectedness and perceived stress and loneliness. A repeated measures ANOVA analysis revealed that family and friends were associated with higher levels of social connectedness and lower levels of perceived stress and loneliness. Higher levels of social connectedness in relation to in-person interactions compared to online interactions were also reported. Students' levels of perceived stress appeared higher than in past research, as well as their levels of connection with classmates, instructors, and the university community in comparison to 2020-21 data.

Keywords: social connectedness, perceived stress, loneliness, COVID-19, relationships, undergraduate, university students

Humans are naturally social creatures, born with an innate need to belong and create fulfilling relationships (Baumeister & Leary, 1995). Social connectedness has been found to be an important contributor to positive mental health, due to the fact that humans are born dependent on other people, as babies are unable to survive independently (Liberman, 2013). Because of this immediate dependency, humans have an attachment system that lasts throughout their lives, which is part of what makes social connectedness so ingrained into human nature (Liberman, 2013). Social connectedness is defined to be a sense of belonging and the psychological bond people feel in relation to other individuals and groups (Haslam et al., 2015). This means that in order to feel socially connected, the individual needs to feel a sense of connection and feel a sense of fulfillment from the relationship. A loss of a sense of fulfillment in a social relationship can result in feelings of loneliness; it can also be a consequence of stress through complex biological, physical, social and genetic factors (Campagne, 2019). Perceived stress emerges from an imbalance between threats and demands from the environment and the resources designed to meet those demands (Cohen, 2000). It has been previously found to have a bidirectional relationship with loneliness (Campagne, 2019). Loneliness has been defined to be the result of a lack of intimate social connections rather than a lack of social contact (Baumeister et al., 2017). It has been found to be the result of a lack of intimate social connections rather than a lack of social contact (Baumeister, Leary, 1995). This information shows that a sense of connection and acceptance is important for an individual to feel a sense of fulfillment from social interactions.

A sense of connection in an individual's environment is strongly related to positive self-perception, as well as stronger scholastic competence when related to school settings (Pittman & Richmond, 2008). This need for a regular attachment system is why social circles

tend to change throughout different life stages; when an individual is separated from their initial social circle, they need to replace them with another group (Pittman & Richmond, 2008). These kinds of changes result from various aspects including maturation and environmental changes that introduce a different social pool (Pittman & Richmond, 2008). Young adults who graduate from their familiar high school population and are quickly introduced to a novel, larger university social pool introduces the opportunity to determine who they choose to bond with but also propose the risk of a lack of connection with other individuals, and the larger school community (Pittman & Richmond, 2008). This is supported by findings that show how friendships serve as effective social support when dealing with the challenges that come with adulthood, and the challenges and adjustment that come with that life stage (Miething et al., 2016). During this stage of adjustment, young adults in a new university setting need a sense of connection, since a lack of belongingness has been found to increase their likelihood of increased stress, and emotional distress (Pittman & Richmond, 2008). An investigation of university-aged young adults that found how challenges within interpersonal relationships with their family, friends and romantic partners were strongly associated with high stress as well as poor mental health (Darling et al., 2007). The most significant relationship stressor in the young adult university population was being separated from their familiar social circles, such as their family, and childhood friends (Darling et al., 2007). These findings help express how important regular and supportive social interaction and a sense of belonging are for regular coping and positive adjustment for the university student population.

The importance of social connectedness for development was shown through Orben and colleagues' (2020) investigations on how crucial social connection is for adolescents, as they are more sensitive to peer acceptance, rejection, and approval compared to young children and adults

(Orben et al., 2020). Their findings revealed how crucial social interaction can be for appropriate brain development as humans gradually mature; regularly interacting with others allows them to develop cognitive abilities such as self-referential processing, which enables adolescents to better understand the perspectives of others (Orben et al., 2020). The formation of social bonds has also been found to be associated with positive emotions, while feelings of anxiety and depression have been found to be a result of feelings of rejection, loneliness and failing to feel accepted (Baumeister, Leary, 1995). This has been found to define the difference between social connection and mere social contact, as mere social contact does not equate to acceptance and a fulfilling social relationship (Baumeister, Leary, 1995). Considerable research has also found that people with insufficient supportive intimate relationships tend to experience greater stress than those who do, which shows how influential social connection is on stress and well-being (Baumeister, Leary, 1995). Based on these findings, social connectedness is likely to be a significant buffer against stress while promoting positive well-being throughout development.

An investigation by the National College Health Assessment (NCHA) determined through a survey that the top three factors negatively affecting students' performance are stress, anxiety, and sleep difficulties (Rahn et al., 2016). Stress was the top predictor as reported by 49% of Brescia students, 48% of Western students and 54% of Huron students (Rahn et al., 2016). Perceived stress is a result of an imbalance between demands or threats and resources designed to deal with those demands (Cohen, 2000). Chronic stress can result in physical effects which can result in an increased risk of hypertension, diabetes, allergies, or repeated substance abuse (Cohen, 2000). Stress can also affect mental health negatively due to frequent activation of the neural stress response, creating maladaptive neuroendocrine responses (Cohen, 2000). This can put the individual at greater risk of anxiety and depression symptoms (Cohen, 2000). This

concept is also highlighted through the behavioural investigations of animal models by Orben and colleagues (2020) who found that even a brief deprivation of social contact can cause anxiety, hyperactivity and heightened sensitivity to social rewards (Orben et al., 2020). These past research findings have revealed how stress can be a negative contributor to mental health and provides space for the investigation of helpful buffers for stress reduction.

Social connection has been researched in regard to its connection to stress, loneliness and anxiety levels. Social connectedness has been found to alleviate stress in response to potentially stressful situations that seem to be out of individuals' immediate control (Kar et al., 2021). Findings from Seppala, Rossomando, and Doty also revealed that social connection helps regulate emotional reactions, and serves as a buffer against stress and pain; their investigations showed that individuals who held their spouse's hand showed increased activation in brain areas associated with emotional regulation, which relates to perceived stress levels and their management (2013). These findings contribute to the idea that social connection may be an effective buffer for the negative effects of stress.

Investigations focused on the importance of social connectedness throughout life stages have found that "… high-quality peer relationships during adolescence appear to protect against mental health problems and strengthen adolescent resilience" (Orben et al., 2020). Their research also revealed that social interaction has been found to help develop self-referential processing, executive control, and mentalizing; skills that help adolescents better understand the minds and perspectives of others (Orben et al., 2020). Sladek and Doane (2015) found that higher levels of social connectedness were related to physiological indications of low stress, such as sleeping easier and longer, and a more adaptive Cortisol Activation Response once they wake up the next

day. This research has helped reveal how social connectedness has been shown to play an important role in reducing perceived stress and loneliness.

Loneliness or the lack of intimate social connections (Baumeister et al., 2017) has been shown to be closely related to levels of perceived stress. For example, Baumeister et al. (2017) found that people who do not have sufficient supportive intimate relationships tend to experience greater stress than those who do, highlighting the role of fulfilling social connections on stress and well-being. Campagne (2019) investigated the relationship between stress and social isolation and determined that this relationship appears bidirectional. That is, loneliness appears to result in higher stress levels, but also that higher stress levels appear to result in more loneliness (Campagne, 2019).

The beginning of the COVID-19 pandemic in 2020 resulted in an initial mandated quarantine which discouraged direct, in-person social contact. Various factors of the pandemic contributed to feelings of uncertainty and lack of control, such as a lack of effective treatment and preventive methods, a large number of deaths in various countries including those with excellent health services, the vulnerability of healthcare workers, and massive impacts on economies (Kar et al., 2021). These confounding variables in addition to a lack of regular social connectedness contributed to decreased mental health and increased perceived stress (Kar et al., 2021). Kar et al., (2021) reported higher proportions of moderate/high anxiety levels and moderate/high depression symptoms in college and university students during the onset of the pandemic. Kar and colleagues aimed to determine the most common and effective coping mechanisms used by young adults amid the pandemic (2021). While the most common coping strategy was found to be "hoping for the best", other frequent coping strategies included remaining busy in activities, having religious faith, problem-solving, sharing feelings, and

talking to others (Kar et al., 2021). Folk and colleagues (2020) also investigated how social connectedness was impacted by the COVID-19 pandemic. They found that university students reported significantly lower levels of social connectedness during the pandemic compared to their previous reports before the lockdown (Folk et al., 2020). Mental distress was observed to have increased significantly early in the pandemic with the biggest increase occurring in young people aged 18 - 24 years old, with young women showing larger increases in mental distress than young men. (Pierce et al., 2020).

These findings highlight the importance of examining potential buffering factors for stress in young people in general, and in young women specifically. (Mackenzie (2021) investigated how social connectedness was related to perceived stress during the first year of the COVID-19 pandemic in an all-female undergraduate university student population. The Social Connectedness Scale - Revised was used to measure social connectedness levels (Lee et al., 2008). Perceived stress levels were measured using the Perceived Stress Scale (PSS) (Cohen et al., 1983). Students' levels of perceived stress were found to be higher than those reported in prior research reflecting the detrimental impact of the COVID-19 pandemic on increasing perceived stress (Mackenzie, 2021). In addition, different levels of social connection with different social groups were found, with significantly higher levels of social connection reported with family and friends. (Mackenzie, 2021). Importantly, Mackenzie (2021) also showed that social connections with different social groups contribute differentially to levels of perceived stress. Higher levels of social connections with both family and friends, but not classmates, instructors, or the school community, significantly predicted lower levels of perceived stress (Mackenzie, 2021). This study demonstrated that social connections with certain social groups are more important than others to female university students during times of great stress; greater

social connections with family and friends seem to reduce perceived stress while social connections with other groups do not. It is not known, however, how frequent and what type of social interactions give rise to feelings of more social connection in female university students. It is also not known how feelings of loneliness relate to social connections with different social groups or to perceived stress in female university students.

The current study investigated the relationship between social connections, loneliness and perceived stress in female Brescia University College students during the late phase of the COVID-19 pandemic (the 2022-23 academic year). Details about levels of connections with different social groups and frequency and types of social activities were collected, and levels of social connectedness, loneliness and perceived stress were assessed to probe for putative relationships. A comparison to data collected from early in the COVID-19 pandemic (the 2020-21 academic year) will also probe for time-related changes in the measures. The level of participants' social connectedness with different groups was tested with the Social Isolation Index scale (SII) modified to apply more strongly to an undergraduate student population (Wistar et al., 2019). Levels of social connection and satisfaction with connections with different social groups: family, friends, romantic partners, classmates, instructors, and school community were assessed as in Mackenzie's (2021) study and the frequency and type of social interactions with each social group were also characterized with the Level of Social Connection with Different Groups Questionnaire. To determine the overall level of social connectedness of participants, the Revised Social Connectedness Scale (SCS - Revised) was used (Lee et al., 2008). In order to investigate the participants' level of loneliness, the Revised UCLA Loneliness Scale was used (Russell, 1996). Lastly, the Perceived Stress Scale (PSS) was used to determine the participants' level of perceived stress over the past month (Cohen et al., 1983).

It was hypothesised that higher levels of social connectedness would be significantly negatively related to measures of perceived stress and loneliness. It was also hypothesised that stronger social connections with friends, family, and romantic partners would be the strongest predictors of lower levels of perceived stress and loneliness. This study will be important for evaluating social connectedness, loneliness, and perceived stress levels in Brescia students during the resolution of the COVID pandemic. Further, this study may identify specific social interactions that buffer against loneliness and perceived stress providing potential opportunities for intervention or support in female undergraduates.

Method

Social Connectedness and Perceived Stress Data 2020-21

Data to examine time-related changes in social connectedness and perceived stress was first collected from ninety-one undergraduate students (18 - 32 years old) enrolled in the first-year psychology course, PSY 1015B during the winter term of the 2020-21 academic year. These participants completed an online survey through research participation software and completed four questionnaires including a demographics questionnaire, the Social Connectedness Scale (Lee et al., 2008), the Perceived Stress Scale (Cohen et al., 1983), and the Level of Social Connections with Different Groups Questionnaire (Mackenzie, 2021). All of these measures were used in the current study.

Participants

One hundred undergraduate students (99 identified as female; 1 preferred not to say), from a Canadian women's university generated data during the 2022-23 academic year. To be eligible to participate, students were required to be enrolled in the first-year psychology course, PSY 1015B, which occurred during the winter term (January - April 2023) of the 2022-23

academic year. Participants were recruited via research participation software that was accessible through their psychology course. Participants received one research participation credit for participating in the study. All study procedures were approved by the Brescia University College Research Ethics Board, and all participants provided informed consent before beginning the study.

Materials

The study consisted of an online survey that contained questions from six questionnaires to determine their levels of social connectedness, loneliness and perceived stress, as well as their connectedness with different social groups.

Demographic Questions

First, participants were required to complete 11 demographic questions (Appendix A) that were created to collect information on attributes such as gender and age previously shown to affect social connectedness, such as (Lee & Robbins, 1995: Hair et al., 2008). An example of a demographic question is "Please specify your gender".

Level of Social Connections with Different Groups Questionnaire

Participants were then asked to complete 11 questions about the level of social connections with various groups (Appendix B), in order to explore and qualify students' Strength of Social Connections with specific social groups such as their families, friends, and classmates (Mackenzie, 2021). These questions are measured on a five-point Likert scale ranging from "Not at all connected" to "Very connected" or "Want a lot less connection" to "Want a lot more connection". An example of a question from this set of questions is "How do you feel about your level of connection with the Brescia community?

Social Isolation Index - Revised (SII-Revised)

Participants then completed 19 questions comprising our revised version of the Social Isolation Index (SII) (Appendix C) which was used to determine the regular social circle of the participants and the type of interactions that regularly occur with those different groups (Wistar et al., 2019). This scale was originally developed to assess the social connections of middle-aged adults, so it was modified by the researchers for this study in order to better assess the social interactions of university undergraduate students. Responses were determined based on the participants' responses from the options presented on a seven-point Likert scale, which either range from "+5 - "Once a day or more" to "0 - Never", An example of a question from the SII-Revised is "How often do you visit/connect/engage in activities at home with your close friends?".

Social Connectedness Scale - Revised (SCS-Revised)

Participants were then required to complete the fifteen questions from the Social Connectedness Scale-Revised (SCS-Revised) (Appendix D) to determine information about their overall levels of Social Connectedness (Lee et al., 2008). Responses were measured based on responses on six-point Likert scales, which range from "Strongly Disagree" to "Strongly Agree". An example of a question from the SCS-Revised is "I feel close to people".

UCLA Loneliness Scale-Revised

The 20-item revised UCLA Loneliness Scale (Appendix E) was then used to determine the level of Loneliness the participants were experiencing (Russell, 1996). It was created to measure participants' feelings of Loneliness and perceived social isolation. Responses are recorded using a four-point Likert Scale ranging from "Never" to "Always". An example of a

question from the Revised UCLA Loneliness Scale is "How often do you feel that you lack companionship?"

Perceived Stress Scale (PSS)

The final fourteen questions (Appendix F) were used to obtain information about the participants' levels of Perceived Stress (Cohen et al., 1983). Responses were recorded using five-point Likert Scales, which range from "Never" to "Very often". An example of a question from the PSS is "In the past month, how often have you found that you could not cope with all the things you had to do?"

Procedure

Participants accessed this study by first logging into a research participation software. They were then able to view the Study Description on the research participation software and were able to select the study in order to participate. They were taken to the Qualtrics website via an anonymous link, where they were first shown a letter of information and were asked to confirm their consent before continuing. They were then prompted to complete the study virtually for approximately 30 minutes. Once participants completed the survey, they were shown a debriefing form that contained information for contacting the researcher if they had further questions regarding the study.

Results

Before any data analyses were conducted, the data from a participant whose gender was indicated as something other than "female" was excluded; a sample of one is not large enough to form a non-female sample for analysis. This exclusion was necessary due to past research that suggests sex and gender differences in social connectedness (Liu et al., 2022). In addition, nine

participants were excluded based on how long they spent completing the questionnaire. Participants who took less than one-third of the median duration (< 204 secs), or more than 3 times the median duration (> 1833 secs) were also excluded (Worley & Mucci-Ferris, 2021). This yielded a final sample of 90 participants who all identified as female, undergraduate students.

Characterising Perceived Stress, Social Connectedness, Loneliness and Social Connection with Different Groups

Descriptive statistical analyses were performed to obtain means and standard deviations for the PSS, the SCS, the UCLA Loneliness Scale, and the Strength of Social Connection with different social groups. Perceived Stress levels for 2022-23 were reported as $M = 29.55$, $SD = 7.69$ (Figure 1) and Social Connectedness levels were reported as $M = 59.56$, $SD = 14.22$ (Figure 2). UCLA Loneliness Scale measures were reported as $M = 45.08$, $SD = 10.97$ (Figure 3).

The descriptive analysis for levels of connection with different social groups reported Family as M = 3.78, SD = 0.97, Friends as M = 3.50, SD = 1.07, Classmates as M = 2.46, SD = 0.92, Instructors as M = 3.12, SD = 0.90, and the University Community as M = 2.82, SD = 1.10 (Figure 4).

Time-Related Changes in PSS, SCS and Strength of Social Connections

The measures of Perceived Stress, Social Connectedness and Strength of Social Connection with different groups were compared to data obtained during the 2020-21 school year, through an independent samples t-test. The independent samples t-test revealed that PSS scores for 2022-23 were significantly higher than PSS scores for 2020-21, $t(171) = -6.10$, $p < .001$ (Figure 1). There was no statistically significant difference in participants' SCS scores, $t(171) = 1.84$, $p = .068$ (Figure 2). The independent t-test also revealed that there was a

Figure 1

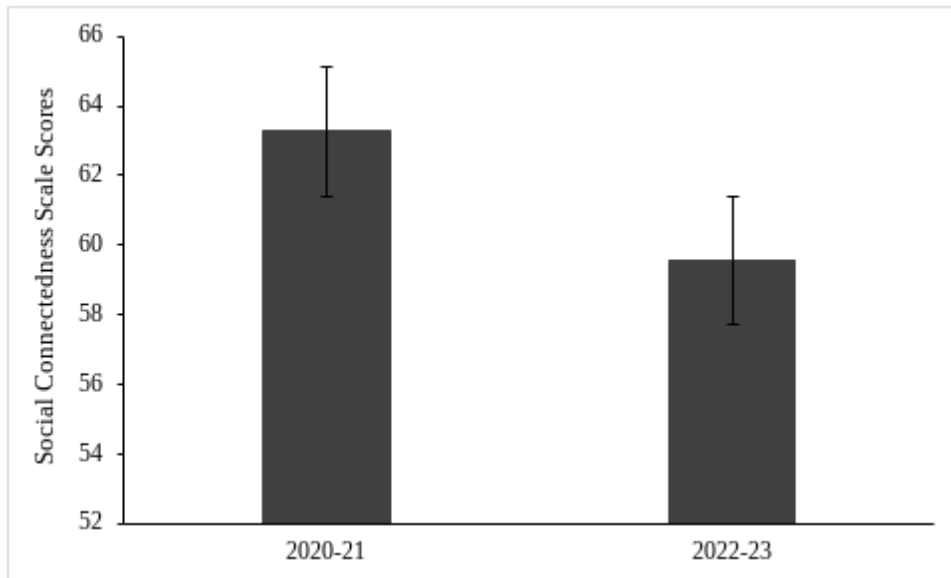*Mean levels of perceived stress*
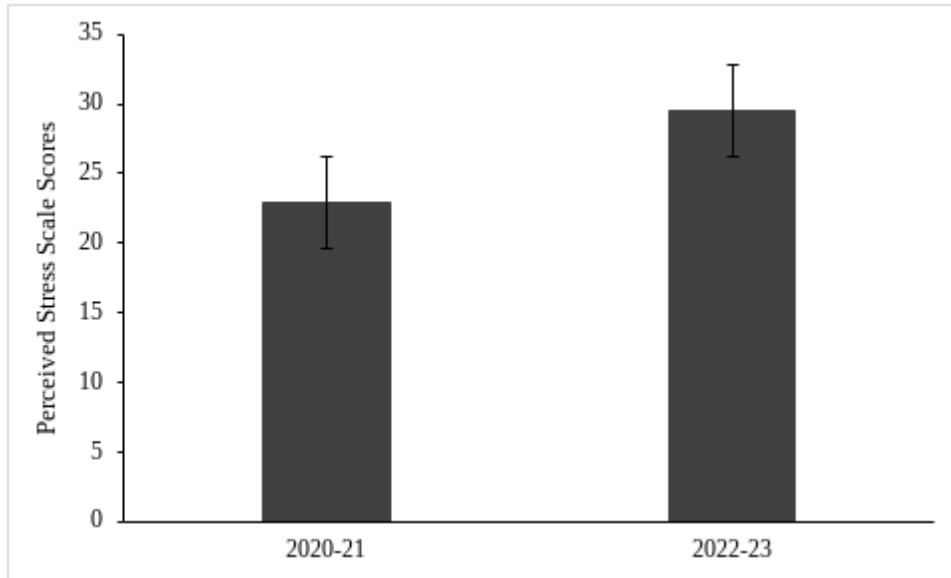
Note. Height of bars indicate mean scores. Error bars represent Standard Error of the Mean

(SEM).

Figure 2

Mean levels of social connectedness

Note. Height of bars indicate mean scores. Error bars represent Standard Error of the Mean

(SEM).

Figure 3

Mean level of loneliness

*Note.* Height of the bar indicates the mean UCLA Loneliness Scale score.

significant increase in participants' Strength of Social Connection with Classmates, $t(170) =$ -6.21, $p < .001$, Instructors, $t(170) = -6.54$, $p < .001$, and the University Community, $t(170) =$ -3.33, $p = .001$ (Figure 4). There was no statistically significant difference in participants' Strength of Social Connection with Family $t(170) = 1.20$, $p = .231$ or Friends $t(169) = -0.25$, $p =$ .801 (Figure 4).

Strength of Connections with Different Social Groups

A repeated measures ANOVA with a within-subjects factor of Social Group (5 levels: Family, Friends, Classmates, Instructor & University) and between-subjects factor of the year (2 levels: 2020-21, 2022-23) was conducted to probe for differences among Strength of Social Connection with these different social groups and time-related changes. This ANOVA revealed a significant main effect of Year $F(1, 169) = 21.40$, $p < .001$, $\eta = .03$ and a significant Social Group * Year interaction $F(4, 676) = 13.40$, $p < .001$, $\eta = .03$. Tukey's post hoc tests revealed that participants reported significantly stronger social connections in 2022-23 than in 2020-21 (p < .001). Further, the Strength of Connection with the different social groups are different in each year. Tukey's Post Hoc tests revealed that in 2020-21, participants reported significantly stronger social connections with Family than any other social group, including Friends (p < .001), Classmates (p < .001), Instructors (p < .001), and University Community (p < .001). Post hoc comparisons also revealed that participants were significantly more socially connected with Friends than with Classmates (p < .001), Instructors (p < .001), and University Community (p < .001). Lastly, participants were significantly less connected with Classmates than with Instructors (p < .001) and University Community (p < .001). There was no significant difference between participants' levels of connection with Instructors and the University Community (p = .972). In contrast, in 2022-23, participants did not report a significant difference in Strength of Social

Figure 4

Mean levels of social connection with different groups
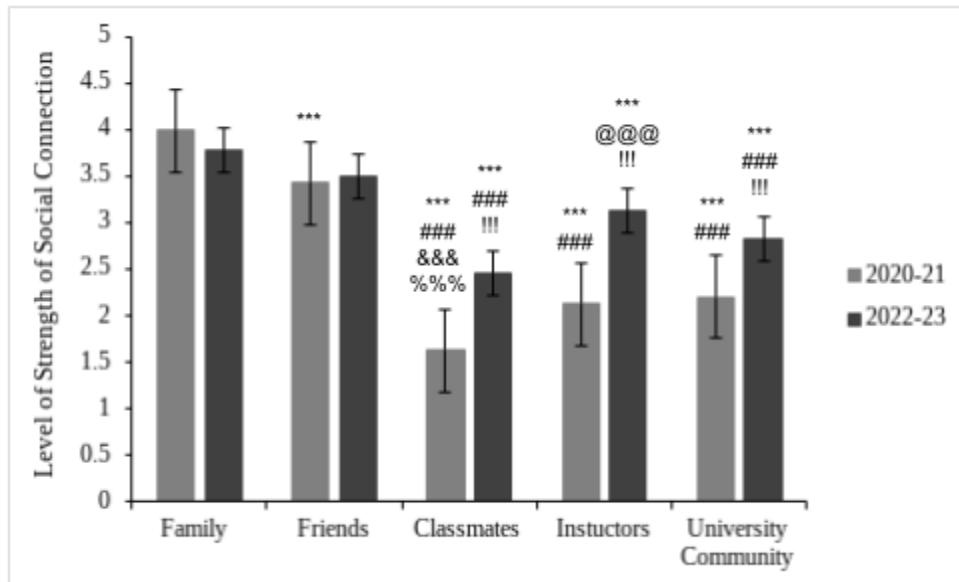
Note. Height of bars indicate means. Error bars represent SEM. Strength of Social connection was significantly different among groups. *** p < .001; significantly lower than Family. ### p < .001; significantly lower than Friends. @@@ p < .001; significantly lower than Classmates. !!! p < .001, . For the 2020-21 comparison data, &&& p < .001, significantly lower than Instructors. %%% p < .001, significantly lower than the University Community. Error bars represent Standard Error of the Mean (SEM).

Connection between Family and Friends (p = .59). However, in 2022-23, participants reported significantly stronger social connections with Family than with Classmates ($p < .001$), Instructors ($p < .001$), and the University Community($p < .001$) (Figure 4). Participants also reported feeling significantly stronger connections to Friends than to Classmates ($p < .001$) and the University Community.($p < .001$), but there was no significant difference in their Strength of Social Connection between Friends and Instructors ($p = .107$) (Figure 4). It was reported Strength of Social Connection was significantly lower for Classmates than for Instructors ($p < .001$), and there was no significant difference between Classmates and the University Community ($p = .13$) (Figure 4). Lastly, there was no significant difference between participants' levels of connection with Instructors and the University Community ($p = .28$)

In-Person & Online Interactions

Frequency of in-person and online interactions with different social groups were analysed using a repeated measures ANOVA with within-subjects factors of Social Group (5 levels: Family, Friends, Classmates, Instructor & University Community) and Interaction Format (2 levels: In-Person & Online). The ANOVA revealed that there were significant main effects of Format $F(1, 84) = 77.3$, $p < .001$, $= .043$, and Social Group $F(3, 252) = 46.7$, $p < .001$, $= .220$, as well as a significant Social Group * Format Interaction $F(3, 252) = 12.7$, $p < .001$, $= .012$. The frequency of In-Person Interactions was significantly lower than the frequency of Online Interactions $t(84) = -8.79$, $p < .001$. Tukey's post hoc tests for In-Person and Online Interactions revealed that participants reported significantly higher frequencies of interactions with Family in comparison to Friends (p < .001), Roommates (p < .001), and Partners (p < .001). The significant Format * Social Group interaction shows that the frequency and nature of social interactions with

the different social groups are complex. These effects are difficult to summarise but can be seen in Figure 5.

We hypothesised that participants would report higher rates of social connectedness on the SCS with increased In-Person Interactions, so a correlational analysis was done to compare SCS scores with In-Person Interactions scores. The correlation indicated a significant, moderate, positive correlation between the SCS score and In-Person Interactions, $r(87) = .46, p < .001$. It also reported a significant, weak, positive correlation between the SCS score and Online Interactions, $r(87) = .17, p < .001$ (Table 1).

Relationships Among Social Connectedness, Perceived Stress, Loneliness scores, and Patterns of Social Connection

In order to evaluate the relationships among the scores of the SCS, PSS, and the UCLA Loneliness Scale, A Pearson correlational analysis was conducted.

The correlation results revealed that there was a significant, weak, negative relationship between the Social Connectedness scores and Perceived Stress scores, $r(86) = -.27, p = .012$ (Table 2). There was a significant, moderate, negative correlation between the Social Connectedness scores and Loneliness scale scores, $r(86) = -.48, p < .001$ (Table 2). These relationships indicate that as Social Connectedness goes up, both Perceived Stress and Loneliness goes down. Lastly, a significant, strong, positive correlation was shown to exist between the Perceived Stress scores and Loneliness scale scores, $r(86) = .67, p < .001$ (Table 2). Lastly, a significant, strong, positive correlation was shown to exist between the Perceived Stress scores and Loneliness scale scores, $r(86) = .67, p < .001$ (Table 2).

Figure 5

Mean differences between interaction format and social groups
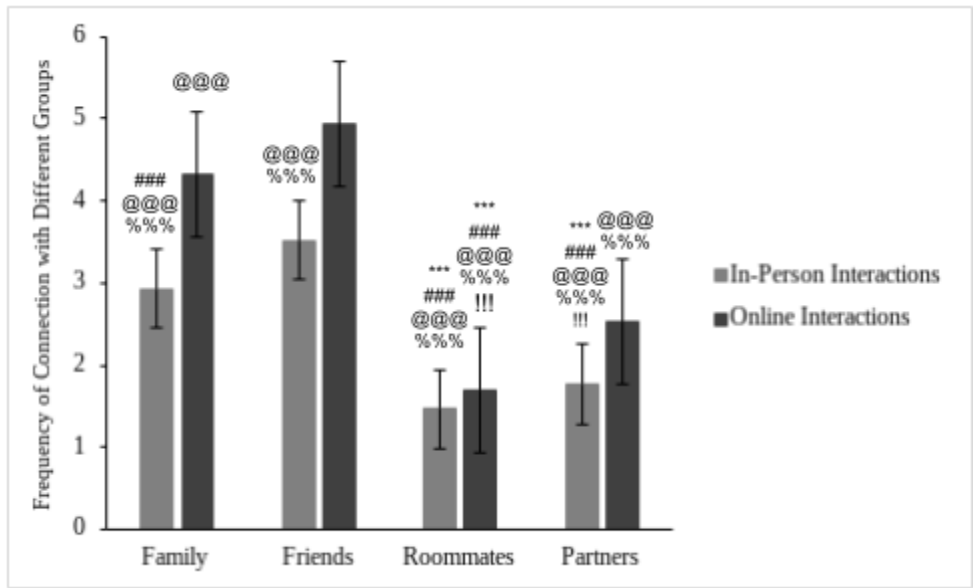
Note: Height of bars indicate means. Error bars represent SEM. Frequency and nature of social interaction with different social groups were significantly different among groups. *** $p < .001$; significantly lower than In-Person Family. ### $p < .001$, $p = .011$; significantly lower than In-Person Friends. @@@ $p < .001$, $p = .019$; significantly lower than Online Friends. %%% $p < .001$, $p = .003$; significantly lower than Online Family. !!! $p < .001$; significantly lower than Online Partners. Error bars represent Standard Error of the Mean (SEM).

Table 1

Correlations between In-Person Interactions, Online Interactions, and SCS

Variable	SCS Score	Pearson's *r*
In-Person Interactions	*p* <.001	.464***
Online Interactions	*p* <.001	.173***

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

Table 2

Correlations between scores of Social Connectedness, Perceived Stress, Loneliness and strength

of social connection with different groups

Variable	SCS	PSS	UCLA
SCS	—	—	—
PSS	p = .012*	—	—
UCLA	p < .001***	p < .001***	—
Strength Family	p = .003**	p < .001***	p = .018*
Strength Friends	p < .001***	p = .002**	p < .001***
Strength Classmates	p = .005**	p = .232	p = .003**
Strength Instructors	p = .676	p -.190	p = .230
Strength University Community	p = .983	p = .405	p = .832

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

In order to determine the relationships present among Perceived Stress, Loneliness, Social Connectedness and the Strength of Connection with different social groups, correlational analyses using Kendall's tau were conducted. The analyses revealed a significant, positive correlation between Family and Social Connectedness scores, r(85) = .32, *p* = .003, a significant, negative correlation with the Loneliness scale scores, r(85) = -.25, *p* = .018 and a significant, negative correlation with the Perceived Stress scores, r(85) = -.40, *p* < .001 (Table 2).

The Friends factor had a significant, positive correlation with the Social Connectedness scores, r(84) = .58, *p* < .001, and a significant, negative correlation with the Loneliness scale scores, r(84) = -.54, *p* < .001, and a significant, negative correlation with the Perceived Stress scores, r(84) = -.33, *p* = .002 (Table 2). The Classmates factor had a significant, positive correlation with the Social Connectedness scores, r(85) = .30, *p* = .005, and a significant, negative correlation with the Loneliness scale scores, r(85) = -.32, *p* = .003, and a non-significant, negative correlation with the Perceived Stress scores (Table 2). There were no significant correlations with Strength of Social Connection with Instructors or the University Community. The Instructors factor had a non-significant, positive correlation with the Social Connectedness scores, a non-significant, negative correlation with the Loneliness scale scores, and a non-significant, negative correlation with the PSS scores (Table 2). Lastly, the University Community factor had a non-significant, positive correlation with the Social Connectedness scores, a non-significant, negative correlation with the Loneliness scale scores, and a non-significant, negative correlation with the Perceived Stress scores, (Table 2). Overall these data suggest higher strength levels with the Family and Friends levels, which had the most significant relationships with Perceived Stress scores and Loneliness scale scores, resulting in a decrease of those factors.

Relationships among SCS, UCLA Loneliness Scale, and PSS and Social Interactions

In order to determine the relationships among scores of Social Connectedness,

Loneliness, Perceived Stress and frequency of Social Interactions with different social groups, of

participants in relation to Online Interactions and In-Person Interactions, a correlational analyses

using Kendall's tau was conducted (Table 3).

The In-Person interactions were significantly positively correlated with higher Social

Connectedness scores, such that the frequency of In Person Interactions increased so did Social

Connectedness, r(86) = .46, *p* < .001 (Table 3). Conversely, there was a significant negative

relationship between the Frequency of In-Person Interactions and Loneliness, such that as

In-Person Interactions were more frequent participants reported significantly less Loneliness

scores r(86) = -.17, p = .006 (Table 3). There was no significant relationship between the

Frequency of In-Person interactions and the Perceived Stress scores, nor between the Frequency

of Online Interactions and Social Connectedness scores, Loneliness or Perceived Stress.

Table 3

Correlations between SCS, PSS, UCLA loneliness scale, online interactions and in-person

interactions

Variable	SCS	PSS	UCLA
In-Person Interactions	p < .001***	p = .700	p = .111
Online Interactions	p = .107	p = .136	p = .243

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

Discussion

The first aim of this study was to evaluate the current overall levels of social

connectedness, perceived stress and loneliness in undergraduate students in the late phases of the

COVID-19 pandemic and how those measures relate to their levels of social connection and type

of social interactions with different groups. We also aimed to compare the finalised data to Social

Connectedness, Perceived Stress and levels of connection measures found in 2020-21 to

determine how and if those levels have changed since the peak of the COVID-19 pandemic

(Mackenzie, 2021). The analyses revealed a significant increase in participants' strength of

connection with their Instructors, Classmates, and University Community in 2022-23, compared

to findings from 2020-21. There was maintenance in participants reporting the strongest sense of

connection with Family and Friends in 2022-23, as previously found in 2020-21. It was found

that increased social connectedness was associated with a decrease in perceived stress and

loneliness; participants also reported a significantly higher strength of social connection with

their Family and Friends in comparison to their Roommates and Romantic Partners. This study

provides further support for the existing literature by demonstrating that there is a link between

social connectedness, perceived stress and loneliness in female university students. It builds upon

past research that has revealed that mental distress increased significantly during the pandemic in

young adults, more among young women in comparison to young men (Pierce et al., 2020). This

makes the female first-year undergraduate population used for this study ideal. It also provides

further support for past studies that found that a strong sense of connection with family and

friends is important for the university student population, as it was found to be related to a

stronger self-perception, and stronger academic proficiency (Pittman & Richmond, 2008). The

current study also extends existing findings that have found that supportive friendships serve as

effective social support when dealing with challenges that are associated with adjusting to a new life stage, such as starting university (Miething et al., 2016).

It was hypothesised that higher levels of social connectedness would be significantly negatively related to lower levels of perceived stress and loneliness. This hypothesis was confirmed, as there was a significant, weak, negative relationship between Social Connectedness and Perceived Stress scores; as social connectedness levels rise, perceived stress levels decrease. The second part of this hypothesis was also confirmed, as there was a significant, moderate, negative relationship between the Social Connectedness and Loneliness scale scores; as social connectedness levels increase, loneliness levels decrease.

This finding that students' social connectedness levels are associated with lower levels of perceived stress and loneliness is supported by past research that has found that social connection helps serve as a buffer against stress (Seppala, 2013). Baumeister and Leary also found that a lack of fulfilling intimate social relationships was a strong predictor for feelings of anxiety and loneliness (1995). Orben and colleagues (2020) further revealed that high-quality peer relationships not only help protect against mental distress but also have a positive impact on brain development during adolescence and early young adulthood. Kar and colleagues also found that participants who coped with the onset of the COVID-19 pandemic by talking and feeling connected to others were less likely to be severely anxious compared to participants who didn't utilise coping skills at all (2021).

It was also hypothesised that stronger social connections would be associated with family, friends, and romantic partners. This hypothesis was confirmed, as the Family factor had a significant, moderate, positive relationship with Social Connectedness scores, and the Friends factor had a significant, strong, positive relationship with the Social Connectedness scores. The

Partners factor was not supported early on, as various participants reported not having a partner, which resulted in non-significant findings. These findings reveal that participants report a significantly stronger social connection with Family and Friends, meaning that those relationships seem to promote a stronger sense of social connectedness. These results are supported by past longitudinal research which suggests that social connectedness with family and friends combined is a strong predictor for a higher sense of well-being (Jose et al., 2012). Social connections with romantic partners were not found to show a significant relationship, though the current study was limited by the number of participants reporting significant romantic relationships. This is an area where further exploration is needed, in order to directly investigate how interactions with romantic partners directly influence social connectedness.

Further research can build upon past findings that suggest that romantic relationships are associated with higher levels of social connection due to the relational influence upon other relationships, which strengthens the romantic relationship as well as the individual's social network (Flynn et al., 2017). It was also predicted that participants would report feeling the strongest sense of connection with their families, friends, and romantic partners, if any. This prediction was partly confirmed, as most participants did not report having a romantic partner, which resulted in non-significant findings between the Partners factor and other relationships. The Family factor was found to have a significantly higher frequency of online and in-person interactions than Friends, Roommates, and Partners. A similar finding was revealed for the Friends factor, which had a significantly higher frequency than Roommates and Partners. The Partners factor showed no significant relationships. This shows that participants reported feeling the strongest sense of connection with their family and friends, which aligns with previous findings that also found that family and friends were the strongest relationships as reported by

undergraduate students in the midst of the COVID-19 pandemic (Mackenzie, 2021).

Additionally, Barber and Olsen's research aligns with these findings, as family and friends were

reported to be the primary domains for socialization, and most valued by participants (1997).

This observation seems to be maintained within the current study.

In terms of their relation to Perceived Stress and Loneliness, the Family, Friends and

Partners factors were correlated to determine potential significant associations. The Family factor

had a significant, negative correlation with the Loneliness scale scores and a significant, negative

correlation with the Perceived Stress scores. This shows an association between the strength of

social connection with family and a reduction in perceived stress and loneliness. These findings

are supported by past research that suggests that familial and friendship support are the main

predictors for the reduction of mental distress for older adolescents and young adults, including

anxiety, isolation, and stress (Bokhorst et al., 2009). The Friends factor also had a significant,

strong, negative correlation with the Loneliness scale scores and a significant, weak, negative

correlation with the Perceived Stress scores. This also reveals an association with the strength of

social connection with friends and a reduction in perceived stress and loneliness. This finding is

supported by past research which suggests that support from friends significantly buffers the

association between stress and loneliness (Lee & Goldstein, 2016). Relations between the

Partners factor, perceived stress and loneliness were not found to be significant due to the

majority of participants reporting not having a partner. This presents a research area where

further investigation is needed. Past research found that individuals with a secure attachment

style tend to seek comfort and connection from their romantic partner(s) when experiencing

feelings of fear, anxiety and isolation (Simpson & Rholes, 2012), which supports criteria for

further research about the possibility of connection with romantic partner(s) being an effective buffer for feelings of Perceived Stress and Loneliness.

It was further predicted that participants would report higher levels of social connectedness from in-person interactions with different social groups compared to online interactions with those social groups. As predicted, there was a significant, moderate, positive relationship between SCS scores and In-Person Interactions measures, while there was a significant, weak, positive correlation between SCS scores and Online Interactions measures. Participants reported higher levels of social connectedness as a result of in-person interactions compared to online.

This finding could be a result of the lifting of initial COVID-19 restrictions that allow people to meet with people outside of their households (Ministry of Health, 2023). This finding builds upon past research that has found that online interactions and social support are less effective for individuals who have experienced high levels of in-person social support (Cole et al., 2017). Since students have reported feeling higher levels of social connectedness from in-person interactions compared to online, it indicates that interacting with their family, friends, roommates, and romantic partners in-person offers a higher sense of relief from stress and loneliness in comparison to online interactions. This is supported by the current study's findings that revealed both Online and In-Person Interactions to have non-significant, weak, positive relationships with the Perceived Stress and Loneliness scale scores. This shows that any type of social interaction results in a nominal rise in feelings of loneliness and stress.

The finding that participants reported feeling significantly more socially connected to their instructors, classmates, and the university community in comparison to 2020-21 findings may also be indicative of the effects of the COVID-19 guidelines that were updated for 2022,

which reintroduced in-person meetings within schools and households (Ministry of Health, 2023). As students were reintegrated back into mainly in-person classes and interactions, they also had the opportunity to interact with their instructors, classmates and the university community in person. This finding was expected, due to the reduction of asynchronous learning that was a product of online/distance learning. Classes that were offered during the COVID-19 pandemic often had no scheduled class time or a live lecture, meaning that there was little to no opportunity to interact directly with classmates and instructors in a common space. In-person classes now present the opportunity for students to work with and interact directly with their classmates and instructors, as they are able to ask questions and contribute to live discussions within a common learning environment. Vaillancourt and colleagues (2021) found that participants who experienced full-time online schooling felt like they mattered significantly less in comparison to participants who experienced full-time in-person schooling; revealing that in-person schooling and interactions help convey to students that they matter and contribute to fostering a supportive learning environment.

In terms of the relationships between feelings of Social Connectedness and participants' Strength of Social Connection with their families, friends, classmates, instructors and the university community, it was predicted that students would report feeling most connected to their families and friends. This prediction was confirmed by the current study, as the Family and Friends factors both had significant, strong, positive relationships with the Social Connectedness scores, while the Classmates factor had a significant, weak positive relationship with the Social Connectedness scores. The Instructors and University Community factors both had non-significant, weak, positive relationships with the Social Connectedness scores. These findings validate past research that revealed participants feeling higher levels of social

connectedness with their families and friends (Mackenzie, 2021). While the current study's findings show a significant rise in participants' strength of social connection with their classmates, instructors, and the university community from 2020-21 measures, there were no significant differences in overall social connectedness measures. This is likely due to the nature of how participants value social relationships, as it is likely they value familial relationships and friendships more than relationships with their classmates, instructors, and the university community. This is supported by findings from Stewart and Suldo (2011) who tested how perceived social support from parents, classmates and teachers would support well-being; support from parents was found to be the strongest predictor of all indicators of mental health relief. Bokhorst and colleagues (2009) also found that social support from family and friends was equally supportive and beneficial for the reduction of mental distress, compared to classmates and teachers; support from friends only exceeded familial support for participants in late adolescence. The current study has revealed a significant shift in levels of strength of connection with classmates, instructors, and the university community since the initial COVID-19 pandemic social isolation measures and the significantly strong sense of connection participants have maintained with their families and friends.

In addition, it was anticipated that there would be a significantly or non-significantly weak or negative relationship between the social groups and the Perceived Stress and Loneliness scale scores. This would mean that each relationship would act as a buffer against Loneliness and Perceived Stress, and would either lower or significantly reduce the presence of those feelings. This prediction was proven, as the Family and Friends factors had significant, negative relationships with the Loneliness scale scores, and with the Perceived Stress scores. This means that the strength of participants' relationships with their families and friends contributes to a

reduction in feelings of loneliness and stress. This was also seen with the Classmates factor, as there was a significant, weak relationship with the Loneliness scale scores and a non-significant, negative relationship with the Perceived Stress scores, meaning that this relationship resulted in a reduction in feelings of Loneliness and had no impact on feelings of Perceived Stress. The Instructors and University Community factors both had non-significant, negative relationships with the Loneliness scale scores and Perceived Stress scores, meaning that those relationships have no impact on feelings of loneliness and stress. These findings build upon previous results that reveal participants' familial relationships and friendships as the most significant buffers against stress (Mackenzie, 2021). They are supported by findings that highlighted family and peers' support toward participants, which strongly predicted a reduction in self-victimisation, which includes anxiety and depressive symptoms (Attar-Schwartz et al., 2019). The current study's results have found that familial relationships and friendships may act as a productive buffer against loneliness as well as stress.

Some methodological limitations must be considered when discussing the results of the current study. Firstly, the sample consisted almost entirely of participants who self-identified as "female". One participant who self-identified with the "Prefer not to say" option was excluded due to the fact that there were not enough respondents to create a sample for participants who did not identify as female. While the female population was ideal for previous research that acknowledged higher levels of mental distress during the pandemic within young women in comparison to young men, it is an important limitation due to significant findings of gender differences in reports of social connectedness and perceived stress (Pierce et al., 2020). It must also be noted that participants' levels of strength of connection and their feelings of connection with different groups (Family, Friends, Roommates, Romantic Partners) were assessed using one

question within a questionnaire that was modified for the purpose of this study (Wistar et al., 2019). There was also the lack of a question that inquired about in-person interactions inside the home with Family, due to challenges with the questionnaire software. For the sake of fairness, the questions related to in-person interactions inside the home with Friends, Roommates, and Romantic Partners were excluded from the analysis. The nature of the questionnaire used for the present study was quantitative, with no opportunity for qualitative analysis; this was due to the analysis that was possible within the scope of this paper. Lastly, questionnaire results in relation to participants' experiences with romantic Partners were limited due to the majority of participants disclosing not having a romantic partner. This is likely due to the diverse nature of the university population represented within the sample of the current study, as various participants may not have a romantic partner due to personal, religious, or environmental factors.

Future studies should include qualitative elements that allow participants to explain factors in relation to their feelings toward their relationships with their families, friends, roommates, partners, classmates, instructors, and the university community. For example, a student may spend a lot more time with their family in comparison to their friends, but they might be unhappier around their family and may be with them a lot due to holidays and may prefer less connection. It is important to provide an opportunity for nuance when examining undergraduate students who are experiencing various aspects of early adulthood for the first time and are handling those factors differently; students will interpret quantitative questions differently, which affects their answers, thus making a qualitative method the best alternative method. There should also be an attempt to include more equal numbers of male and female participants in order to examine possible gender differences in social connectedness, stress, and loneliness. This would allow future research to build upon past research that has revealed

significant findings within this area (Miething et al., 2016). Lastly, it would be beneficial for future studies to examine differences in social connectedness, perceived stress and loneliness levels in relation to participants' feelings toward different social groups, and potential differences between in-person and online interactions. It is vital in order to determine potential interventions focused on social connectedness that may be beneficial for undergraduate students due to the high potential for feelings of stress and loneliness.

Despite the presence of these limitations, the current study contributes significant information to the literature about university students' levels of social connection, perceived stress and loneliness; as well as how these findings compare to past research within the COVID-19 pandemic. This research determined how these factors are linked, as well as how they relate to different social groups, and which social groups seem to provide the highest levels of social connectedness. These findings indicate that a strong sense of connection with family and friends is especially important in young adulthood, which has been maintained since the pandemic (Mackenzie, 2021). In regards to social connection and its relation to perceived stress and loneliness, these findings support past literature that proposes social connectedness as an important factor for psychological well-being in undergraduate students and young adults (Miething et al., 2016; Orben et al., 2020; Pittman & Richmond, 2008).

Pittman and Richmond have argued that a sense of connection in one's environment contributes to a positive self-view and relates to stronger academic accomplishment within scholastic settings (2008). The results of this study support this argument and provide beneficial information that could be used to build useful interventions for female undergraduate students experiencing increased stress and feelings of loneliness. High levels of stress in university students can lead to harmful consequences such as repeated substance abuse (Cohen, 2000),

increased sleep difficulties (Rahn et al., 2016), and feelings of isolation and loneliness (Campagne, 2019). The information provided by this study can be used to inform post-secondary institutions that are aiming to reduce students' stress levels, as they should aim to address their levels of social connectedness and encourage increasing their levels of connection primarily with their family and friends.

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