EXAMINING LONELINESS AND SOCIAL ANXIETY IN COLLEGE STUDENTS ACROSS DIFFERENT PHASES OF THE PANDEMIC

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Abstract

Introduction: Emerging adulthood (18-25) is a stage of development full of profound changes. Emerging adults attending college are vulnerable to mental health challenges, such as loneliness and social anxiety. The pandemic put students at greater risk with research showing loneliness and social anxiety levels increased pre-pandemic to pandemic onset (greatest health risk and social behavior restrictions period), but none has examined these levels as the pandemic continued and health risk and restrictions decreased. Research reveals a positive relationship between loneliness and social anxiety pre-pandemic, but none has examined their relationship during the pandemic.

Purpose: Aims include examining: 1) whether loneliness and social anxiety levels differ across three years following pandemic onset; and 2) if there are differences in the relationship between loneliness and social anxiety across these years. I hypothesize loneliness and social anxiety levels will be highest during the first year after onset and will be lowest during the third year after onset.

Method: Repeated cross-sectional study included undergraduate participants at a public southeastern university recruited through Introductory to Psychology courses and random sample during three years following pandemic onset (2020-2023). Participants completed a two-part online survey including the UCLA Loneliness Scale and Social Phobia Screener.

Results: The ANCOVA examining AY sample differences in mean ULS score approached significance, $F(2,2905) = .232$, $p = .098$. Post hoc pairwise comparisons were examined and showed the AY1 sample had significantly lower mean ULS scores (19.75) compared to the AY2 sample (20.36), $p = .039$. The ANCOVA examining AY sample differences in mean SPS scores was significant, $F(2,2915) = 19.18$, $p < .001$. Post hoc pairwise comparisons showed the AY1 sample had significantly lower mean SPS scores (3.70) compared to the AY2 sample (4.92) and AY3 sample (4.77) (ps $< .001$). The AY2 and AY3 samples did not significantly differ. Partial correlations revealed significant positive correlations between the ULS and SPS for AY1 ($r = .413$, $p < .001$), AY2 ($r = .445$, $p < .001$), and AY 3 ($r = .436$, $p < .001$). These correlations did not significantly differ when compared using r to z Fisher transformations (AY1 compared to AY2 $p = 0.20$; AY2 compared to AY3 $p = .40$; AY1 compared to AY3 $p = .28$).

Discussion: The results show that college students' levels of loneliness and social anxiety may have been influenced by the chronicity of the pandemic and the social reintegration when social restrictions lessened. This study helps in understanding the trajectory of and relationship between loneliness and social anxiety across pandemic phases in college students. This study can help guide future research in efforts to understand reasons for changes in loneliness and social anxiety, and the causal relationship between loneliness and social anxiety in college students. The longer-term impact of loneliness and social anxiety in college students found in this study suggests the need to attend to student mental health, especially as crises become more chronic.

Chapter 1: Introduction and Literature Review

Introduction

The coronavirus 19 (COVID-19) pandemic has been a time of uncertainty about the future, and caused great upheaval in society, resulting in mask and social distancing mandates, isolation protocols, virtual schooling, and more in its early stages. Data from Understanding America Study's longitudinal online survey revealed the youngest age group (18-34) appeared to be the most vulnerable during the pandemic while reporting the highest mental health distress (Na et al., 2022). This representative sample may have an increased vulnerability to mental health problems as this timeframe overlaps with emerging adulthood, which is a time important for the development of identity, independence, social relationships, and social environment, and changes in these are pronounced for those who transition to college (Arnette 2000).

Two mental health challenges that may be particularly relevant for emerging adults in college during the pandemic are loneliness and social anxiety. Loneliness is a feeling of distress resulting from one's social relationships not meeting their social needs (Hawkley et al., 2003). Loneliness has been associated with adverse health outcomes including physical health conditions, increased levels of mortality, decline in cognitive functioning, and mental health symptoms such as social anxiety (Hawkley & Cacioppo, 2010). A pre-pandemic meta-analysis reported loneliness and social anxiety to be positively associated within and across time (Maes et al., 2019). Social anxiety is a marked and persistent fear of one or more social performance situations (American Psychiatric Association [APA], 2013). Researchers speculate that there is a bi-directional relationship between loneliness and social anxiety. Social anxiety symptoms may interfere with the formation of meaningful social relationships leading to higher levels of loneliness (Lim et al., 2016). Additionally, individuals reporting high levels of loneliness may

fear negative evaluation and rejection, which may lead to symptoms of social anxiety (Lim et al., 2016).

Prior to the pandemic, 65.4% of U.S. college students reported feeling “very lonely” with lower levels of social anxiety being reported by U.S. college students compared to pandemic levels (ACHA, 2018; Center for Collegiate Mental Health, 2020). Under pre-pandemic conditions, emerging adults transitioning to college were in new social environments, which could have led to feelings of loneliness. The new social environments could have led to feeling threatened by social interactions, which is characteristic of social anxiety. Experiencing symptoms of social anxiety would make it less likely to engage in social interactions, which could lead to greater loneliness. Research has shown a positive relationship between loneliness and social anxiety pre-pandemic, revealing that individuals who experience high levels of loneliness also report high levels of social anxiety (Maes et al., 2019).

During the early part of the pandemic when isolation and unknowingness of what the future held were perhaps the greatest, feelings of loneliness and social anxiety increased in United States (U.S.) college students from before the pandemic (Thompson et al., 2021). However, college students' levels of social anxiety and loneliness as they transitioned back into society with fewer and then no restrictions have not been examined. Further, the relationship between loneliness and social anxiety during the later phases of the pandemic has not been investigated.

The purpose of the current study is to address gaps in the literature by examining the levels of loneliness and social anxiety symptoms, as well as the relationship between the two, in different stages of the COVID-19 pandemic in samples of U.S. college students. The literature pertaining to this topic is described in the following sections, starting with loneliness and social

anxiety more generally, then specific to college students, and then specific to college students during the pandemic.

Literature Review

Loneliness

Loneliness impacted society prior to the COVID-19 pandemic and has grown as a public health concern in industrialized countries (Cacioppo & Cacioppo, 2018). Robert Weiss proposed two types of loneliness that reflect different social needs, emotional loneliness and social loneliness (Weiss, 1973). Emotional loneliness is the result of an individual feeling a lack of an intimate, close relationship with another person. Whereas social loneliness is the result of an individual feeling disconnected from a social network of social relationships or groups of friends who share common interests (Russell et al., 1984). One of the most widely used measures of loneliness, the University of California at Los Angeles (UCLA) Loneliness Scale, assesses a unitary state of distress that can be reached through deficits in a variety of relationships (Russell, 1996). Russell and colleagues (1984) demonstrated there was not a significant difference between correlations of social and emotional loneliness with the UCLA Loneliness Scale (ULS), supporting that the two types of loneliness share a common core or experiences captured by the ULS.

Loneliness has been shown to have negative implications for individuals. A theoretical and empirical review conducted by Hawkley and Cacioppo shows loneliness to be associated with negative physical health symptoms, mortality, heightened cholesterol levels, increased obesity rates, and increased cardiovascular health risks (2010). Another meta-analysis of longitudinal studies found loneliness to have the largest effect sizes between anxiety, depression and suicidality (Park et al., 2020). This meta-analysis also found a strong association between

loneliness and risk of cardiometabolic disease and mortality along with a moderate association between loneliness and sleep patterns (Park et al., 2020). Hawkley and Cacioppo's review also shows loneliness to be associated with adverse mental health symptoms and cognitive functioning including increased anxiety and depressive symptoms, a greater likelihood of personality disorders and suicide, a decline of cognitive performance, and increased risk of Alzheimer's disease and dementia (Hawkley & Cacioppo, 2010). Loneliness has also been shown to relate to risky health behaviors, including increased levels of alcohol abuse, and lower likelihood of engaging in health-promoting behaviors such as physical activity, stress management, and healthy eating (Hawkley & Cacioppo, 2010). In addition, loneliness has been shown to relate to disrupted daytime function and disrupted quality of sleep (Hawkley & Cacioppo, 2010).

Loneliness in College Students

Loneliness is common in emerging adulthood (Kirwan et al., 2023). Emerging adulthood occurs through the ages of 18 to 25 years old, with some sources expanding this time period to 29, which is a time of transition for most individuals. Many individuals during emerging adulthood transition out of the family home to college or start new careers, which makes them vulnerable to experiencing loneliness (Kirwan et al., 2023). College students are more susceptible to loneliness because of these social transitions, and leaving their established support system can feel intimidating and isolating, which can result in mental health challenges, such as social anxiety. Levels of loneliness reported by U.S. undergraduate students have been increasing with 56.4% reporting feeling "very lonely" in Spring 2010, 62.8% in Spring 2018, and 65.4% feeling "very lonely" in Spring 2019 (American College Health Association [ACHA], 2010; ACHA, 2018; ACHA, 2019a; ACHA, 2019b). In an empirical review, Ponzetti (1990)

reported that U.S. college students who reported feeling lonely also tended to describe themselves as depressed, shy and/or introverted, reported low levels of self-esteem, and low self-concept including negative evaluations of their body/appearance, sexuality, health, and behavior. Further, Ponzetti reported U.S. college students reporting feeling lonely also experience dissatisfaction in their social network and interpersonal relationships.

Social Anxiety

Social anxiety is one of the most prevalent mental disorders and causes individuals to fear negative evaluations from others (Ranta et al., 2023). Further, social anxiety is the most common anxiety disorder, with most U.S. individuals developing the condition before they reach their 20s. Culture can influence the prevalence of social anxiety, as a cross-sectional study revealed U.S. samples to have some of the highest rates of social anxiety compared to other countries, with U.S. adults reporting a 12-month prevalence rate of 7.1-7.9% (Hofmann et al., 2010). According to the APA (2013), social anxiety can negatively affect individuals by causing psychological, cognitive, social and occupational impairments (as cited in Huang et al., 2018). For instance, individuals living with social anxiety may avoid social interactions due to fear of being perceived negatively by peers (Ranta et al., 2023). They are less likely to spend time with close companions leading to less satisfaction with their friends, family, and romantic partner relationships (Hur et al., 2020).

Social Anxiety in College Students

College is typically a time when emerging adults transition into a new social environment, which may lead students to become worried about social encounters and avoid situations where they could be perceived negatively by others. Social anxiety symptoms in U.S. university students has steadily increased 25% with students' average increasing from 1.82 to

2.07 between 2010-2020 on a five-point Likert scale from 0 (not at all like me) to 4 (extremely like me) on the Counseling Center Assessment of Psychological Symptoms (Center for Collegiate Mental Health, 2020). A study was conducted pre-pandemic to examine the prevalence of social anxiety in individuals ages 16-29 in seven countries using the Social Interaction Anxiety Scale, and the results found that the U.S. had the highest prevalence with more than half of U.S. participants in the study scoring greater than the threshold (>29) with possible scores ranging from 0-80 (Jefferies & Ungar, 2020).

College students who experience social anxiety are more likely to avoid social situations, which may lead to additional mental health challenges. In a qualitative analysis conducted on a college student sample in China with social anxiety disorder prior to the pandemic, reports of experiencing distorted self-consciousness, fear of negative evaluation from others, negative psychosomatic experience, and a strong desire to seek treatment were reported (Luan et al., 2022). The social anxiety symptoms experienced by college students may contribute to their reported levels of loneliness experienced.

Relationship Between Loneliness and Social Anxiety

Research has shown a positive relationship between loneliness and social anxiety, revealing that individuals who experience high levels of loneliness also report high levels of social anxiety (Maes et al., 2019). Experiencing symptoms of both social anxiety and loneliness is not uncommon as a meta-analysis consisting of 102 cross-sectional and 10 longitudinal studies of children and adolescents found almost all correlations between loneliness and social anxiety symptoms were positive, ranging from $r = .10$ to .72. (Maes et al., 2019). Another study conducted pre-pandemic found individuals with social anxiety disorder also report higher levels

of loneliness than those who did not have social anxiety disorder, further supporting this relationship (Oren-Yagoda et al., 2022).

The relationship between loneliness and social anxiety may be bi-directional. Researchers speculate that loneliness may influence social anxiety. Individuals who report feeling lonely have also reported low self-concept, self-esteem, social support, social skills, and high fear of negative evaluation, as well as dissatisfaction in their interpersonal relationships (Cacioppo et al., 2006; Ponzetti 1990). Thus, these individuals are more likely to fear rejection in social situations, which may lead to symptoms of social anxiety (Lim et al., 2016). This longitudinal study also found earlier signs of loneliness predicted later signs of social anxiety symptoms supporting a causal relationship (Lim et al., 2016).

Researchers also propose that social anxiety may influence loneliness. The cognitive-behavioral model of social anxiety has negative evaluation as a core feature and proposes that individuals living with social anxiety will appraise a social situation with fear of negative evaluation (Cacioppo et al., 2006). A study revealed that individuals who report symptoms of social anxiety may avoid social interactions out of fear of negative evaluation, leading to reported feelings of loneliness (Lim et al., 2016). This longitudinal study also reveals that earlier levels of social anxiety predicted later loneliness supporting a causal relationship.

Relationship Between Loneliness and Social Anxiety in College Students

As previously discussed, college students are prone to feelings of loneliness and social anxiety separately as they enter a new social environment, which makes them vulnerable to experiencing both due to the potential bilateral relationship between them. Research supports this conclusion showing that loneliness and social anxiety are more prevalent during emerging adulthood in Chinese college students due to the unique challenges experienced during this

developmental stage (Ma et al., 2014) The relationship between social anxiety and loneliness puts college students at greater risk of mental health challenges. While loneliness and social anxiety have been examined in college students, no studies have examined the relationship between social anxiety and loneliness in U.S. college students before the COVID-19 pandemic.

Emerging Adulthood, College Years, and the COVID-19 Pandemic

The emerging adulthood stage of development was first coined by Jeffrey Arnett and focuses on individuals aged 18-25 (Arnett, 2000). Arnette found the emerging adulthood stage to be distinguishable from adolescence and young adulthood, as this time period is full of profound changes in reference to social networks, social environment, work, education, and worldview (Arnette, 2000). During these years, individuals are subject to exploration and freedom, which can lead them to develop character qualities important to becoming self-sufficient and independent (Arnette, 2000). About two-thirds (62%) of emerging adults find themselves leaving home for the first time to pursue higher level education (National Center for Education Statistics, 2021), with another one-third leaving home to explore the workforce and independent living (Ross & Bateman, 2018). The transition to college is already a challenging time full of new experiences and new social environments as students navigate changes in their responsibilities, changes in their sleeping and eating patterns, and learn to adapt to a new environment (Barbayannis et al., 2022; University of North Carolina at Chapel Hill, 2022). College students also face financial stressors, pressure from family and society, and managing their time as they take on an extensive academic course load, study for exams, compete for admissions, scholarships, and internships, while trying to find time for self-care (Barbayannis et al., 2022; University of North Carolina at Chapel Hill, 2022). Further, most emerging adults pursue their college education in non-linear ways, often changing majors, while simultaneously working,

finding their identity, and exploring different worldviews as most students find themselves having a different worldview by the end of college (Arnette, 2000).

Experiencing this time during a national pandemic put college students at an even greater risk of mental health difficulties. The Center for Disease Control and Prevention (2021) provides a timeline of key moments during the COVID-19 pandemic in the United States including health risk and health behavior restrictions (Center for Disease Control and Prevention [CDC], 2021). COVID-19 was declared as a public health outbreak on January 31, 2020 and was later declared as a pandemic by the World Health Organization on March 11, 2020. The pandemic had its greatest level of disruption in the early stage in which individuals were subject to many restrictions including mask mandates, isolation protocols, public closings (gyms, restaurants, stores), and other health behavior mandates. COVID-19 became the third leading cause of death in the U.S., with deaths exceeding 1,000 per day and nationwide cases exceeding 5.4 million in August 2020. In Fall 2020, clinical trials were conducted to identify the effectiveness of COVID-19 vaccines, which became available to the U.S. population beginning with healthcare professionals and older adults with 200 million doses being administered in the U.S by April 2021. During the first year following the onset of the pandemic (March 2020) the mask mandate was still required along with isolation protocols restricting the number of people allowed in social gatherings and limiting capacity in restaurants, stores, and gyms, while maintaining a social distance of six feet from one another. Also occurring during the first year of the pandemic were three different variants in the U.S. (Alpha, Gamma, Beta) (CDC, 2021). During January 2021 over 100 million cases of COVID-19 were recorded worldwide, with death rates in the U.S exceeding 500,000.

The second year following the onset of the pandemic was a phase of the pandemic where hospitalizations and weekly deaths remained high with COVID-19 remaining as the third leading cause of death, recorded deaths reaching one million in the U.S, and deaths surpassing six million worldwide (CDC, 2023). During the second year of the pandemic, there was a growing surge of the Delta variant which sparked a third wave of infection in summer 2021, and a new variant "Omicron" was detected in the U.S. Among the Omicron surge, more than 2,600 people were dying from the COVID-19 virus day. During this second year the mask mandate was still required, but was uplifted in spring 2022 along with relaxed isolation protocols allowing larger numbers of people allowed in social gatherings, restaurants, stores, and gyms.

The third year of the pandemic was pandemic which reflected the lowest risk of hospitalizations and weekly deaths (CDC, 2023). During this time the mask mandate along with isolation protocols were relaxed with no restriction to the number of people allowed to gather indoors (restaurants, stores, gym).

College Students Loneliness and Social Anxiety During the COVID-19 Pandemic

The implementation of isolation protocols has been shown to be negatively related to college students' levels of loneliness (Thompson et al., 2021; Tull et al., 2020; Vaterlaus, 2022). Research has shown that levels of loneliness increased from pre-pandemic to pandemic onset, as a study conducted in September 2020 revealed that the average score for loneliness before the COVID-19 pandemic began was 18.71 (*SD* = 15.21) compared to 21.64 (*SD* = 15.72) after the COVID-19 pandemic onset in U.S. college students (Thompson et al., 2021). To further support these findings, a study conducted in fall 2020 found 64% of U.S. college students scored positively for loneliness (i.e., a score of 6-9 on the3-item ULS) (Vaterlaus, 2022), which revealed an increase from the 49% of college students who scored positively in fall 2019

(ACHA, 2019b). Additional research has also found an estimated 38-50% of emerging adults ages 18-24 in the Central Philippines experienced higher levels of loneliness during the isolation protocols implemented during the second month of the federal mandatory lockdown (June to July 2020) during the coronavirus pandemic, with 56.7% reporting moderate levels and 23.6% reporting severe levels of loneliness (Labrague et al., 2021).

College student social anxiety has been negatively affected by the pandemic (Kindred & Bates, 2023; Ranta et al., 2023, Thompson et al., 2021). The prevalence of social anxiety has increased from 2013 to 2021 and continues to rise in individual ages 13-21 (Ranta et al., 2023). Research has shown that social anxiety has increased from pre-pandemic to pandemic onset in U.S. college students, as a study conducted in September 2020 revealed that the average score for social anxiety before the COVID-19 pandemic began was (M = 16.35, SD = 14.96) compared to 18.94 (SD = 16.39) after the COVID-19 pandemic onset (Thompson et al., 2021). To further support these findings, a cross-sectional study examining social phobia in Chinese college students found an increase in levels of social phobia from pre-pandemic (December 2019) to during the pandemic (August 2021) (Lin et al., 2023).

Limited studies have investigated the relationship between social anxiety and loneliness in college students. One study found social anxiety symptoms in U.S. college students increased during the onset of the pandemic in September 2020 as loneliness worsened from pre-pandemic levels in March 2020 (Thompson et al., 2021).

The Current Study

Research has revealed increased levels of loneliness (Thompson et al., 2021; Tull et al., 2020; Vaterlaus, 2022) and social anxiety (Kindred & Bates, 2023; Ranta et al., 2023, Thompson et al., 2021) from pre-pandemic to the early pandemic phases in college students in different

countries including U.S. college students. Research has also revealed a positive relationship between loneliness and social anxiety during the early part of the pandemic (September 2020) in U.S. college students (Thompson et al., 2021). However, there have not been any studies that have examined loneliness and social anxiety through different phases of the pandemic. Additionally, less research has been done looking at loneliness and social anxiety as college students transition back into society with relaxed and then no restrictions. The majority of studies have examined social anxiety and loneliness during the onset of the pandemic revealing higher levels of social anxiety and loneliness symptoms in comparison to pre-pandemic levels; however, it is important to examine the impact the COVID-19 pandemic has had during the years following the strict isolation protocols. Therefore, this study addresses these gaps using data from a pre-existing repeated cross-sectional study of U.S. college students conducted during three academic years Fall 2020–Spring 021, Fall 2021-Spring 2022, and Fall 2022-Spring 2023 following the onset of the pandemic in March of 2020. The study aims are to examine whether levels of loneliness and social anxiety in college students differ across different phases of the pandemic, and if there are changes in the relationship between loneliness and social anxiety in college students across different phases of the pandemic.

Research question 1 pertains to whether levels of loneliness in college students differ across different phases of the pandemic, and if so, how? Research has shown an increase of levels of loneliness from pre-pandemic (March 2020) to pandemic onset (September 2020) (Thompson et al., 2021; Tull et al., 2020; Vaterlaus, 2022). Therefore, I expected high levels of loneliness would be reported during the first academic year after pandemic onset (corresponding to a period of the highest hospitalizations, stay at home order, and the strictest safety mandates). Compared to that first academic year after pandemic onset, I hypothesized that lower levels of

loneliness would be reported in the second academic year after pandemic onset as restrictions were relaxed and students returned to campus (hypothesis 1), and in the third academic year after pandemic onset when students returned to campus with optional/no restrictions (hypothesis 2). I also hypothesized that compared to the second academic year after pandemic onset, that levels of loneliness would be lower in the third academic year after pandemic onset given further relaxing of restrictions (hypothesis 3).

Research question 2 pertains to whether levels of social anxiety in college students differ across different phases of the pandemic, and if so, how? Research has shown an increase of levels of social anxiety from pre-pandemic to pandemic onset (September 2020) (Kindred & Bates, 2023; Ranta et al., 2023, Thompson et al., 2021). Therefore, I expected high levels of social anxiety would be reported during the first academic year after pandemic onset (corresponding to a period of the highest hospitalizations, stay at home order, and the strictest safety mandates). Compared to the first academic year after pandemic onset, I hypothesized that lower levels of social anxiety would be reported in the second academic year after pandemic onset as restrictions were relaxed and students returned to campus (hypothesis 4), and in the third academic year after pandemic onset when students returned to campus with optional/no restrictions (hypothesis 5). I also hypothesized that compared to the second academic year after pandemic onset, that levels of social anxiety would be lower in the third academic year after pandemic onset given further relaxing of restrictions (hypothesis 6).

Research question 3 pertains to whether there is a relationship between loneliness and social anxiety in college students across different phases of the pandemic. If so, did the relationship differ across different phases of the pandemic? If so, how did the relationship differ? Research has shown a moderate, positive correlation between loneliness and social anxiety pre-

pandemic, revealing that individuals who report high levels of loneliness also report high levels of social anxiety (Maes et al., 2019). Further, research has shown that symptoms of loneliness and social anxiety increased during the pandemic from March 2020 to September 2020. (Thompson et al., 2021). However, no research has examined the relationship between loneliness and social anxiety during the pandemic. Therefore, I wanted to explore the relationship between loneliness and social anxiety during each of the three academic years after pandemic onset. Given the potential bi-directional relationship between loneliness and social anxiety (Lim et al., 2016), I suspected that there would still be a positive relationship between college students' levels of loneliness and social anxiety during each of the three academic years after pandemic onset, but did not know how the varying conditions of the pandemic during those years may relate to the strength of the relationship between loneliness and social anxiety.

Chapter 2: Method

Research Design

This study used a pre-existing data set from a larger study, the Pandemic Student Stress and Coping Study, Department of Psychology, East Carolina University (Dolbier C., 2020 - 2023), which is a repeated cross-sectional online survey study examining college students stress and coping in undergraduate students at a large Southeastern public university from pre-pandemic to three academic years post pandemic onset. The aim of the current study is to examine levels of loneliness and social anxiety and the relationship between the two across the three academic years post pandemic onset. The online survey consisted of two parts (Part I and Part II) taken within one week to reduce participant burden with each part taking approximately 30-45 minutes to complete. The larger study includes qualitative and quantitative components. For the purpose of this proposed study, only quantitative data were examined.

The data examined were collected during the three academic years following the onset of the pandemic. The first academic year following the onset (Fall 2020-Spring 2021) was a time where the highest number of hospitalizations and deaths due to COVID-19 occurred. The greatest disruptions regarding education (virtual school, no holiday breaks), residency (no on-campus living), health mandates (social distancing, mask mandate), and access to services (telehealth, curbside pickup) took place during this academic year. The second academic year following the onset of the pandemic (Fall 2021-Spring 2022) was a time when vaccines became available, students were able to return to campus with safety precautions, classrooms held face-to-face classes with smaller numbers of students or larger rooms, and restrictions to access to services were relaxed. The third year following the onset of the pandemic (Fall 2022-Spring 2023) was a time when the number of hospitalizations and deaths regarding COVID-19 were at their lowest, a booster shot became available, professors were allowed to hold face-to-face classes without density restrictions, students could reside on campus with no adjustments, and safety measures became optional.

Participants

Each semester, the eligibility criteria to participate in the study were being aged 18-26 and enrolled as an undergraduate student at the university. Participants of varying genders, races, ethnicities, sexual orientations, and socioeconomic backgrounds were expected. Convenience sampling was used to recruit participants from Introductory Psychology courses. Participants were also recruited via emails sent to student organizations representing diversity. In addition, each semester a random sample oversampling for men and people of color was provided by the university's survey research oversight committee to attempt to gather a more diverse sample.

Procedures

The university's institutional review board approved the study. Recruitment materials included a link to the survey. After the participants provided consent electronically, they were prompted to begin part one of the survey. Upon completion of part one, participants received a link to part two of the survey and were asked to complete this part within a week of completing part one. Validation checks were embedded in part 1 and part 2 surveys (i.e., correctly answering four out of five questions throughout the survey, e.g., "When you see this item select Agree"). Participants who were enrolled in Introductory Psychology courses and who passed the validation checks were provided research credit as part of a requirement for participating and/or consuming research in the course. Participants who were not enrolled in Introductory Psychology courses and who passed the validation checks were entered into a gift-card raffle for one of multiple $50 gift cards each semester. Data for participants who passed the validation checks were used in analyses.

Measures

The surveys in the larger study included measures of demographic and background information (e.g., age, race, ethnicity, gender); stress - Perceived Stress Scale (Cohen & Williamson, 1988), University Stress Scale (Stallman & Hurst, 2016), COVID pandemic stress items (developed by the research team), and an open-ended item about pandemic stress (developed by the research team); coping - Brief COPE (Carver, 1997) and an open-ended item about pandemic coping (developed by the research team); psychological symptoms - Patient Health Questionnaire 8 (Kroenke et al., 2008), Generalized Anxiety Disorder 7 (Spitzer et al., 2007), Social Phobia Screener (Batterham et al., 2017), Panic Disorder Screener (Batterham et al., 2015), Specific Phobia Questionnaire (Ovanessian et al., 2019); positive change due to the pandemic - Stress Related Growth Scale – Short Form (Cohen et al., 1998) and an open-ended

item about positive changes due to the pandemic (developed by the research team); and loneliness (University of California at Los Angeles [UCLA] Loneliness Scale; Russel et al., 1994). For purposes of this study, only the UCLA Loneliness Scale (Russel et al., 1994) and Social Phobia Screener (Batterham et al., 2017) were examined.

UCLA Loneliness Scale

The study used a revised version of the UCLA Loneliness Scale (ULS), which originally consisted of 20 items including 10 positively worded statements and 10 negatively worded statements (Russell, 1996). The ULS is a unidimensional construct and does not measure multidimensional measures of loneliness. However, the ULS may include questions that capture both emotional loneliness (e.g., “No one really knows me”) and social loneliness (e.g., “I feel isolated from others”). The revised version (ULS-10) consists of 10 positively and negatively worded statements and has been found to be internally consistent (Cronbach's alpha = 0.94), which was found in a sample of 310 nurses employed at a military hospital (Russell, 1996). The scale has an acceptable test-retest reliability (r = .73) over a 1-year period. This test-retest reliability was tested in a sample of 301 elderly individuals over the age of 65 who participated in a 1-year longitudinal study and were readministered the ULS 12 months later (Russell, 1996). Convergent validity was found as the ULS significantly correlates negatively with measures of social support and self-esteem, and positively correlates with depression and neuroticism among college students (Russell, 1996). Construct validity was demonstrated by the ULS significantly correlating with the New York University Loneliness Scale and the Differential Loneliness Scale (Russell, 1996). The ULS-10 consists of five positively worded statements (e.g., "There are people I can turn to”), and five negatively worded statements (e.g., “I lack companionship”), which are rated on a 4-point Likert scale ranging from Never (1) to Always (4). The five

positively worded statements are reversed scored, and items are summed. Total scores range from 10-40, with higher scores indicating greater levels of loneliness.

Social Phobia Screener

The Social Phobia Screener (SPS) is a five-item social anxiety screener (Batterham et al., 2017). The screener was validated in two samples, with the first sample consisting of 12,292 Australian young adults screened for a clinical trial, including 1,687 participants who completed a phone-based clinical interview, and the second population-based sample of 4,214 Australian adults recruited online (Batterham et al., 2017). The Social Phobia Screener was validated against clinical criteria using the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998) and an additional well-validated scale, the Social Phobia Inventory (SPIN; Connor et al., 2000). The scale demonstrated internal consistency (Cronbach's alpha = .98) within the trial sample (Batterham et al., 2017). Respondents are asked to rate the five items in reference to the past month using a 5-point Likert scale ranging from Not at all (0) to Extremely (4). If respondents answer, "Not at all" to the first question stating, "To what extent have you felt fearful or embarrassed of any social situations during the past month?" they do not complete the subsequent items on the screener as these items are not relevant, and are consequently scored zero. The items are summed, with a possible range of scores being 0-20, with higher scores reflecting greater severity. The criteria for a positive screen on the SPS was determined by participants answering "A little" (1) or higher to items 1 , 2 ("Was the fear or embarrassment you experienced during the past month excessive or unreasonable?"), and 5 ("During the past month, how much has your work, home, or social life been disrupted because of your fear or embarrassment?"), and either item 3 ("During the past month, have you avoided any social situations because of your fear or embarrassment?") or 4 ("During the past month, how much

have you suffered through any social situations because of your fear or embarrassment?"). Participants who met the clinical criteria had a mean score of 8.9 on the SPS.

Data Analyses

For the current study I used SPSS version 27 for all analyses. I calculated descriptive statistics for demographic variables, the ULS, and SPS (means and standard deviations for continuous variables, frequencies and percentages for categorical variables). I examined demographic differences between samples. Differences in age by sample were determined using an analysis of variance (ANOVA). Separate chi square tests were conducted to examine differences in race, ethnicity, gender, first/continuing generation college student status, and sexual orientation by sample. I then controlled for demographic variables that significantly differed by sample in subsequent analyses comparing samples. In addition, I examined relationships between demographic variables and the ULS and SPS. I conducted Pearson correlations for age with the ULS and SPS. I conducted a series of ANOVAs to examine differences in the ULS and SPS by race, ethnicity, gender, first/continuing generation college student status, and sexual orientation. I then controlled for demographic variables that significantly related to the ULS in subsequent analyses examining the ULS. I then controlled for demographic variables that significantly related to the SPS in subsequent analyses examining the SPS.

Research Questions & Hypotheses

Research question 1 (do levels of loneliness in college students differ across different phases of the pandemic, and if so, how) and H1 (Participants in the first academic year after pandemic onset [greatest social interaction restrictions and health risk] will report higher levels of loneliness compared to participants in the second academic year after the pandemic onset) was

addressed using an analysis of covariance (ANCOVA). H2 (Participants in the second academic year after pandemic onset will report higher levels of loneliness compared to participants in the third academic year after pandemic onset) and H3 (Participants in the first academic year after pandemic onset [greatest social interaction restrictions and health risk] will report higher levels of loneliness than participants in the third academic year after pandemic onset) was addressed using an analysis of covariance (ANCOVA). The fixed factor was sample, outcome variable was the ULS, and covariates were demographic variables that significantly differed by sample or significantly related to ULS). Pairwise post-hoc comparisons were conducted.

Research question 2 (do levels of social anxiety in college students differ across different phases of the pandemic, and if so, how) and H4 (Participants in the first academic year after pandemic onset [greatest social interaction restrictions and health risk)] will report higher levels of social anxiety compared to participants in the second academic year after pandemic onset) was addressed using an ANCOVA. H5 (Participants in the second academic year after the pandemic onset will report higher levels of social anxiety compared to participants in the third academic year after the pandemic onset) and H6 (Participants in the first academic year after pandemic onset [greatest social interaction restrictions and health risk] will report higher levels of social anxiety than participants in the third academic year after pandemic onset) was addressed using an ANCOVA. The fixed factor was sample, outcome was the SPS, and covariates were demographic variables that significantly differed by sample or significantly related to the SPS. Pairwise post-hoc comparisons were conducted.

Research question 3 (is there a relationship between loneliness and social anxiety in college students across different phases of the pandemic, and if so, did the relationship differ across different phases of the pandemic, and if so, how did the relationship differ) was explored

using Pearson correlations between the ULS and SPS for each sample. Significant differences in correlation coefficients between samples were compared using r to z Fisher transformations.

Chapter 3: Results

Academic Year Samples

After removal of participants who did not pass the validity checks and removal of duplicate participants across semesters, the final sample sizes were 719 for academic year (AY) 1, 1,217 for AY2, and 1,104 for AY3. Table 1 provides descriptive statistics for categorical demographic variables for each AY sample, and Table 2 provides descriptive statistics for continuous demographic variables for each AY sample. Across all three samples, the majority of participants were not Hispanic or Latina/o/x, White, female, heterosexual, and continuing generation college students, with an average age around 19 years old, and highest parent education a bachelor's degree.

Descriptive Statistics for Key Variables by Academic Year Sample

Table 2 shows descriptive statistics for key study variables for each AY sample. Participants in all three samples reported on average that they "rarely" experienced loneliness. Across samples, 23-30% of participants reported on average "never" experiencing loneliness, 50-56% on average reported "rarely," 19-20% reported "sometimes" and 1-2% reported "always" experiencing loneliness. Participants in AY1 reported on average just under "a little" social anxiety. AY2 and AY3 participants reported on average just over "a little" social anxiety. Across samples, 39-50% of participants on average reported not experiencing any social anxiety symptoms at all, 33-35% on average reported experiencing social anxiety symptoms "a little," 12-19% "moderately," 4-7% "severely," and less than 1% "extremely."

Demographic Differences Between Samples

To run subsequent analysis, gender and race categories were collapsed. Gender was dichotomized into female and non-female (including males, transgender, non-binary, and another

Table 1. Descriptive statistics for categorical variables for each academic year sample

Variable	AY1 (N = 719)		AY2 (N = 1217)		AY3 (N = 1014)	
	#	%	#	%	#	%
Gender*						
Female	504	70.1	756	62.1	652	64.3
Male	205	28.5	436	35.9	345	34.0
Transgender	4	0.6	0	0.0	0	0.0
Transgender Woman	0	0.0	0	0.0	1	0.1
Transgender man	0	0.0	1	0.1	1	0.1
Non-binary or genderfluid	2	0.3	19	1.6	9	0.9
I choose not to disclose	0	0.0	2	0.2	3	0.3
Another gender identity	0	0.0	2	0.2	2	0.2
Race*						
White	506	70.4	828	68.0	695	68.5
Black	109	15.2	184	15.1	140	13.8
Asian	29	4.0	45	3.7	44	4.3
Native American or Alaskan Native	3	0.4	3	0.2	6	0.6
Native Hawaiian or other Pacific Islander	0	0.0	2	0.2	0	0.0
Multiracial/ethnic	51	7.1	80	6.6	73	7.2
Another race	12	1.7	65	5.3	52	5.1
Ethnicity						
Not Hispanic or Latina/o/x	649	90.3	108	88.8	917	90.4
Hispanic or Latina/o/x	68	9.5	127	10.4	97	9.6
Sexual Orientation**						
Heterosexual/straight	620	86.2	987	81.1	846	83.4
Lesbian	7	1.0	16	1.3	9	0.9
Bisexual	51	7.1	75	6.2	89	8.8
Pansexual	9	1.3	17	1.4	21	2.1
Queer	3	0.4	14	1.2	4	0.4
Asexual	3	0.4	43	3.5	7	0.7
Gay	3	0.4	14	1.2	10	1.0
Questioning/unsure	15	2.1	22	1.8	14	1.4
Another sexual orientation	7	1.0	16	1.3	5	0.5
I prefer not to disclose	0	0.0	11	0.9	9	0.9
First generation college student	238	33.1	399	32.8	334	32.9

Variable	AY1 (*N* = 719)		AY2 (*N* = 1217)		AY3 (*N* = 1014)	
	#	%	#	%	#	%
Continuing generation college student	481	66.9	816	67.1	678	66.9

Note: AY = academic year, * = significant difference between samples $p < .05$, ** = significant difference between samples $p < .001$

Table 2. Descriptive statistics for continuous variables for each academic year sample

Variable	AY1 (*N* = 719)		AY2 (*N* = 1217)		AY3 (*N* = 1014)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Age*	19.29	1.49	19.31	1.62	19.14	1.58
Highest Parent Education	5.87	2.03	5.90	2.10	5.98	2.01
ULS	19.74	6.55	20.47	6.21	19.93	6.25
SPS**	3.67	4.16	4.97	4.58	4.74	4.45

Note: AY = academic year, ULS = UCLA Loneliness Scale, SPS = Social Phobia Screener, * = significant difference between samples $p < .05$, ** = significant difference between samples $p < .001$

gender). For race, Native American or Alaskan Native and Native Hawaiian or other Pacific Islander was combined into the "other" category with a total of 5 categories after condensing. There were significant differences for age, gender, race, and sexual orientation between AY samples. An ANOVA revealed significant differences between samples in age, $F(2,2949) = 3.38$, $p = .034$. Post-hoc pairwise comparisons revealed the AY2 sample had a significantly higher age compared to the AY3 sample ($p = .014$; see Table 2). An ANOVA revealed there were not significant differences between samples in highest parent education, $F(2,2945) = 0.60$, $p = .547$.

There were significant differences in percentages of females between samples $X^2(2) = 12.43$, $p = .002$ with AY1 sample having a significantly higher percentage of female participants compared to AY2, and AY3 samples (see Table 1). There were significant differences in percentages of some race categories between samples $X^2(5) = 17.07$, $p = .029$ with the AY1 sample having a significantly lower percentage of individuals identifying as another race (including Native American or Alaskan Native and Native Hawaiian or other Pacific Islander)

(2%) compared to the AY2 (6%) and AY3 (6%) samples. There were significant differences in percentages of some sexual orientation categories between samples $X^2(16) = 58.50$, $p < .001$ (see Table 1). The AY1 sample had a significantly higher percentage of heterosexual/straight participants compared to the AY2 and AY3 samples. The AY2 sample had a significantly higher percentage of asexual participants compared to AY1 and AY3 samples. There were not any significant differences in percentages of first/continuing generation college students between samples, $X^2(2) = 0.02$, $p = .995$. There were not significant differences in percentages of participants who identified as Hispanic or Latino/a/x between samples $X^2(2) = 0.77$, $p = .681$. Based on these analyses, I controlled for age, gender, race, and sexual orientation in subsequent analyses comparing samples.

Demographic Relationships with Key Variables

I conducted a series of ANOVAs to examine differences in means of ULS and SPS scores by race, ethnicity, gender, first/continuing generation college student status, and sexual orientation. Mean ULS scores significantly differed by ethnicity, $F(1,2937) = 11.11$, $p < .001$, with Hispanic or Latino/a/x participants having a higher mean ($M = 21.27$, $SD = 6.74$) than non-Hispanic or Latino/a/x participants ($M = 19.97$, $SD = 6.26$). Mean ULS scores significantly differed by first/continuing generation college student, $F(1,2944) = 18.73$, $p < .001$ with first generation college students having a higher mean ($M = 20.82$, $SD = 6.65$) than continuing generation college students ($M = 19.75$, $SD = 6.12$). Mean ULS scores significantly differed by race, $F(4,2925) = 8.74$, $p < .001$. Post- hoc pairwise comparisons revealed White participants had a significantly lower mean ($M = 19.65$, $SD = 6.21$) than Black participants ($M = 21.14$, $SD = 6.45$), multiracial/ethnic participants ($M = 21.39$, $SD = 6.45$) and participants identifying as

another race (including Native American or Alaskan Native and Native Hawaiian or other Pacific Islander) (M = 21.13, SD = 6.29).

Mean ULS scores significantly differed by sexual orientation, $F(9,2945) = 13.04$ $p <$ .001. Post-hoc pairwise comparisons revealed heterosexual/straight participants had a significantly lower mean (M = 19.61, SD = 6.13) compared to bisexual (M = 22.16, SD = 6.45), pansexual (M = 24.02, SD = 7.52), queer (M = 24.57, SD = 6.34), asexual (M = 21.45, SD = 7.37), gay (M = 23.67, SD = 6.61), questioning/unsure (M = 24.22, SD = 5.71), participants identifying as another sexual orientation (M = 23.46, SD = 6.06), and participants who preferred not to disclose (M = 23.50, SD = 6.16). Lesbian participants also had a significantly lower mean (M = 19.25, SD = 6.23) compared to bisexual (M = 22.16, SD = 6.45), pansexual (M = 24.02, SD = 7.52), queer (M = 24.57, SD = 6.34), gay (M = 23.67, SD = 6.61), questioning/unsure (M = 24.22, SD = 5.71), participants identifying as another sexual orientation (M = 23.46, SD = 6.06), and participants who preferred not to disclose (M = 23.50, SD = 6.16). Bisexual participants had a significantly lower mean (M = 22.16, SD = 6.45) compared to questioning participants (M = 24.22, SD = 5.71). Pansexual participants had a significantly higher mean compared to asexual participants (M = 21.45, SD = 7.37). Asexual participants had a significantly lower mean (M = 21.45, SD = 7.37) compared to questioning/unsure participants (M = 24.22, SD = 5.71). Mean ULS scores did not significantly differ by gender, F (1,2943) = 1.44, p = .230.

Mean SPS scores significantly differed by gender $F(1,2944) = 25.34$ $p <$ .001 with female participants having a higher mean (M = 4.88, SD = 4.47) than non-female participants (M = 4.01, SD = 4.41). Mean SPS scores significantly differed by first/continuing generation college student, F (1,2945) = 9.90, p = .002 with first generation college students having a higher mean (M = 4.94, SD = 4.77) than continuing generation college students (M = 4.40, SD = 4.29). Mean

SPS scores significantly differed by race, F (4,2926) = 2.58, p = .035. Post-hoc pairwise comparisons revealed Black participants had a significantly lower mean (M = 4.08, SD = 4.54) than White (M = 4.61, SD = 4.40) and multiracial participants (M = 5.22, SD = 4.76).

Mean SPS scores significantly related to sexual orientation F(9,2946) = 19.27, p < .001. Post hoc pairwise comparisons revealed heterosexual/straight participants had a significantly lower mean (M = 4.15, SD = 4.20) compared to bisexual (M = 6.83, SD = 4.98), pansexual (M = 8.15, SD = 5.68), queer (M = 7.48, SD = 4.61), gay (M = 6.96, SD = 5.01), questioning (M = 8.12, SD = 5.36), and participants identifying as another sexual orientation (M = 6.79, SD = 5.60). Lesbian participants had a significantly lower mean (M = 4.81, SD = 4.49) compared to bisexual (M = 6.83, SD = 4.98), pansexual (M = 8.15, SD = 5.68), queer (M = 7.48, SD = 4.61), and questioning participants (M = 8.12, SD = 5.36). Bisexual participants had a significantly higher mean (M = 6.83, SD = 4.98) compared to asexual participants (M = 4.70, SD = 4.65). Pansexual participants had a significantly higher mean (M = 8.15, SD = 5.68) compared to asexual participants (M = 4.70, SD = 4.65) and participants who preferred not to disclose (M = 5.65, SD = 3.83). Queer participants had a significantly higher mean (M = 7.48, SD = 4.61) compared to asexual participants (M = 4.70, SD = 4.65). Asexual participants (M = 4.70, SD = 4.65) had a significantly lower mean compared to gay (M = 6.96, SD = 5.02), questioning (M = 8.12, SD = 5.36) and participants identifying as another sexual orientation (M = 6.79, SD = 5.60). Participants who preferred not to disclose had a significantly lower mean (M = 5.65, SD = 3.83) compared to questioning participants (M = 8.12, SD = 5.36). Mean SPS scores did not significantly differ by ethnicity, F (1,2938) = 2.72, p = .099.

Age and the ULS had a significant positive correlation (r = .07, p < .001). Age and the SPS were not significantly correlated (r = .035, p = .058). Pearson correlations revealed highest

parent education had significant negative correlations with the ULS (r = -.094, p < .001) and SPS (r = -.056, p = .002).

Based on these analyses, I controlled for age, ethnicity, first/continuing generation college student, race, and sexual orientation in subsequent analyses including the ULS. For subsequent analyses that include the SPS, I controlled for first/continuing generation college student, race, gender, and sexual orientation. Because the dichotomous first generation/continuing generation college student status variable overlaps conceptually with highest parent education, only highest parent education was controlled for in subsequent analyses.

Addressing Research Question 1 and Associated Hypotheses

Research question 1 (do levels of loneliness in college students differ across pandemic phases, and if so, how) and H1 (higher levels will be reported by participants in AY1 compared to AY2) were addressed using an ANCOVA. H2 (higher levels will be reported by participants in AY2 compared to AY3) and H3 (higher levels will be reported by participants in AY1 compared to AY3) were addressed using an ANCOVA.

The ANCOVA examining AY sample differences in mean ULS scores (controlling for age, gender, race, ethnicity, sexual orientation, and highest parent education) approached significance, $F(2,2905) = .232$, $p = .098$. Age, sexual orientation, ethnicity, and highest parent education were significant covariates (ps < .05). Because the ANCOVA approached significance, post hoc pairwise comparisons were examined and showed the AY1 sample had significantly lower mean ULS scores (19.75) compared to the AY2 sample (20.36), p = .039. These findings do not support hypotheses 1 through 3.

Addressing Research Question 2 and Associated Hypotheses

Research question 2 (do levels of social anxiety in college students differ across pandemic phases, and if so, how) and H4 (higher levels will be reported by participants in AY1 compared to AY2) were addressed using an ANCOVA. H5 (higher levels will be reported by participants in AY2 compared to AY3) and H6 (higher levels will be reported by participants in AY1 compared to AY2) were addressed using an ANCOVA.

The ANCOVA examining AY sample differences in mean SPS scores (controlling for age, highest parent education, gender, race, and sexual orientation) was significant, $F(2,2915) = 19.18$, $p < .001$. Gender, sexual orientation, and highest parent education were significant covariates (ps < .03). Post hoc pairwise comparisons showed the AY1 sample had significantly lower mean SPS scores (3.70) compared to the AY2 sample (4.92) and AY3 sample (4.77) (ps < .001). The AY2 and AY3 samples did not significantly differ. These findings do not support hypotheses 4 through 6.

Addressing Research Question 3

Research question 3 (is there a relationship between loneliness and social anxiety in college students across pandemic phases, and if so, did the relationship differ across phases, and if so, how) was addressed using Pearson correlations.

Partial correlations (controlling for age, highest parent education, gender, ethnicity, race, and sexual orientation) revealed significant positive correlations between the ULS and SPS for AY1 ($r = .413$, $p < .001$), AY2 ($r = .445$, $p < .001$), and AY 3 ($r = .436$, $p < .001$). These correlations did not significantly differ when compared using r to z Fisher transformations (AY1 compared to AY2 $p = 0.20$; AY2 compared to AY3 $p = .40$; AY1 compared to AY3 $p = .28$).

Chapter 4: Discussion

The COVID-19 pandemic greatly impacted emerging adults in college making them more vulnerable to mental health challenges, with loneliness and social anxiety being two particularly relevant challenges (Na et al., 2022). Research revealed levels of loneliness and social anxiety increased from pre-pandemic to pandemic onset, but no research examined them throughout different phases of the pandemic (Thompson et al., 2021). Research has also revealed a positive relationship between loneliness and social anxiety, but no research had examined the relationship between the two variables during the pandemic (Maes et al., 2019). This study aimed to examine levels of loneliness and social anxiety in college students across different phases of the pandemic and examine the relationship between loneliness and social anxiety across different phases of the pandemic. We expected to find the highest levels of loneliness and social anxiety reported in AY1 with lower levels being reported in AY2, and the lowest levels of loneliness and social anxiety being reported in AY3 following the onset of the pandemic. However, our hypotheses were not supported, and we found levels of loneliness and social anxiety to be higher in AY2 and in AY3 for social anxiety (compared to AY1). When exploring the relationship between loneliness and social anxiety we expected to see a positive relationship, which was supported by the results.

The first research question aimed to examine the levels of loneliness in college students across different phases of the pandemic. We expected to see higher levels of loneliness reported in the first AY following the onset of the pandemic as this was a period with the greatest health risk (highest hospitalizations recorded) and health behavior restrictions (stay at home order) compared to the second AY following the onset of the pandemic as restrictions were relaxed and students returned to campus. We also expected to see higher levels of loneliness in the second AY following the onset of the pandemic compared to the third AY following pandemic onset as

restrictions were further relaxed (lowest health risk and health behavior restrictions [no capacity or social distance restrictions]), and higher levels of loneliness reported in the first AY (greatest health risk and health behavior restrictions) compared to the third AY following pandemic onset. Contrary to our hypotheses, we found that participants in AY1 had significantly lower levels of loneliness compared to participants in AY2, and there was no significant difference in the levels of loneliness between participants in AY1 and AY3, or AY2 and AY3. We speculate that the chronicity of the pandemic may have contributed to the later effects of loneliness of college students. The pandemic was a time of great upheaval resulting in mask mandates, isolation protocols, social distancing restrictions, virtual schooling, new vaccines, and unknown about the future. However, many individuals may not have expected the pandemic to persist for a long period of time. The continuation of health risk and health behavior restrictions may have influenced college students to feel the impact later as they may have been busy adjusting to the health risks and the stay-at-home order during the first AY to feel the full effects. The continuation of the pandemic may have also caused strain on individuals contributing to the higher levels of loneliness reported by participants in AY2 compared to AY1 as limited capacity and social distance protocols were still implemented in public spaces, but not in AY3 when there were not social isolation restrictions.

Previous research has found levels of loneliness to be higher during pandemic onset compared to pre-pandemic levels (Thompson et al., 2021; Vaterlaus, 2022). Thompson et al had participants reflect on their life pre-pandemic (March 2020) compared to pandemic onset (September 2020) and found levels of loneliness to be higher during pandemic onset. However, the study did not identify the specific scales used or describe what the levels mean, therefore, their findings cannot be compared to the current study (Thompson et al., 2021).

Vaterlaus's study found participants on average reported experiencing loneliness "some of the time" pre-pandemic (Fall 2019) and early pandemic (November 2020) with a lower average mean reported pre-pandemic. The levels of loneliness reported by participants in all three AYs in the current study were lower as they reported, on average, "rarely" experiencing loneliness. Vaterlaus's study revealed on average higher levels of loneliness in participants, which may be due to the study using different measures than the current study, along with the current study controlling for demographic variables. Vaterlaus's study was also conducted in a different timeframe (November 2020) than the current study (Fall 2020-Spring 2023). Participants in Vaterlaus's samples consisted of participants from a U.S. university with majority being women, White and of similar age. However, the current study used the ULS 10-item measure to examine levels of loneliness, which differed from Vaterlaus's study which used a 3-item measure derived from the ULS and adapted for phone interviews to examine loneliness in college students. No research had examined levels of loneliness in college students as the pandemic continued into the later phases. Thus, this study contributes to the pandemic research as it highlights the trajectory of loneliness across pandemic phases, with low levels across all three AYs post pandemic onset, and a significantly greater level in the second AY compared to the first.

The second research question aimed to examine the levels of social anxiety in college students across different phases of the pandemic. We expected to see higher levels of social anxiety reported in the first AY following the onset of the pandemic as this was a period with the greatest health risk (highest hospitalizations recorded) and health behavior restrictions (stay at home order) compared to the second AY following the onset of the pandemic as restrictions were relaxed and students returned to campus. We also expected to see higher levels of social anxiety

in the second AY following the onset of the pandemic compared to the third AY following pandemic onset as restrictions were further relaxed (lowest health risk and health behavior restrictions [no capacity or social distance restrictions]), and higher levels of social anxiety reported in the first AY (greatest health risk and health behavior restrictions) compared to the third AY following pandemic onset. Contrary to our hypotheses, this study found that participants in AY1 had significantly lower levels of social anxiety compared to participants in AY2 and AY3, but AY2 and AY3 samples did not differ.

Although we expected the levels of social anxiety to be the highest during the first AY following pandemic onset as this was a period with greatest health risk threat and health behavior restrictions, we speculate that these may not have had as profound an impact as expected. Rather, it may be that transitioning back into society when restrictions were relaxed and then became optional that may have contributed to the higher levels of social anxiety reported in AY2 and AY3 as students were adjusting to being back in-person. Perhaps students had adjusted to online courses and isolation/social distancing protocols, so the relaxation of restrictions as they transitioned back into society created a sense of fear or nervousness to be around others and attend courses in-person contributing to the higher levels of social anxiety in students. The chronicity of the pandemic may have also contributed to the strain and later effects of social anxiety college students experienced.

Previous research has found levels of social anxiety to be higher during pandemic onset compared to pre-pandemic levels (Ranta et al., 2023; Thompson et al., 2021). Thompson et al had participants reflect on their life pre-pandemic (March 2020) compared to pandemic onset (September 2020) and found levels of social anxiety to be higher during pandemic onset.

However, the study did not identify the specific scales used or describe what the levels mean, therefore, their findings cannot be compared to the current study (Thompson et al., 2021).

Research conducted by Ranta et al. (2023) used data from the Finnish School Health Promotion survey collected in 2015 and again in 2021 (between March 1 and May 28). The reported the prevalence of social anxiety (i.e., exceeding the cut off score on the Mini-SPIN) by gender and found it increased from 2015 to 2021 in females 18-20 years old (24.9% to 43.1%) and males 18-20 years old (17.2% to 22.5%). The prevalence of social anxiety (i.e., exceeding the cut off score on the SPS) in the current study was lower than those 2015 and 2021 levels, with 13.1-19.2% of female and 3.9-7.5% of male participants in AYs one through three. This could be due to our sample consisting of majority females and having a higher age range compared to Ranta et al (Ranta et al., 2023). Another explanation could be the due to Ranta et al sample consisting of Finnish participants compared to the current study sample's consisting of participants in the United States (Ranta et al., 2023). The current study also used the SPS to measure social anxiety symptoms which differs from Ranta et al. as they measured social anxiety symptoms using the MINI-Spin. No research had examined levels of social anxiety in college students as the pandemic continued into the later phases.

Data collected from the Center of Collegiate Mental Health (CCMH) found levels of social anxiety became higher from 2010 to 2020 (pre-pandemic) as the mean score reported by college students increased from 1.82 to 2.07 (reflecting a moderate level) on a 5-point Likert scale ranging from (0) not at all to (4) extremely (Center for Collegiate Mental Health, 2020). Our study found a lower score on average (corresponding to experiencing "a little" social anxiety) across all three AYs following pandemic onset compared to the previous study. The contrast between studies could perhaps be due to different measures and time frames being used

in each study. The data reported by the CCMH was collected during the 2019-2020 academic year, beginning July 1, 2019 and closing on June 30, 2020 compared to the current study beginning data collection in Fall 2020. Another explanation for the contrast between studies could be due to the CCMH being a national survey, while the current study only consists of participants from one university (Center for Collegiate Mental Health, 2020). This study contributes to pandemic research as it highlights the trajectory of social anxiety across pandemic phases, with low levels across the three AYs following pandemic onset, with significantly higher levels in AY2 and AY3 compared to AY1

A study conducted by Lin et al. (2023) also found an increase in social phobia scores from pre-pandemic to early pandemic as the mean score reported by Chinese students increased from 1.03 pre-pandemic to 1.12 early pandemic (corresponding to "slightly" experiencing symptoms of social phobia). The findings from Lin et al. are consistent with the current study score on average corresponding to experiencing "a little" social anxiety. Both studies are conducted in college student samples and use the Social Phobia Scale to measure social anxiety symptoms.

The third research question was exploratory and aimed to examine the relationship, if any, between loneliness and social anxiety in college students across different phases of the pandemic. This study found that there was a positive relationship between loneliness and social anxiety, and the relationship did not significantly differ by AY sample. A moderate correlation was found in each sample across the different phases of the pandemic.

The findings from this study are consistent with previous pre-pandemic research examining the relationship between loneliness and social anxiety. A meta-analysis was conducted to examine the relationship between loneliness and social anxiety across childhood

and adolescence and found all correlations between to be positive ranging from $r = .10$ to $r = .72$ (Maes et al., 2019). All correlation coefficients in this study fell within the range (AY1: $r = .413$; AY2: $r = .445$; AY3: $r = .436$.

A study conducted by Lim et al. (2016) found a positive correlation between loneliness and social anxiety ($r = .52$). This longitudinal study was conducted at three different times across a 6-month period pre-pandemic and the results found that higher levels of loneliness predicted future levels of social anxiety. The current study findings are consistent with that study as correlations were moderate and positive. The current study has a slightly lower correlation strength, which could reflect a weaker relationship due to the pandemic. It is also possible that the difference is due to the different measures used as Lim et al. used the UCLA Loneliness Scale Revised to measure loneliness and Social Interaction Anxiety Scale to measure social anxiety symptoms, and the current study uses the UCLA Loneliness Short Form Revised and the Social Phobia Screener. The current study samples also have a lower mean age (19 years old) and different population (college students) compared to Lim et al.'s study (43-45 years-old) in the general population.

No research had examined the relationship during the pandemic, but previous research had found a positive relationship between loneliness and social anxiety pre-pandemic (Maes et al., 2019). Our study supports a positive and moderate strength relationship between loneliness and social anxiety during the first, second, and third AYs following the onset of the pandemic.

Implications

The results from this study may reflect the impact of the pandemic on college student loneliness and social anxiety in the three AYs following the onset of the pandemic. We cannot conclude that levels of loneliness and social anxiety were caused by the pandemic, but the higher

levels of loneliness and social anxiety reported in AY2 and social anxiety in AY3 suggest there may be long-term effects despite the lessening health threats and fewer health behavior restrictions. These results underscore the need to attend to student mental health, even more so as crises become more chronic. The results from this study can help inform college student support services that may be helpful for future crises. Perhaps support services should aim to help students adjust during the onset of a crisis. For instance, if the crisis necessitates a move to remote learning the way the pandemic did, providing assistance and support to students in making this shift. If a crisis becomes chronic, students may benefit from support services aimed to help them cope such as bolstered capacity to provide individual and group mental health services and flexibility in the delivery mode based on the type of crisis.

Limitations

This study's results should be viewed in light of its limitations. First, the repeated cross-sectional design includes different participants in each sample. With each sample consisting of different participants, we cannot conclude that levels of loneliness and social anxiety increased or decreased between AYs, however, we can conclude whether levels were higher or lower between AYs. Second, we cannot conclude that the levels experienced were caused by the pandemic. There may have been other external factors that influenced participants' loneliness and social anxiety levels outside of the pandemic that were not captured in this study (e.g., disability status, death in family, war). Third, all participants were recruited from a public southeastern university and while the samples were generally representative of the undergraduate population, the majority of the samples were White and female (despite the efforts made to recruit a more diverse sample). Thus, the findings may not be generalizable to underrepresented racial/ethnic groups, which may be impacted more by pandemic/crises (Hartzell et al., 2021). Fourth, this

study used self-report measures which are subject to bias and limitations including social desirability responding, honesty, and accurate interpretation. Lastly, this study used a screener to assess social anxiety and did not use clinical interviews to obtain a diagnosis of social anxiety disorder.

Future Research

After reviewing the results from this study new questions have emerged that may guide future research. Future research is needed to examine why levels of loneliness and social anxiety may be greater during different phases of a future pandemic or other crises. Specifically, future research is needed to understand the lasting effects of future pandemics/crises on college students, and why there may be changes in levels of loneliness and social anxiety in college students across phases (e.g., social restrictions, health threat, concern regarding social interaction). In addressing that question, future research should examine/account for factors other than the specific pandemic/crisis that may be contributing to loneliness and social anxiety (e.g., new social environment for those starting college). Another idea for future research is to use a longitudinal study design that follows the same participants across time. This would enable examination of the causal relationship between loneliness and social anxiety. Lastly, future research should examine loneliness and social anxiety in underrepresented racial/ethnic groups who may be more vulnerable to adverse effects of pandemics/crises.

Conclusion

The findings from this study suggest that levels of loneliness and social anxiety were higher in the second academic year following the onset of the pandemic compared to the first academic year, and the level of social anxiety was higher in the third academic year compared to the first academic year following the onset of the pandemic. The study also found a positive,

moderate correlation between loneliness and social anxiety across all three academic years following pandemic onset. The results show that college students' levels of loneliness and social anxiety may have been influenced by the chronicity of the pandemic and the social reintegration when social restrictions lessened. This study helps in understanding the trajectory of and relationship between loneliness and social anxiety across pandemic phases in college students. This study can help guide future research in efforts to understand reasons for changes in loneliness and social anxiety, and the causal relationship between loneliness and social anxiety in college students. The longer-term impact of loneliness and social anxiety in college students found in this study suggests the need to attend to student mental health, especially as crises become more chronic.

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