Alone Together: Investigating Loneliness, Anxiety, and Housing Situations Among Students in the Covid-19 Pandemic

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Abstract

The COVID-19 pandemic has significantly impacted university students' mental health by creating drastic disruptions in their daily lives. Increasing experiences of loneliness and anxiety led to unique challenges, which are further influenced by individual living situations or traits such as intolerance of uncertainty (IU). This research examines the relationship between loneliness and general and COVID-related anxiety in students, as well as the moderating and mediating roles of IU and housing situations. It is part of a bigger study that investigates primary and secondary stressors in students during the COVID-19 pandemic and utilises a cross-sectional correlational quantitative study design. The sample comprised 444 participants and questionnaires such as the UCLA Three-Item Loneliness Scale, the GAD-7, questions about COVID-related anxiety, the Intolerance of Uncertainty Scale (IUS) and questions about their housing situation. The results indicated that while there are significant relationships between general anxiety and loneliness and IU, COVID-related anxiety is not related to loneliness. Some (marginally) significant mediations indicate a mediating effect of IU on loneliness and COVID-related anxiety, while non-significant moderations show no effect of housing situation. This research contributes to the growing field of mental health research and the understanding of the pandemic's effects, with a focus on young adults, such as university students. Discussion points include the construction of the COVID-related anxiety variable as well as additional considerations for future research, such as social media or students' living situations.

Keywords: loneliness, anxiety, COVID-related anxiety, IU, housing situation, university students

Introduction

The COVID-19 pandemic, declared a global emergency by the World Health Organization (WHO) in 2020, had far-reaching effects (Onyeaka et al., 2021). Lockdown measures were implemented worldwide, affecting various aspects of daily life, including the way people work, live, plan for the future, and socialise (Lee et al., 2020). Educational establishments, such as universities or schools, were closed (Şimşir et al., 2022) and online education was implemented (Onyeaka et al., 2021). The lockdown, however, came with high psychological costs, bringing rise to problems such as anxiety, depression and loneliness (Kumar & Nayar, 2021). These mental health problems were further intensified by worries about the duration of the lockdown and fear of being infected, but also by feelings of boredom or frustration (Onyeaka et al., 2021). Social distancing measures were issued to get the pandemic under control, leading to people staying at home and minimising their social contact to a few, if any, individuals (Okruszek et al., 2020). University students, although not at direct physical risk for COVID-19, were uniquely affected by this disruption of daily life (Aristovnik et al., 2020), experiencing drastic changes in their everyday lives and futures. These changes and the accompanying uncertainty create stress and anxiety as well as a general fear for the future (Birmingham et al., 2023). By examining underlying factors, future research may gain a more nuanced understanding of the interplay between loneliness, anxiety, and student well-being during crises such as the COVID-19 pandemic.

Loneliness and Anxiety in the Pandemic Context

In the context of widespread isolation and disrupted routines, loneliness emerged as a particularly important issue, especially among university students. Loneliness is a state that an individual experiences when one perceives discrepancies between the interpersonal relationships one wishes to have and the relationships that one currently has (Heinrich & Gullone, 2006). What matters is not the number of social interactions but the perceived quality of those interactions. Loneliness is a universal experience (Heinrich & Gullone, 2006) and has been identified as one of the strongest predictors of developing mental health problems such as depression, symptomatic symptom disorder or anxiety (Werner et al., 2021). There are two different types of loneliness: emotional loneliness, which is a consequence of a lack of close and intimate attachments to others, and social loneliness, where the individual lacks social relationships and being part of a group to share interests or activities (Heinrich & Gullone, 2006). Both types of loneliness can lead to significant anxiety and perceived negative assessments of social support. Due to the scope of this research and in light of the unusual circumstances brought about by the pandemic, such as social isolation, the focus of

the current study will be placed more on the social aspect of loneliness. Although loneliness is more common during earlier developmental phases, such as adolescence (Heinrich & Gullone, 2006), the pandemic also influences students and their perception of loneliness. The onset of the pandemic created changes in living situations for many students, which led to the loss of daily social contact with friends or classmates, creating a sense of loneliness and isolation (Birmingham et al., 2023). Even outside of the pandemic, students are already vulnerable to loneliness when transitioning to university (Heinrich & Gullone, 2006) as they must adapt to new social environments and increased independence. The loss of these social contacts during the pandemic, which are especially important for being mentally healthy (Onyeaka et al., 2021), placed them at higher risk for poor mental health outcomes (Aristovnik et al., 2020). Although loneliness has been recognised as a risk factor for poor mental health, the findings on the relationship with anxiety during the COVID-19 pandemic were mixed (Okruszek et al., 2020). Some studies suggest a significant association between loneliness and anxiety or COVID-related worry, while others report no direct link, but rather indirect ones. This indicates that the relationship is complex and very context-dependent (Okruszek et al., 2020).

Given the fact that loneliness can be a predictor of anxiety, it is important to consider how anxiety was affected during the pandemic. Anxiety is typically a feeling of concern that appears because one emotionally overreacts to a situation that is perceived as threatening (Kan et al., 2021). This worry can be persistent and multifaceted, covering aspects such as the future, finances or health, for example (Stein & Sareen, 2015). Characteristics of anxiety are also intolerance of uncertainty, as well as difficulties managing worry (Stein & Sareen, 2015). In addition, individuals often prepare for possible future negative events (Craske et al., 2011). Muscle tension, exhaustion or agitation often accompany the worry and persistent anxiety is known to weaken the immune system, making one more prone to infection (Kan et al., 2021). Symptoms of anxiety are expected to have increased during the pandemic, as the uncertainty associated with the situation likely intensified feelings of worry (Weber et al., 2022). Additionally, increased experiences of loneliness during this time may have further contributed to the psychological distress and anxiety (Weber et al., 2022). Studies show that students, on average, experienced more anxiety symptoms during the pandemic compared to non-students (Weber et al., 2022). There are several reasons why these higher anxiety levels emerged during the pandemic. First of all, there was high uncertainty regarding the education to follow (Liyanage et al., 2021), where students had to deal with higher stress levels and anxiety regarding, for example, their future. On top of that, changes were implemented

leading to social isolation, while some even had to deal with being far away from home (Liyange et al., 2021). Beyond the social disruptions of the pandemic, students also faced a loss of control over their circumstances, a psychological key factor in managing stress. The perception of being in control can act as a buffer against negative stress (Birmingham et al., 2023). Not only is the buffer being taken away due to the pandemic's unpredictability, but losing control is also linked to psychological and physiological health and can affect academic performance (Birmingham et al., 2023). Therefore, focusing on a younger age group who had to deal with these exact issues might bring valuable insights. While anxiety is a general psychological construct, the pandemic gave rise to a more specific form of anxiety, known as COVID-related anxiety.

In light of the circumstances, the COVID-19 pandemic understandably played a vital role in heightened anxiety worldwide. The term 'COVID-related anxiety' often refers to this specific anxiety experienced during those times. 'Fear of COVID' is another term commonly used to describe the immediate and often specific fears related to the virus, such as the fear of contamination (Coelho et al, 2020). This paper, however, uses the term 'COVID-related anxiety' as it reflects the more encompassing nature of anxiety in relation to COVID, including not only acute fear but also sustained worry, concerns about the future and more pandemic-related stressors (Coelho et al., 2020). Nevertheless, the terms are often used interchangeably, and several terms are used to describe a very similar construct. Other terms include 'pandemic-related anxiety or coronavirus anxiety' (Lee et al., 2020). COVID-related anxiety is linked to health concerns, such as the fear of getting infected and the impact of the pandemic-related flow of information (Tyrer, 2020). This form of anxiety shares characteristics with health anxiety. Individuals suffering from health anxiety have an excessive fear of contracting a disease, which is why they often interpret benign symptoms as threatening. Related to COVID, for example, it would be the fear of contracting the infection. To cope, individuals with heightened COVID-related anxiety would engage in so-called safety-seeking behaviours (Tyrer, 2020). These include excessive handwashing, continuing to isolate or avoiding situations where infection might be a threat (Tyrer, 2020). However, it is important to note that anxiety is not inherently negative (da Silva et al., 2021). Moderate levels of anxiety can be beneficial in this state of emergency, as it ensures and encourages individuals to engage in precautionary behaviours, such as hand washing, keeping their distance and adhering to guidelines (da Silva et al., 2021). Low levels of anxiety could lead to compromised safety of the populations as they minimise the importance of such behaviours (da Silva et al., 2021). Nevertheless, feelings of anxiety, regardless of their intensity, should

not be dismissed and should be taken seriously. If the anxiety becomes excessive, it can interfere with daily life and lead to psychological consequences. What makes the situation more complicated is that anxiety symptoms can also overlap and, through that, be confused with COVID-19 symptoms (da Silva et al., 2021), which might lead to even more anxiety and excessive safety behaviours. There are some indications of underlying factors acting as bridges between loneliness and anxiety (Owczarek et al., 2022), which is where Intolerance of Uncertainty (IU) might serve as a mediating factor, as it is heavily linked to anxiety. Including IU into the relationship might bring more insight into the interplay between loneliness and anxiety.

Intolerance of Uncertainty and Housing Situation

To understand why COVID-related anxiety affected some individuals more strongly than others, it is important to consider (IU), which is a key to the development of anxiety (Coelho et al., 2020). IU refers to an individual's tendency to react negatively to situations or events where the outcome is uncertain or unknown (Bavolar, 2023). This reaction occurs regardless of how likely this uncertain event is to happen or how severe the consequences might be (Bavolar, 2023). Individuals with high intolerance of uncertainty often exaggerate their perceptions of threat and possess negative beliefs about their ability to cope with change and uncertainty (Carleton et al., 2012). IU is related to a variety of emotional and cognitive responses fueling risk perception, anxiety, as well as worry (Bavolar et al., 2023). Concerning IU, two dimensions can be broadly identified: prospective IU and inhibitory IU (Carleton et al., 2012). Prospective IU is more cognitively focused and is related to the worrying aspect of intolerance of uncertainty, while inhibitory IU is more behaviourally focused and leads to avoidance behaviours due to perceived uncertainty (Carleton et al., 2012). Within this research, the cognitive aspects are examined, which is why it will focus on prospective IU. Uncertainty can be triggered by events as small as disruptions in daily routines or interactions, including social support (Satici et al., 2022). Such a minor disruption can already lead to feelings of perceived loss of control, which fuels uncertainty (Satici et al., 2022). Predictably, IU played a role in the COVID-19 pandemic (Bavolar et al., 2023) due to the widespread uncertainty that it created. Especially in the initial phases of the pandemic, great uncertainty led to emotional responses such as higher anxiety, worry and a general fear of the coronavirus. The intense media coverage further amplified the effect, as individuals with higher IU often seek out threat-relevant information (Bavolar et al., 2023). Given the significant role that IU plays in the emotional, cognitive and behavioural responses to uncertainty, it is expected that it played a central role in the perception of the COVID-19

pandemic and the subsequent heightened levels of anxiety. Most likely, it mediates the relationship between loneliness and anxiety, as the widespread uncertainty that was brought about by the pandemic during that time, paired with the intense media coverage and social isolation, amplified anxiety responses in individuals with high IU.

Beyond individual traits like IU, environmental factors played a critical role in shaping psychological well-being during the pandemic. One aspect that might influence loneliness as well as anxiety in the pandemic is the housing situation. Housing situations might play an important factor, as living alone has been indicated to influence loneliness as well as anxiety (Benke et al., 2020). In situations where most institutions that allow for socialising had closed, individual homes became the most important places in people's lives (Lips, 2021). In these circumstances, the environment in which people live significantly impacts how they deal with difficult events. The home environment, in particular, influences how, especially young people, experienced the lockdown (Lips, 2021). Living alone, for instance, has been identified with higher anxiety and higher loneliness, both generally but also during the COVID-19 pandemic (Benke et al., 2020). The relationship with co-habitants, whether family, partner or roommates, also plays a crucial role (Lips, 2021). In times of restricted social contact, living with others can protect against loneliness (Hopf et al., 2022) and might offer the benefits of social support, as there are opportunities to talk about worries, for example (Lips, 2021). Additionally, spending more time together can also lead to newfound positive aspects in the relationship. Nevertheless, there are also negative aspects to consider, such as increased possibilities of conflict situations due to a lack of space for people to retreat to (Lips, 2021). The quarantine also limited the possibility of leaving the home and blowing off steam with other people, different from those you are living with (Hall & Zygmunt, 2021). Individual challenges for students include organising their studies at home, either alone or with family, roommates, or partners (Lips, 2021). The pandemic also led to changes in living arrangements. Some students might even return to their family homes due to the closure of student halls or the cancellation of exchange studies (Chen & Lucock, 2022), often with little preparation and having to cope with the feeling of losing control or independence (Hall & Zygmunt, 2021).

Overall, this research aims to investigate the interaction between loneliness and IU in predicting COVID-related and general anxiety among university students. To gain a thorough understanding, the role of the university students' housing situation as a moderator will be explored, as well as the mediating role of IU (Figure 1). Based on the research gap on this topic, the primary research question is: *'How do loneliness and intolerance of uncertainty*

interact to predict general and COVID-related anxiety in university students?'. It is hypothesised that the relationship will be positive, meaning that higher amounts of loneliness and intolerance of uncertainty lead to higher levels of general and COVID-related anxiety. In addition, the subordinated research question of '*To what extent does the student's living situation moderate the relationship between loneliness and anxiety?*' will be explored. A negative moderation would mean that living with roommates, a partner, or family leads to a weakened relationship between loneliness and anxiety. Therefore, the relationship between loneliness and anxiety is moderated by living situations, such that the association is more strongly positive in students who live on their own. Those questions would mean the following hypotheses:

H1: There is a positive relationship between the amount of loneliness and general and COVID-related anxiety in students.

H2: There is a positive relationship between loneliness and intolerance of uncertainty.

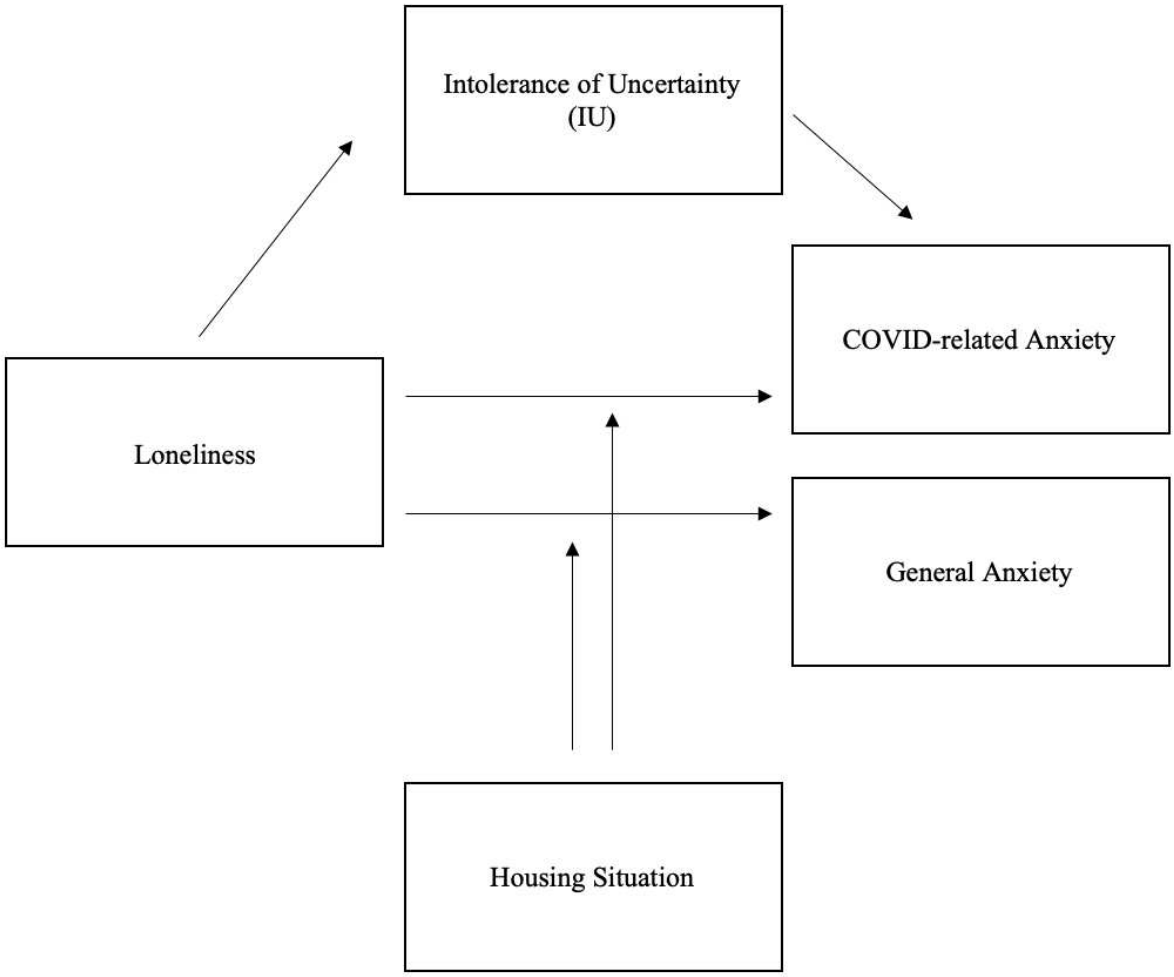
H3: There is a positive relationship between intolerance of uncertainty and general and COVID-related anxiety.

H4: Intolerance of uncertainty mediates the relationship between loneliness and general and COVID-related anxiety, such that it increases the relationship.

H5: Housing situation moderates the relationship between loneliness and general and COVID-related anxiety, such that for students living together with other individuals, the relationship is reduced.

Figure 1

Illustration of the relationship Between the Variables.



Methods

Study Design

This research employed a cross-sectional correlational quantitative study design. The data used within this research was collected during the COVID-19 pandemic and is part of a bigger study that investigates primary and secondary stressors in students during the pandemic. Multiple surveys were used to collect the data for the original study, however, this research only used the second survey to gather the data. In the current study, the relationships between loneliness (dependent variable), general and COVID-related anxiety (independent variables), as well as intolerance of uncertainty (IU) and housing situation will be analysed in detail.

Participants & procedure

Participants were recruited using three ways: 1) students were invited via e-mail based on previous participation in a first wave of the study, 2) one of the authors visited the students during an online lecture and administered the survey as part of their lesson, and 3) students

were invited to participate via advertisement from a study advisor. To encourage participation, there was an additional lottery to win a monetary prize (25 euros) for those who completed the questionnaire. Furthermore, all students received feedback on their results after the survey. This feedback included their well-being scores in comparison to those of other students and provided information about resources to enhance their well-being. Based on this, the sampling method employed is a non-probability sampling, combining convenience sampling and voluntary response sampling. To participate in the study, participants had to be students in their first or second year of study at a university in the Netherlands.

Materials

For this research, participants needed to have an electronic device, access to Wi-Fi and a link to the survey. After giving their consent, participants were first asked about their demographics, including age, gender, nationality and educational level. After that, they were asked to fill out a variety of questions, consisting of general questions such as their age and gender, as well as questions derived from multiple questionnaires to assess underlying psychological constructs. For this research, only the Three-Item Loneliness Scale, the GAD-7, questions about COVID-related anxiety, the IUS and questions about their housing situation will be relevant (Appendix A).

Three-Item Loneliness Scale

To measure loneliness, the Three-Item Loneliness Scale was used, which stems from the R-UCLA Loneliness Scale (Hughes et al., 2004). It consists of three items, which are scored on a 3-point Likert scale, where 1 indicates *hardly ever* and 3 indicates *often*. The items measure perceived social isolation with the following questions: “How often do you feel that you lack companionship?“, “How often do you feel left out?” and “How often do you feel isolated from others?”. The scale shows moderate to high reliability with an alpha of α =.72, however, the internal consistency is quite good (Hughes et al., 2004). Within this current sample, internal consistency is still acceptable with an alpha of α =.75.

Generalised Anxiety Disorder Questionnaire (GAD-7)

To measure anxiety, the Generalised Anxiety Disorder Questionnaire (GAD-7) was used (Rutter & Brown, 2017). The questionnaire consists of seven items, scored on a 4-point Likert scale, ranging from 0 to 3. Hereby, 0 indicates *not at all* and 3 indicates *nearly every day*. The items assess classic symptoms of anxiety such as feeling nervous, anxious or on edge, having trouble relaxing or worrying too much. Scores range from 0 to 21, with higher scores indicating more severe anxiety symptoms. The internal consistency for the GAD-7 is

high (α = .85), and the scale shows good convergent and discriminant validity (Rutter & Brown, 2017). After calculating Cronbach's alpha within this sample, the internal consistency is still good (α = .88).

COVID-related anxiety

COVID-related anxiety was assessed by two questions related to worrying about COVID. These questions were created specifically for the original study and were not based on a theoretical framework. The first question was "To what extent are you worried about getting Covid (again)?" and the second question was "To what extent are you worried that someone close to you (close friends and family) will get Covid?". Both questions were scored on a 7-point Likert scale, with 1 indicating *not at all* and 7 indicating *very much*. To ensure that both items measure the same construct, Cronbach's alpha was calculated. With an alpha coefficient of α = .72, the new scale demonstrates acceptable internal consistency.

Intolerance of Uncertainty Scale

To measure intolerance of uncertainty (IU), the shortened version of the Intolerance of Uncertainty Scale (IUS) was used, which consists of 12 items in total (Carleton et al. 2007). The items are scored on a 5-point Likert scale (1 = *not at all characteristic of me*; 5 = *entirely characteristic of me*). Items of the IUS-12 include "Unforeseen events upset me greatly." or „When I am uncertain I can't function very well.". The internal consistency of the scale is excellent with an alpha of α = .91 (Carleton et al., 2007). The internal consistency within this sample is still good with an alpha of α = .86.

Housing situation

The individual housing situation was assessed using a single question: "What is your current living situation?". Several answer options were provided using a 5-point Likert scale. These answer options include "I live in student housing with shared facilities (for example: shared bathroom and kitchen).; I live alone (without roommates); I live together with my partner; I live with (one of) my parents; Otherwise, namely:…".

Data Analysis

A sensitivity power analysis was conducted using G*Power (Faul et al., 2009) for a linear multiple regression (fixed model, R^2 deviation from zero). This was performed to test the robustness of the results by checking whether they hold up under different conditions With a sample size of N = 444, an alpha level of α = .05, and a power of 0.80, the analysis indicated that the minimum detectable effect size was f^2 = .039, which indicates that the study can detect small to medium-sized effects. Starting with the analysis, a descriptive

correlational design, including regression analyses, was chosen to investigate the relationship between loneliness, (COVID-related) anxiety, housing situation and IU. Afterwards, the collected data was analysed using R. Descriptive statistics such as means, percentages and standard deviations were used to investigate and summarise the demographic data of the sample (age, gender, nationality and educational level). Dummy coding was used to create two categories for the variable of housing situation, namely living alone versus living with others. Next, a variable called COVID-related anxiety was created. Correlations were calculated between the variables in the model and demographics. These correlation analyses were used to gain more insight into the relationships between the relevant variables and the descriptive statistics. Afterwards, a multiple regression model was utilised to describe and investigate the relationship between the dependent variable of (COVID-related) anxiety and the independent variable of loneliness (H1). Furthermore, to investigate the hypothesis that housing situation is an influencing factor in loneliness and (COVID-related) anxiety, a moderation analysis was conducted. Next, to investigate whether IU is an influencing factor in loneliness and (COVID-related) anxiety, a mediation analysis with IU as the mediator was conducted. For all analyses, a significance level of $\alpha < .05$ was set, and the assumptions of multiple regression, namely normality, linearity, homoscedasticity and multicollinearity were checked. None of the assumptions were violated.

Results

Participants

In total, 650 participants filled out the survey, however, 206 of them had to be excluded because they did not fill out the whole questionnaire, leaving 444 participants in the sample. Participants in this sample were students aged 17-38 years, with an average age of 18 years (*SD* = 1.82). Out of the sample, 49.89% identified as male (n = 221), with 49.66% identifying as female (n = 220) and 0.45% indicating non-binary/other (n = 2). The nationality of 70.27% (n = 312) of the sample was Dutch, 8.56% was German (n = 38), and 21.17% comprised other nationalities (n = 94). Of the sample, 55,41% of the participants lived in student housing with shared facilities (n = 246). The second-largest group lived with their parents, as indicated by a percentage of 28% (n = 126).

Descriptive Statistics

A descriptive analysis was conducted to report on the characteristics of the sample regarding their feelings of loneliness, (COVID-related) anxiety, housing situations and their levels of IU. Most participants in the sample reported moderately high feelings of loneliness,

as indicated by a mean of 1.87 (*SD* = 0.61), assessed on a 3-point Likert scale. The sample's average anxiety tendencies are at 0.94 (*SD* = 0.72). The average amount of COVID-related anxiety, however, is 4.3 (*SD* = 1.50). Levels of IU are at 2.68 (*SD* = .73), indicated by a 5-point Likert scale. This means that the sample's participants possess moderate levels of IU.

Correlation Analysis

A correlation analysis (Table 1) was conducted to examine the relationships of the demographic characteristics of the sample in relation to the main variables of loneliness, (COVID-related) anxiety, IU and housing situation. The analysis showed several significant positive as well as negative correlations, however, most of them were relatively weak.

Table 1

Means, Standard Deviations and Bivariate Correlations for the Sample Data.

	M	*SD*	1	2	3	4	5	6	7	8
1. Loneliness	1.87	0.61	-							
2. Anxiety	0.94	0.72	.44**	-						
3. COVID-related anxiety	4.30	1.50	.10*	.14**	-					
4. IU	2.68	0.73	.33**	.52**	.14**	-				
5. Housing situation	0.10	0.30	.12*	.07	.03	.08	-			
6. Age	18.96	1.82	.13**	.19**	.06	.12*	.20	-		
7. Gender	1.51	0.51	.03	-.12*	-.23**	-.07	-.04	.09	-	
8. Nationality	1.51	0.82	.24**	.27**	.12*	.28**	.22	.27	.13	-

Note. *$p < .05$. **$p < .01$.

In line with H1, a moderate positive correlation between the variables of anxiety and loneliness was found, $r(440) = .44$, $p < .001$. This means that as loneliness increases, anxiety increases as well and vice versa. As for COVID-related anxiety, the relationship is also significant but not very strong, indicated by a weak correlation coefficient, $r(440) = .10$, $p = .035$. This is in line with H1 as well. Consistent with H2, loneliness is also significantly positively correlated to IU, $r(440) = .33$, $p < .001$. However, the relationship is not very strong as the correlation coefficient is weak to moderately strong. Lastly, there is a significant weak positive correlation between loneliness and housing situation, indicated by $r(440) = .12$, $p = .011$

Anxiety positively correlates to COVID-related anxiety, indicated by a significant weak to moderate correlation, $r(440) = .52$, $p = .002$. In support of H3, a significant moderate

to strong correlation was found between anxiety and IU, indicated by $r(440) = .52$, $p < .001$. Anxiety and housing situation, however, are very weakly correlated ($r(440) = .07$, $p = .139$).

COVID-related anxiety and IU present a relatively weak and significant correlation of $r(440) = .14$, $p = .003$, whereas COVID-related anxiety and housing situation are very weakly correlated ($r(440) = .03$, $p = .511$). IU and housing situation are weakly correlated as well, indicated by $r(440) = .08$, $p = .077$.

Regression Analysis

Next, two multiple regression analyses were conducted, including anxiety and COVID-related anxiety as the dependent variables and loneliness, IU, and housing situation as the predictors (Table 2 and Table 3).

Table 2

Multiple Regression Model With Anxiety as the Dependent Variable.

	Estimate	SE	95% CL		p
			LL	UL	
(Intercept)	-0.84	0.13	-1.08	-0.61	< .001
Loneliness	0.35	0.05	0.26	0.45	< .001
IU	0.42	0.04	0.34	0.50	< .001
Housing situation	-0.003	0.09	-0.19	0.18	0.971

In line with H1, loneliness significantly predicted anxiety in students. The results also showed a significant effect of IU on anxiety, $\beta = .42$, $SE = .04$, $t(440) = 10.37$, $p < .001$. This indicates that IU does affect anxiety, as higher levels of IU are associated with higher levels of anxiety. Lastly, a non-significant effect of the housing situation on anxiety was found ($\beta = -.003$, $SE = .09$, $t(440) = -.037$, $p = .971$), indicating that the housing situation does not influence levels of anxiety. An R^2 of .35 means that 35% of the variance within the dependent variable of anxiety can be explained by the independent variables of loneliness, IU, and housing situation. The residual standard error was 0.58, indicating the average amount of error in this model. The analysis revealed a significant F-value of $F(3, 440) = 79.14$, $p < .001$. This indicates that the regression model used in this analysis is statistically significant. This means that the model can explain the collective effect of the predictors on the dependent variable of anxiety.

Table 3

Multiple Regression Model With COVID-related Anxiety as the Dependent Variable.

	Estimate	SE	95% CL		p

			LL	UL	
(Intercept)	3.35	0.31	2.75	3.96	< .001
Loneliness	0.15	0.12	-0.10	0.39	0.234
IU	0.25	0.10	0.04	0.45	0.018
Housing situation	0.07	0.24	-0.40	0.55	0.767

Based on this model, it can be said that loneliness does not significantly predict COVID-related anxiety in students (β = .15, *SE* = .12, *t*(440) = 1.19, *p* = .234). Nevertheless, the results show a significant effect of IU on COVID-related anxiety (β = .25, *SE* = .10, *t*(440) = 2.38, *p* = .018), indicating that IU affects COVID-related anxiety positively. An R^2 of .02 means that the independent variables of loneliness, IU and housing situation can explain 2% of the variance in the dependent variable of COVID-related anxiety. The regression model was statistically significant, *F*(3, 440) = 3.46, *p* = .017.

Moderation Analysis

Next, a moderation analysis was conducted in order to test the prediction that housing situation moderates the relationship between loneliness and anxiety. Although a negative coefficient was found, the analysis revealed no significant interaction effect of housing situation, β = .21, *SE* = .17, *t*(440) = 1.21, *p* = .226. This indicates no moderation effect of housing situation on the relationship between loneliness and anxiety. Furthermore, the F-value of *F*(3, 440) = 35.4, *p* <.001 suggests that the model was statistically significant and, therefore, suitable for explaining the effect of housing situation on the relationship between loneliness and anxiety. Based on these results, the hypothesis that housing situation reduces the relationship between loneliness and anxiety needs to be rejected.

Afterwards, a second moderation analysis was conducted, this time using COVID-related anxiety as the dependent variable. The model revealed no significant main effects, as well as no significant interaction effect of housing situation β = .58, *SE* = .39, *t*(440) = 1.46, *p* = .144. This also indicates no moderation effect of housing situation on the relationship between loneliness and COVID-related anxiety. However, the model is not statistically significant (*F*(3, 440) = 2.27, *p* = .080) and, therefore, not suitable for predicting COVID-related anxiety in the sample or for answering the hypothesis.

Mediation Analysis

A causal mediation analysis was conducted to examine whether IU mediates the relationship between loneliness and anxiety. The analysis revealed a significant indirect effect (ACME), *b* = .16, 95% CI [0.11, 0.22], *p* < .001, indicating that loneliness has a significant

effect on anxiety through IU. The direct effect (ADE) of loneliness on anxiety was also significant, $b = 0.36$, 95% CI [0.26, 0.46], $p < .001$. The total effect was significant as well ($b = .52$, 95% CI [0.42, 0.63], $p < .001$), demonstrating that loneliness is significantly associated with anxiety directly and indirectly through IU. As indicated by the proportion mediated ($b = .32$, 95% CI [0.22, 0.43], $p < .001$), approximately 31.5% of the total effect of loneliness on anxiety was mediated by IU.

A second causal mediation analysis was conducted to examine whether IU mediates the relationship between loneliness and COVID-related anxiety. The analysis revealed a significant indirect effect (ACME), $b = .1$, 95% CI [0.01, 0.19], $p = .028$, indicating that IU significantly mediates the relationship between loneliness and COVID-related anxiety. The direct effect (ADE), however, was not statistically significant, $b = .15$, 95% CI [-0.11, 0.42], $p = .252$, suggesting that the relationship between loneliness and COVID-related anxiety was not direct. Nevertheless, the total effect of the mediation was marginally significant ($b = .25$, 95% CI [-0.01, 0.50], $p = .056$). Approximately 39% of the effect of loneliness on COVID-related anxiety was mediated by the mediator, $b = .39$, 95% CI [-0.38, 2.51], $p = .076$. Based on the results of the two mediation analyses, H4 can be partly accepted.

Discussion

This research aimed to investigate the relationship between loneliness and general anxiety, as well as COVID-related anxiety, in university students during the COVID-19 pandemic. Additionally, it examined the influencing factors of housing situation and intolerance of uncertainty on this relationship. These findings provide a meaningful contribution to the academic field of mental health research and contribute to the further understanding of the COVID-19 pandemic. This study contributes by examining not only general and COVID-related anxiety, but also the roles of loneliness, intolerance of uncertainty, and housing situation, which are factors that are often considered independently but rarely explored in combination.

The findings revealed that there is a significant positive relationship between loneliness and general anxiety. This finding aligns with previous research. As already suggested by Werner et al. (2021), loneliness is one of the strongest predictors of mental health problems such as anxiety. What is surprising, however, is that there does not seem to be a significant relationship between loneliness and COVID-related anxiety. During the COVID-19 pandemic, worries in general, but especially concerns about one's health, have been more prevalent (Tyrer, 2020). As loneliness exacerbates anxiety symptoms, it was

expected that loneliness should lead to stronger COVID-related anxiety as well, because social isolation during the pandemic may have intensified feelings of uncertainty, vulnerability and a lack of social support, all of which are known to amplify worry, also in a health-related context. There are several reasons why this research does not support that hypothesis. Firstly, it is possible that social distancing and isolation have a less negative impact on one's health, as they reduce the perceived risk of infection (Stuart et al., 2021). Therefore, even if someone feels lonely, at the same time, they might feel safe due to restricted social contact. Another reason might be that digital technologies mitigate the negative impacts of the pandemic (Stuart et al., 2021). Using online social technologies, such as social media, for example, offers perceived social support and can even partially or fully replace offline social contacts (Stuart et al., 2021). Hence, using social digital technologies might have an impact on the relationship between loneliness and COVID-related anxiety. Additionally, the age group of the students may have also played a role in this. As students, who are typically of a young age, are not specifically at risk for serious negative health consequences resulting from contracting COVID (Aristovnik et al., 2020), it may be that they are not perceiving COVID as a direct health risk. Rather, they might be more concerned with their academic future or their social life (Aristovnik et al., 2020), making them less vulnerable to COVID-related anxiety. Lastly, the direction of the relationship might be reversed, meaning that COVID-related anxiety might lead to higher feelings of loneliness rather than the other way around. As already noted above, concerns about one's health can lead to increased isolation and avoidance of health-threatening situations due to the fear of contracting an infection (Tyrer, 2020). This isolation can lead to increased feelings of loneliness, suggesting a more bidirectional relationship between those two constructs, which could not be tested in the current research.

The findings also suggest a positive, though weak, relationship between loneliness and IU. This is in line with H2. With loneliness being a significant precursor of mental health problems (Werner et al., 2021), it is not surprising that it can affect IU as well. The loss of social support, along with the resulting loneliness (Satici et al., 2022), can trigger feelings of uncertainty. The hypothesis that IU has a positive relationship with general and COVID-related anxiety can also be accepted. This is again in line with previous research, suggesting that IU is related to anxiety, worry and risk perception (Bavolar et al., 2023), which are part of COVID-related anxiety as well. Given the positive relationships between IU and loneliness as well as general and COVID-related anxiety, the finding that it also mediates these respective relationships was expected to be confirmed as well. This is in line with H4,

although the mediation between loneliness and COVID-related anxiety was only marginally significant.

Another unexpected finding is that there does not seem to be a moderating impact of one's housing situation on the relationship between loneliness and general and COVID-related anxiety. To explain this, it may be worth going into detail about the quality of those living arrangements. While living with someone else can act as a buffer against loneliness (Hopf et al., 2022) and offer social support, it can also lead to more conflict situations (Lips, 2021). Being unable to leave home to blow off steam or always being around the same people (Hall & Zygmunt, 2021) can heighten the risk for those conflicts to arise. Additionally, relationship quality is important when it comes to feelings of loneliness (Heinrich & Gullone, 2006). It could be that, even though living with roommates, family or a partner, the relationship quality of those living arrangements is not good and, therefore, has no effect on levels of loneliness or anxiety. Furthermore, the argument that online social contacts are a relevant factor (Stuart et al., 2021) is again supported, where online contacts buffer against the lack of quality in relationships at home or compensate for living alone. This suggests that the housing situation alone might not be a sufficient predictor for mental health outcomes such as loneliness and anxiety, but relationship qualities or perceived social support should be considered within the housing situation as well.

Limitations

To account for the (non-) significant findings, some limitations of this research need to be mentioned. An important limitation might have been the construction of the variable of COVID-related anxiety. Because this research used preexisting data, not a lot of questions were suitable for the construction of the variable of COVID-related anxiety. To be more specific, it was just two questions asking about the individual's concern about themselves or someone close catching COVID. Considering the large scope that such a mental health construct encompasses, the resulting variable of those two combined questions might not have been enough to truly capture the essence of that construct. This is underlined by the fact that there are already existing scales to measure COVID-related anxiety, such as the Coronavirus Anxiety Scale (CAS) (Lee, 2020). It involves items that come from a variety of mental health constructs, such as panic attacks, posttraumatic stress disorder, major depressive disorder, as well as generalised anxiety disorder (Lee, 2020). Not only is it more comprehensive to use an existing scale, but using more than two items is also better in terms of construct validity (Eisinga et al., 2013). In comparison, it is to be expected that using just two questions to measure such an encompassing construct will probably not yield significant results. However,

as the data and questionnaires stem from a preexisting study, it was not possible to use this scale.

Recommendations

Knowing these limitations already provides good starting points for improving future research, but it may also be worthwhile to build upon this research by including other factors. What stands out as an important factor is the use of online digital technologies such as social media. Connecting with others online can offer, just as offline relationships, many benefits and can help maintain relationships, reduce loneliness, and create intimacy (Stuart et al., 2021). For many, it might have been a fundamental part of their lives during the pandemic that helped them get through these times, so it should not be disregarded when it comes to the research on the COVID-19 pandemic. Including social technologies as moderators or mediators might offer valuable insights into the dynamic of the relationship between loneliness and general and COVID-related anxiety. Another recommendation concerns the research on housing situations. As the housing situation is hypothesised to affect loneliness, it might be worth including it in future research as one of the main variables. Generally, there has been limited research regarding the effects of housing situations, despite their fundamental role in students' lives. Future research should aim to refine the measurement of housing situation, for example, distinguishing between living alone, with family, with roommates, or with a partner, and account for the quality of those living arrangements.

Strengths and Contributions

Despite its limitations, this research also has some strengths. It explored the relationship between COVID-related anxiety and age, as the target group were young adults, and confirmed that young individuals are at risk for developing anxiety as well and, therefore, should not be overlooked. Furthermore, this research highlights that not all anxiety is bad, but that it can also be beneficial to have a certain amount of worry and respect when it comes to the uncertainties of a pandemic like COVID-19. Moreover, this research puts the variables loneliness, (COVID-related) anxiety, IU and housing situation in a unique context as they are rarely examined in combination, providing more in-depth information about the contextual relationships between loneliness and, specifically, anxiety. Lastly, despite the extensive research on the COVID-19 pandemic, this study contributes to the existing body of knowledge by including a large sample of young adults, such as students, who confirm some of these previous studies and expand on them, thereby increasing the generalizability of the findings.

Conclusion

In conclusion, this research sheds light on the complex interplay between loneliness, intolerance of uncertainty, anxiety, and living situation among university students during the COVID-19 pandemic. While the study confirmed several expected associations, such as the strong link between loneliness and general anxiety along with the mediating role of intolerance of uncertainty, it has also brought some unexpected results to light, such as a lack of a direct relationship between loneliness and COVID-related anxiety. These findings highlight the importance of researching complex mental health constructs together, rather than in isolation, to better understand their impact on young adults, such as university students. In light of the challenges posed by the COVID-19 pandemic, it is essential to consider both emotional and environmental situations when designing mental health interventions. This approach could help increase resilience and preparedness in the face of potential future public health crises. Ultimately, this research contributes to the growing body of research on the COVID-19 pandemic and its impact on university student populations, as well as the effects of their housing situations, in future research.

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Appendices

AI Statement

During the presentation of this work, the author used ChatGPT in order to help resolve coding errors in R Studio. After using the tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the work. Other software that has been used to write this thesis includes, but is not limited to, Microsoft Word, R Studio, G*Power 3.1 and Google Scholar.

09.06.2025
Matea Steven

Appendix A: Questionnaires

Three-Item Loneliness Scale

1. How often do you feel that you lack companionship?
2. How often do you feel left out?
3. How often do you feel isolated from others?

GAD-7

Over the past two weeks, how often have you felt bothered by…
… feeling nervous, anxious, or on edge?
… not being able to stop or control worrying?
… worrying too much about different things?
… having trouble relaxing?
… being so restless that it is hard to sit still?
… becoming easily annoyed or irritable?
… feeling afraid as if something awful might happen?

IUS

1. Unforeseen events upset me greatly.
2. It frustrates me not having all the information I need.
3. One should always look ahead so as to avoid surprises.
4. A small, unforeseen event can spoil everything, even with the best of planning.
5. I always want to know what the future has in store for me.
6. I can’t stand being taken by surprise.

7. I should be able to organize everything in advance.
8. Uncertainty keeps me from living a full life.
9. When it's time to act, uncertainty paralyses me.
10. When I am uncertain I can't function very well.
11. The smallest doubt can stop me from acting.
12. I must get away from all uncertain situations.

Questions about COVID-related anxiety

To what extent are you worried about getting corona (again)?

To what extent are you worried that someone close to you (close friends and family) will get corona?

Question about housing situation

What is your current living situation?

1. I live in student housing with shared facilities (for example: shared bathroom and kitchen).;
2. I live alone (without roommates);
3. I live together with my partner;
4. I live with (one of) my parents;
5. Otherwise, namely:....