Unveiling Well-Being in the Pandemic: A Cross-Sectional Analysis of Social Contact, Resilience, and Mental Well-Being of University Students in the COVID-19 Pandemic.

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Abstract

Background: The global COVID-19 pandemic has disrupted personal and public safety. This resulted in social distancing measures to slow the virus's spread. As a result of the university closures, the lack of social interaction, and psychological stress, the level of well-being of university students was significantly reduced. To learn from the negative impacts of social distancing on well-being, the current study investigated the associations between psychological resilience, face-to-face and online social contact with friends and family, and the well-being of Dutch university students during the COVID-19 pandemic. Additionally, the study explored potential buffering effects of resilience on the associations between social contact with friends and family (both face-to-face and online) and well-being. **Methods:** A cross-sectional study design was used with a sample of 457 undergraduate students enrolled in Dutch universities. The data were collected through online self-report questionnaires. The Mental Health Continuum Short Form (MHC-SF) measured the construct of well-being. The construct of resilience was examined using the Brief Resilience Scale (BRS). Further, two items assessed the frequency of face-to-face contact with friends and family, and two assessed the frequency of online contact with friends and family. The statistical analyses, including multiple linear regression and moderation analyses, were conducted using the R studio software. **Results:** The findings indicated that face-to-face social contact with friends and family was positively associated with students' well-being. Similarly, online social contact with friends and family was also significantly related to students' well-being. Further, resilience showed a significant positive association with students' well-being. Moderation effects of resilience on the relationship between social contact and well-being were not significant either for face-to-face social contact or for online social contact. This suggests that the relationship between social contact and well-being is independent of resilience levels. **Conclusion:** The study highlights the critical role of maintaining both face-to-face and online social contact in promoting well-being during times of crisis and social isolation. Further, resilience emerged as an essential factor for well-being but did not influence the impact of social contact on well-being. These findings suggest that interventions to enhance social contact and resilience are crucial for supporting students' mental health during crises and times of social restrictions.

Keywords: COVID-19 Pandemic, University Students Well-being, Social Contact, Online, Face-to-face, Resilience, Mental Health

Unveiling Well-Being in the Pandemic: A Cross-Sectional Analysis of Social Contact, Resilience, and Well-Being of University Students in the COVID-19 Pandemic.

The global COVID-19 pandemic has caused millions of deaths and affected all facets of personal life, public safety, and the global economy (Ciotti et al., 2020; Wong et al., 2023; World Health Organization, 2021). To minimise the spread of the virus, people were mandated to reduce physical interactions, leading to curfews, quarantines, and the closure of non-essential institutions (Anderson et al., 2020; Elmer et al., 2020). This generated great psychological stress and uncertainty (e.g., Torales et al., 2020). Indeed, the psychological literature shows that social distancing measures effectively slow infections and mitigate public health burdens, particularly from airborne viruses (e.g., BMJ, 2022; Glass et al., 2006; McGrail et al., 2020). However, the potential psychological consequences of social distancing were often overlooked in favour of controlling the spread (e.g., Lee et al., 2024).

Although the COVID-19 pandemic is no longer a global crisis, it is still a threat to people's health and not the only one to come (UN News, 2023). Infectious viruses such as those causing dengue, yellow fever, or Zika-Virus infections are expected to affect around 60% of the world's population by 2080, while the spread of almost 60% of known viruses will increase (Houtman & Shultz, 2022; Mora et al., 2022). Consequently, WHO officials demand that the world be prepared for future pandemics, particularly those caused by airborne viruses, which might result in lockdowns and social distancing measures (BMJ, 2022; UN News, 2023). This foresight highlights the importance of learning from the COVID-19 crisis. The current research is focusing on mental well-being during the COVID-19 lockdown. Specifically, the study aims to investigate how various forms of social contact and resilience have influenced the well-being of Dutch university students during the pandemic. These insights could help develop interventions that enhance mental health during future health-related crises or situations that cause significant psychological stress for individuals.

Well-Being of Students During the Pandemic

A lot of research has focused on university students who were particularly affected by the lockdown and the associated alterations (e.g., Grajek & Sobczyk, 2021). Students faced challenges such as university closure, online learning, and loss of social activities. These challenges resulted in a significant decline in the psychological well-being of students during the pandemic (e.g. Aarntzen et al., 2023; Elmer et al., 2020; Pfefferbaum & North, 2020). To better understand the construct of well-being, this research refers to the three core dimensions defined in the psychological literature, namely emotional, social and psychological well-being

(e.g. Keyes, 2002; Luijten et al., 2019). To live a flourishing life, a person needs balanced levels of the core dimensions (e.g., Joshanloo & Nosratabadi, 2009).

Several research findings, however, found an imbalance and a reduction in all dimensions of students' well-being during the COVID-19 lockdown. The first dimension, emotional well-being, is characterised by positive feelings, fewer negative emotions, and a strong sense of life satisfaction (Joshanloo & Nosratabadi, 2009; Keyes et al., 2008). Numerous studies and meta-analyses during the pandemic showed that less time spent outside and less social contact negatively impacted life satisfaction, happiness, and thus emotional well-being (e.g., Ebrahim et al., 2021; Lades et al., 2020; Stieger et al., 2021; VanderWeele et al., 2020). Next, the social well-being dimension involves feelings of community, belonging, and trust in social structures (Keyes, 1998; Lamers et al., 2011). A longitudinal study before and after the onset of COVID-19 confirms that decreased social contact led to increased loneliness and depressive symptoms among students during the pandemic (Elmer et al., 2020). Lastly, psychological well-being indicates effective personal functioning and includes autonomy, environmental mastery, personal growth, positive relationships, life purpose, and self-acceptance (Lamers et al., 2011). Research findings identified that social distancing led students to develop more negative future outlooks (Fried et al., 2020). Furthermore, Stieger et al. (2020) reported that the lockdown adversely affected psychological well-being through behavioural changes such as social isolation and lack of meaningful relationships. In conclusion, psychological research during the COVID-19 pandemic found that the levels of all three dimensions of well-being have significantly decreased in times of the COVID-19 lockdown.

Social Contact and Well-Being

Deductively, a fundamental component of maintaining good levels of well-being is social contact. As mentioned above, the decline in face-to-face interactions during lockdown was related to lower psychological, emotional, and social well-being (e.g., Ebrahim et al., 2021; Elmer et al., 2020; Sibley et al., 2020; Stieger et al., 2020). Baumeister and Leary (1995) argue that humans inherently require significant social relationships to foster relatedness and belonging. Several multi-method psychological research findings have consistently demonstrated the profound influence of face-to-face social connections on human well-being (Kross et al., 2013; Sun et al., 2020). Particularly in times of stress and crisis, meaningful social relationships and feelings of belonging are essential (Haslam & Reicher, 2006; Holt-Lunstad et al., 2015; Slavich, 2020).

Research highlighted that strong social bonds with family members and close friends have been essential for improving students' overall well-being. Social contact with an inner circle of family members and close friends provides emotional stability, a sense of belonging and support during difficult times. Research has found that students with close relationships with their families and friends were happier and more satisfied with life. They felt less anxious and suffered less from depression (e.g. Brown & Greenfeld, 2021; Choi et al., 2020). A robust support system of friends and family served as a barrier against psychological difficulties, especially when suffering from stressful circumstances such as the COVID-19 pandemic (e.g. Marinucci et al., 2022; Saltzman et al., 2020). Based on these findings, a positive relationship between face-to-face contact with friends and family and well-being is expected.

Next, to compensate for social distancing measures, politicians and media outlets encouraged the population to substitute their regular contact and engage more frequently in online social contact (Mental Health Foundation, 2020). This raises the question of whether online social contact can compensate at least partly for a reduced frequency of face-to-face contact. However, replacing the need for in-person interaction with online social contact has been debated. On the one hand, research indicates that alternatives to real-life social communication, such as social media, cannot adequately compensate for the loss of face-to-face contact (e.g., Teo et al., 2019). Moreover, numerous studies during the pandemic have shown that increased screen time and reliance on digital connections were associated with lower well-being and heightened levels of depression (e.g., Ellis et al., 2020; Stieger et al., 2021). Furthermore, a study by Rudert and Janke (2022) found no evidence that any form of online communication could compensate for a lack of face-to-face communication.

Conversely, online contact might still be preferable during lockdown rather than having no social contact at all (e.g., Kushlev & Leitao, 2020; Kroencke et al., 2023; Waytz & Gray, 2018). Furthermore, scientific evidence shows that online contact effectively mitigates loneliness (e.g., Nowland et al., 2018; Van Breen et al., 2021). Supporting this notion, studies conducted in Italy during the first COVID-19 lockdown demonstrated that online connections helped protect individuals from psychological distress during physical isolation (Marinucci et al., 2022; Pancani et al., 2021). Marinucci et al. (2022) also found that online contact could adequately replace face-to-face interaction during the strictest phase of the Italian lockdown, directly contradicting Rudert and Janke (2022). Whether online contact adequately replaces face-to-face contact seems to remain controversial.

What can be approached critically in this debate is that for many people with physical and mental disabilities, online communication has long been an essential source of social

contact that is often not possible for them physically (e.g., Gonzales, 2015; Mesch, 2012). For many marginalised communities, online social contact significantly contributes to their well-being (e.g. Cheatham, 2012; Duplage & Szule, 2019). Additionally, it can be assumed that online and offline social contact are interrelated. The complementarity hypothesis offered by Kushlev and Leitao (2020) implies that online technologies can improve human connectedness and, thus, well-being by complementing face-to-face relationships and facilitating social interactions that would otherwise be impossible. Research has provided empirical support for the complementarity hypothesis in various contexts and populations, including individuals with autism and older adults at risk of social isolation (Benford & Standen, 2009; Delello & McWhorter, 2017). In conclusion, what remains important for this study's scope is that face-to-face and online contact have been positively associated with well-being and are, therefore, important channels of social exchange. Based on these findings and theories, this study investigates whether online social contact with one's inner circle of friends and family has a similarly positive relationship with well-being as face-to-face contact for university students during the COVID-19 lockdown.

Resilience and Well-Being

Next to social contact, another crucial factor that may protect the well-being of students during a pandemic is psychological resilience. Even though many people suffer from difficult situations and crises, there seem to be individual differences in mental health outcomes. Psychological resilience is thought to be an essential component in understanding the differences in people (e.g. Wu et al., 2013). It is the ability to adapt and recover from adversity (Smith et al., 2008). Resilience is not just an inherent trait but a dynamic and ongoing process (Shiner & Masten, 2012). It is shaped by various life experiences and an individual's responses to them (Shiner & Masten, 2012). The process of resilience is generally divided into stages, which include adaption, recovery, and growth and development (Ayed et al., 2019; Sood et al., 2014). This emphasises that resilience is an individual and active process which maintains psychological integrity in times of crisis.

Recent research underscores resilience as a critical factor in managing mental health challenges during the pandemic. Resilience seems to buffer against perceived threats and associated anxieties (Paredes et al., 2021; Prime et al., 2020). For instance, a study by Liu et al. (2020) revealed a negative relationship between resilience and symptoms of depression and anxiety among adolescents during lockdown. Similarly, other studies have identified resilience as a positive contributor to psychological health, good psychological functioning, and overall subjective well-being during the pandemic (Monte et al., 2020; Kavčič et al., 2021; Li et al.,

2021; Paredes et al., 2021). Thus, the current study anticipates a positive relationship between resilience and students' well-being, which aligns with several studies on this relationship during the COVID-19 pandemic.

Moderating Effect of Resilience

As aforementioned, psychological resilience is a crucial resource that can protect peoples' mental well-being during stressful times (e.g., Smith et al., 2008). The concept of resilience has been extensively studied as a moderator in the context of stress exposure and its related adverse outcomes (e.g., Anyan & Hjemdal, 2016). A study by Havnen et al. (2020) found that during the COVID-19 pandemic, resilience moderated the relationship between stress exposure and depressive symptoms. Individuals with higher resilience reported lower levels of depression compared to those with lower resilience (Havnen et al., 2020). Similarly, a study by Shah et al. (2021) during the COVID-19 pandemic demonstrated that psychological resilience could mitigate the negative impacts of social isolation on well-being among university students in Pakistan, which suggests that resilience buffers against the detrimental effects of social isolation.

Similar moderating effects to those in the studies mentioned above can be expected in the context of social contact, well-being, and resilience. First, a lack of social contact during the pandemic was associated with higher levels of psychological stress (e.g. Matos et al., 2021; Nitschke et al., 2020). At the same time, research conducted during the COVID-19 pandemic confirmed that resilience is a core trait that enables coping with stressful situations with a higher positive response (e.g., Polizzi et al., 2020). Following this line of reasoning, the study expects that when students experience psychologically demanding times, such as having less social contact, resilient students are better able to cope with this situation and thus maintain higher levels of well-being. Therefore, a significant moderating role of resilience in the relationship between social contact and well-being is expected.

The Current Study

This cross-sectional cohort study aims to understand the extent to which the COVID-19 pandemic has affected the well-being dimensions of Dutch university students and the role of potential protective factors such as social contact and resilience. The findings are expected to contribute to developing targeted interventions that promote maintaining social contact and strengthen resilience to reduce the negative effects of limited social contact on students' mental health. This leads to the research question: *To what extent do face-to-face social contact, online contact, and resilience uniquely predict well-being, and how are the effects of*

face-to-face and online contact moderated by resilience in a sample of Dutch university students during the lockdown of the COVID-19 pandemic?

Hypothesis 1 (H1): During the COVID-19 pandemic, increased face-to-face social contact with friends and family will be positively associated with enhanced well-being.

Hypothesis 2 (H2): During the COVID-19 pandemic, increased online social contact with friends and family will be positively associated with enhanced well-being.

Hypothesis 3 (H3): During the COVID-19 pandemic, increased resilience levels will be positively associated with well-being.

Hypothesis 4 (H4): Resilience will moderate the relationship between the frequency of social contact (both face-to-face and online) and well-being with a buffering effect.

Methods

Study Design

The current study, which is part of a larger project, employed a cross-sectional design to capture a snapshot of students' experiences during the pandemic. At the time of the data collection (October 2020), Dutch universities had switched to online teaching, buildings were closed, and university staff was working from home. Further, non-essential shops were closed, and social gatherings were restricted to groups of at most five people. In general, in-person socialising with others beyond co-residents was advised against. The research data were gathered using convenience sampling methodology (e.g., Peterson & Merunka, 2014). Due to the study being part of a larger research project, various characteristics were measured. As not all are relevant to the current research question, they will not be mentioned further. For the scope of this study, question items were employed to measure the constructs of Well-being, Resilience, and Social Contact (see Appendix A). The BMS ethical committee of the University of Twente approved the research with request number 191054.

Participants

The sample consisted of undergraduate students at Dutch universities in their first or second year of a BSc programme. All students were approached as part of a larger research project conducted during the COVID-19 pandemic in October 2020, when social distancing measures were strictly enforced. After data cleaning, which required that participants answer at least 75% of the questions in the relevant columns, the final sample included 457 participants. The mean age of the students was 19 years (SD = 1.83), with 239 females (52.3%), 215 males (47%), and three identifying as others (0.7%). Regarding nationality, 299 (65.4%) participants reported having Dutch nationality, 43 (9.4%) identified as German, and 115 (25.2%) indicated another nationality. Regarding degree programs, 424 (92.7%)

participants were enrolled in Dutch STEM disciplines, while 33 (7.3%) were Dutch bachelor psychology students.

Procedure

Recruiting first- and second-year STEM and Psychology students was conducted using convenience sampling. Researchers or research assistants from the study by Aarntzen et al. (2023) administered surveys during online lectures and sent email invitations to students who had participated in a prior wave of the study (pre-COVID-pandemic), where they gave permission to be contacted again. To incentivise participation, advertisements were posted claiming that students could win a €25 monetary prize if they completed all measurements. This multifaceted approach ensured effective communication and broad participation while adhering to social distancing measures. Informed consent was obtained from all participants via online written consent as part of the study. Participants completed an online questionnaire that asked for demographic information (e.g. gender, age, origin) and specific COVID-19-related questions (e.g. frequency of social contact) and tested various validated psychological measures. The Brief Resilience Scale (BRS) and the Mental Health Continuum Short Form (MHC-SF) were particularly relevant for the present study.

As this study is a secondary analysis of an existing dataset, a post-hoc sensitivity analysis was performed using the software tool GPower 3.1 rather than an a priori power analysis (Faul et al., 2009). The sensitivity analysis was employed to compute the minimal effect size that would achieve statistical significance at conventional error probability levels (α = 0.05) for testing the hypotheses, given the sample size. The basis for the sensitivity analysis was the moderation analysis (H4)**,** which was the most complicated analysis. In GPower 3.1 (F-test family, Linear multiple regression), three predictor variables were included (two main effects and one interaction term). The analysis demonstrated that with a minimal power requirement of 0.80 and a sample size of N = 457, it was possible to detect small to medium effect sizes (f^2 = 0.038) at 2.62 critical F-test ratios. Given the sample size, the study can detect small to medium effects in the moderation analysis**.**

Materials

Students' Well-being

The students' well-being was assessed using the Mental Health Continuum Short Form (MHC-SF) (Keyes et al., 2008). The MHC-SF is a 14-item self-reported measure of mental health, investigating participants' emotional (3 items), social (5 items), and psychological (6 items) well-being (see Appendix A). Participants could respond on a 6-point Likert scale, ranging from 1 (Never) to 6 (Every day). Items for emotional well-being ask about happiness,

interest, and life satisfaction (Yeo & Suárez, 2022). Items for social well-being ask about social integration, social contribution, social coherence, social actualisation, and social acceptance (Keyes, 1998). Finally, items for psychological well-being ask about autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance, respectively (Ryff & Keyes, 1995). Two representative items for the MHC-SF are: “During the past month, how often did you feel happy?” and “During the past month, how often did you feel your life has meaning?”.

An initial evaluation of the MHC-SF by Keyes et al. (2008) reported acceptable internal consistency of the entire MHC-SF (α = .74). Later studies (e.g., De Bruin & Du Plessis; Lamers et al., 2011) reported internal consistency of the MHC-SF total scale within the acceptable-to-high range (α = .74 to .94). Finally, the MHC-SF has good convergent validity (Keyes et al., 2008) and good discriminant validity (e.g., Doré et al., 2016; Lamers et al., 2011). The current study computed a Cronbach's alpha of .89 for the total scale. For the subscales, the values were as follows: Emotional Well-being (α = .85), Social Well-being (α = .71), and Psychological Well-being (α = .79).

Resilience

Participants’ resilience was assessed using the Brief Resilience Scale (BRS) (see Appendix A). The BRS consists of six items evaluating the capability to overcome stress (Smith et al., 2008). A representative item for the BRS is “I tend to bounce back quickly after hard times”. Items are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The items 2, 4, and 6 needed to be reverse-coded. The obtained total scores range from 6 to 30, where a high score represents more resilience. The BRS demonstrated strong internal reliability in previous research (Cronbach's α = 0.82) (Arslan & Yıldırım, 2021). In the current study, a Cronbach's alpha of .76 was computed.

Social Contact During the Pandemic

Participants’ social contact during the COVID-19 pandemic was measured using a self-constructed set of questions (see Appendix A). These questions were designed to assess the construct of “Social Contact”, which refers to the frequency and type of social interactions among participants with their friends, fellow students, and family during the COVID-19 pandemic. Initially, the internal consistency was assessed using Cronbach's alpha. All values were .29 or lower, which is below the acceptable threshold for internal consistency. Thus, the items may not reflect a single underlying construct. Given the low internal consistency, which was likely due to the exploratory and context-specific nature of the items, the decision was made to analyse all four items separately.

Student's face-to-face contact was asked with the items: "How much face-to-face contact do you currently have with family (e.g., eating together, doing something fun together)?" and "How much face-to-face contact do you currently have with friends and/or fellow students (e.g., sporting together, eating together)?". Both questions used a 6-point Likert scale ranging from 1 (Every day) to 6 (I have no contact), meaning it was necessary to reverse code the items measuring face-to-face social contact. Student's online contact was asked with the items: "How much virtual contact do you currently have with family (e.g., sending apps, zooming)?" and "How much virtual contact do you currently have with friends and/or fellow students (e.g., sending apps, making phone calls, video calls, social media)?" This second item initially used a 5-point Likert scale ranging from 1 (Throughout the day) to 5 (Once a week or less). This scale was linearly transformed to a 6-point Likert scale to maintain consistency across the construct. Finally, both questions were scored on a 6-point Likert scale. Again, it was necessary to reverse-code the items.

Measuring "Social Contact" with these questions provided direct insight into the modified social patterns and behaviours resulting from COVID-19 restrictions, which standardised instruments might not effectively have addressed (Smith & Noble, 2014). The questions reflected both physical and online channels of social interaction, acknowledging the significant role technology played in maintaining social connections during periods of social distancing (Singh et al., 2022). Despite challenges in the validation, internal consistency, and standardisation of new measurements (DeVellis & Thorpe, 1991), concise language was used to ensure clarity and minimise biases in the questionnaire design (Fowler, 2013). The choice of a 6-point Likert scale balanced the need for detailed responses with the engagement of participants (Chomeya, 2010).

Data Analysis

The cross-sectional data were analysed using R software version 4.3.0 and its open-source statistic software packages (R Core Team, 2023). A correlation matrix utilising Pearson Correlation was employed to examine the relationships between the variables (see Table 1). Additionally, the mean scores and standard deviations were calculated for each scale and subsequently used for the analyses. Next, the scores for all independent variables were standardised before entering into a model. This was done to compare the effects of variables measured on different scales more directly and helped mitigate potential multicollinearity issues, mainly when interaction terms are included in the model. The first model was a multiple regression (Model 1) to examine a significant direct relationship between the independent variables of social contact, resilience, and well-being. A multiple linear

regression analysis (Model 2) was conducted to examine the potential moderating effect of resilience by adding interaction terms consisting of each of the four different types of social contact and resilience.

Generally, several assumption checks were performed to ensure the validity of the models (see Appendix B & Appendix C). For each model, the linearity assumption was verified by inspecting the residual plots. Next, the normality assumption was tested by analysing the distribution of the residuals using a Q-Q plot and running the Shapiro-Wilk test. The third step involved evaluating the homogeneity of variance by examining scatter plots of the residuals against the fitted values (Fox, 2015). Homoscedasticity was further confirmed via the Breusch-Pagan test. Additionally, the assumptions of multicollinearity were assessed by calculating the variance inflation factor (VIF). All VIF values were below 5, indicating no significant multicollinearity issues (Fox, 2015).

Results

Correlations and Descriptive Statistics

Table 1 presents the means, standard deviations, and Pearson's correlations for the primary variables in the study. According to Cohen (1988), a correlation coefficient smaller than .30 represents a weak correlation, a coefficient between .30 and .50 is considered moderate, whereas a coefficient above .50 represents a strong correlation. As expected, well-being (MHC-SF) is positively correlated with face-to-face contact with friends, face-to-face contact with family, online contact with family, and online contact with friends. However, the correlation coefficient indicates relatively weak correlations. The mean scores of the Brief Resilience Scale (BRS) are moderately positively correlated with students' well-being, which suggests that higher resilience is associated with better mental health.

Table 1

Means, Standard Deviations, and Correlations with Confidence Intervals

Variable	*M*	*SD*	1	2	3	4	5
1. Face-to-face contact with friends	3.71	1.29					
2. Face-to-face contact with family	3.66	1.85	-.07 [-.16, .03]				

3. Online contact with family	4.50	1.30	.13**	-.01			
			[.04, .22]	[-.10, .08]			
4. Online contact with friends	4.16	1.45	.29**	.04	.14**		
			[.20, .37]	[-.05, .13]	[.05, .23]		
5. Mental Health Continuum SF (MHC-SF)	2.91	0.89	.28**	.18**	.16**	.24**	
			[.19, .36]	[.08, .26]	[.07, .25]	[.15, .33]	
6. Brief Resilience Scale (BRS)	3.23	0.70	.15**	-.01	-.01	.10*	.43**
			[.06, .24]	[-.10, .08]	[-.11, .08]	[.01, .19]	[.35, .50]

Note. Values in brackets indicate the 95% confidence interval for each correlation. * indicates $p < .05$. ** indicates $p < .01$.

Multiple Linear Regression

A multiple linear regression analysis was conducted to assess if the independent variables — face-to-face contact with friends, face-to-face contact with family, online contact with family, online contact with friends, and resilience — could predict the dependent variable, students' well-being. The overall Model 1 was significant, $F(5, 440) = 37.39$, $p < .001$, explaining approximately 29.82% of the variance in well-being ($R^2 = .29$, adjusted $R^2 = .29$). In line with hypotheses H1 and H2, face-to-face contact with friends ($\beta = 0.16$, $SE = 0.04$, $t = 4.21$, $p < .001$), face-to-face contact with family ($\beta = 0.16$, $SE = 0.04$, $t = 4.39$, $p < .001$), online contact with family ($\beta = 0.11$, $SE = 0.04$, $t = 3.12$, $p = .002$), and online contact with friends ($\beta = 0.12$, $SE = 0.04$, $t = 3.12$, $p = .002$) are all significant positive predictors of well-being (see Table 2). In line with H3, resilience was also a significant positive predictor ($\beta = 0.35$, $SE = 0.04$, $t = 9.68$, $p < .001$). This suggests that higher levels of resilience were significantly positively associated with better well-being during the COVID-19 pandemic. These findings demonstrated that resilience, as well as social contact, contributed significantly to students' well-being during the COVID-19 lockdown.

Table 2

Multiple *Regression Analysis Using Well-being as the Criterion (Model 1) and Moderation Analysis Using Resilience as the Moderator (Model 2)*

Coefficients	ß	SE	t-value	p-value	95% CI
Model 1 Main effects					
(Intercept)	2.92	0.04	82.37	<.001	[2.84, 2.98]
Face-to-face contact with friends	0.16	0.04	4.21	<.001	[0.08, 0.23]
Face-to-face contact with family	0.16	0.04	4.39	<.001	[0.08, 0.22]
Online contact with family	0.11	0.04	3.12	.002	[0.04, 0.18]
Online contact with friends	0.12	0.04	3.12	.002	[0.04, 0.19]
Resilience	0.35	0.04	9.68	<.001	[0.27, 0.41]
Model 2 Interactions added					
Interaction: Face-to-face contact with friends * Resilience	-0.02	-0.38	-0.00	.697	[-0.09, 0.06]
Interaction: Face-to-face contact with family * Resilience	-0.04	0.03	-1.03	.300	[-0.10, 0.03]
Interaction: Online contact with friends * Resilience	-0.01	0.03	0.16	.868	[-0.06, 0.79]
Interaction: Online contact with friends * Resilience	-0.01	0.04	-0.16	.871	[-0.08, 0.07]

Moderation Analysis

A moderation analysis was conducted to determine whether resilience moderated the relationship between the independent variables — face-to-face contact with friends, face-to-

face contact with family, online contact with family, and online contact with friends — and the dependent variable, students' well-being. The overall Model 2 was significant, $F(9, 436) = 20.77$, $p < .001$, explaining approximately 30.01% of the variance in well-being ($R^2 = .30$, adjusted $R^2 = .29$). However, none of the interaction terms between all four forms of social contact and resilience were significant (see Table 2). This indicated that resilience does not moderate the relationship between social contact and students' well-being. Therefore, hypothesis H4 could not be supported.

Discussion

This cross-sectional study investigated the relationships between students' well-being during the second COVID-19 lockdown in October 2020 and different types of social contact (H1 and H2), as well as the construct of resilience (H3). Further, the study explored if resilience moderated the relationship between the different types of social contact and students' well-being (H4). Based on 457 students enrolled at Dutch universities, this study found that increased face-to-face contact with friends and family, as well as increased online social contact with friends and family, were relevant for better well-being. Furthermore, higher levels of resilience seemed important for having higher well-being. However, the findings revealed that resilience did not buffer the relationship between all forms of social contact and well-being, meaning that the positive effects of social contact on well-being seem to operate independently of students' resilience levels. To come to a coherent interpretation of these results, each hypothesis will be discussed individually. Then, these considerations will be combined into an overall reflection concerning previous research.

The confirmation of hypotheses H1 and H2 suggests that during social restrictions, such as during the COVID-19 pandemic, social contact online and face-to-face with friends and family seems to predict the well-being of students. These findings align with existing literature and theories that underscore the inherent significance of social contact for one's well-being (e.g. Baumeister & Leary, 1995). Consistent with prior research conducted during a COVID-19 lockdown, face-to-face social contact with friends and with family was positively associated with students' well-being (Ebrahim et al., 2021; Elmer et al., 2020; Sibley et al., 2020; Stieger et al., 2020). Additionally, a positive relationship between online contact with friends and with family and well-being during a lockdown aligns with prior findings (e.g. Marinucci et al., 2022; Pancani et al., 2021). This means that all independent effects of different forms of social contact on students' well-being were significant and of similar strength. This study, therefore, could support the complementarity hypothesis by Kushlev and Leitao (2020), which claims that having more online social contact could protect

people against psychological distress when face-to-face social contact is less possible. This could be especially important for individuals in extraordinary circumstances, such as people with disabilities or older adults who are more likely to be in danger of loneliness or social isolation (e.g., Duplaga & Szule, 2019; Seifert & Hassler, 2020). This highlights the critical role of maintaining social contact with one's inner circle, both online and offline, in protecting well-being during challenging times, such as the COVID-19 pandemic.

Interestingly, however, in this study, the different forms of social contact were not strongly correlated with each other. This is in contradiction with the so-called "sociability effect" (e.g., Lee, 2009), where individuals who are generally sociable in one form (e.g. online) are expected to be more sociable in other forms (e.g. face-to-face). Previous research during the COVID-19 pandemic found that online contact complemented face-to-face social contact. In their research with participants from 23 countries, Van Breen et al. (2021) confirmed that the more online social contact someone had at the beginning of the lockdown, the more face-to-face contact this person had in subsequent weeks, even if face-to-face contact was restricted. According to Van Breen et al. (2021) and other studies (e.g. Rijksinstituut voor Volksgezondheid en Milieu, 2020), more frequent online contact with friends and family increases the intention to meet face-to-face, which means that social connectedness may also constitute more risk behaviour, namely frequent face-to-face contact during the lockdown.

In the current study, however, this pattern was only shown in a weak significant correlation between students' online social contact with friends and face-to-face social contact with friends. A possible explanation for this could be that the participants were university students who usually live apart from their parents. Almost 35% of the participants were of non-Dutch nationality, which suggests that face-to-face contact with family was more difficult as the family lived further away. Friends, on the other hand, were easier to see face-to-face. Other personal reasons, such as rule conformity, insecurity, and fear of infection, are conceivable. Further, the usual social patterns were disrupted in the unique context of the COVID-19 lockdowns. That is why individuals might have relied on specific forms of contact more depending on their personal preferences, which are essential for their well-being in times of crisis. Here, an important finding is that well-being depends on social contact, independently from its form. In sum, these findings highlight the multifaced nature of social contact and its important role in predicting well-being.

Building on the understanding of the multifaced construct of social contact, this study also explored the concept of psychological resilience and its influence on well-being during

the pandemic. It is noteworthy that besides the various forms of social contact, resilience is also crucial for predicting well-being during a COVID-19 lockdown. The correlation coefficients indicated, however, that social contact and resilience were not highly interrelated. Further, resilience showed a more substantial effect on well-being than social contact. Resilience, defined as the ability to adapt and bounce back from adversity (Smith et al., 2008), appeared to play a crucial role next to social contact. This research showed that students with higher levels of resilience appeared to have reported better well-being during the COVID-19 pandemic, confirming hypothesis H3. This is in line with prior studies, for example, Liu et al. (2020) found a negative correlation between resilience and symptoms of depression and anxiety in adolescents. Similarly, studies by Di Monte et al. (2020) and Kavčič et al. (2021) confirmed that resilience contributes positively to mental health, which suggests that individuals with higher levels of resilience can better cope with stress and maintain their well-being during crises. Thus, students high on resilience managed to get through the pandemic and the associated psychological challenges with better overall well-being.

Finally, the results of this study did not confirm the hypothesis (H4). No significant effect indicated that psychological resilience moderated the associations between all different forms of social contact and students' well-being. Unexpectedly, these results contradicted earlier studies that formed the basis for this hypothesis H4. Previous studies have consistently found significant interaction effects of resilience on the relationship between stressful circumstances and well-being outcomes. For example, resilience has been shown to mitigate the negative impacts of social isolation on well-being (Shah et al., 2021), moderate the relationship between stress exposure and depressive symptoms (Havnen et al., 2020), and buffer against the adverse effects of stress and social isolation on mental health (e.g., Anyan & Hjemdal, 2016; Bonanno et al., 2008). While such a relationship was reasonable, no moderating effect was found in the context of this study.

Several potential reasons could account for the insignificant moderation effect of resilience. Firstly, methodological differences might hinder a conceptual replication of prior findings. The studies by Shah et al. (2021) and Havnen et al. (2020) have shown a moderating effect of resilience. However, these studies focused on social isolation and stress exposure rather than the frequency of social contact. The sheer amount of contact online or face-to-face with friends or family does not indicate if students were socially isolated or going through a complex and stressful time. Therefore, resilience may not show the same moderating effects on well-being in the context of social contact as it does with the measures of social isolation or

exposed stress. Next, the measurement of the construct of social contact did not measure their quality or depth. While it can be useful to know how often someone interacts with friends and family, it does not capture the emotional support or satisfaction that is innate in interactions. Research shows that the quality of social contact, such as feeling understood, supported, and valued, plays a critical role in well-being (e.g., Roshanaei et al., 2024). The used measurement might have missed essential nuances of social contact, such as the depth of interactions and emotional closeness. Moreover, questions might have categorised social contact too broadly without differentiating between various forms of online interactions (e.g., video calls vs. text messages) or face-to-face interactions (e.g., brief encounters vs. long and meaningful conversations). Finally, the self-constructed items may lack validity and reliability compared to more standardised measures, which could have skewed the results. Future research is needed to account for the reasons above. In conclusion, the direct effects of all independent variables imply that well-being is significantly related to the frequency of social contact and resilience. Further, it can be assumed that the non-significance was primarily a result of the self-constructed set of questions for assessing social contact.

Practical Implications

To be prepared for future lockdowns, students should be encouraged to build and maintain a social support system to mitigate the negative psychological impacts of crisis situations. Further, they should be informed that staying socially connected online and face-to-face is vital for their well-being, especially during lockdown. It is worth noting here that it is primarily about having social contact that is best suited to the individual, as all forms similarly predict well-being. Moreover, policymakers and university stakeholders should implement mental health interventions that enhance resilience. Psychoeducation programs about well-being and online platforms for social contact among students could maintain social support and foster resilience.

Strength and Limitation

The present study showed significant strengths but also some limitations. Firstly, focusing on the COVID-19 pandemic and its impact on students' well-being is highly relevant and timely. The study appears to be one of a few that has evaluated the effect of social contact and resilience on well-being during the COVID-19 lockdown in a sample of Dutch university students. Another strength is the investigation of different forms of social contact. Even if a closer comparison, such as a possible substitution of face-to-face contact, cannot be made, it can be confirmed that all forms of social contact examined are important for well-being. This adds clarity to the different opinions in the research, as this study found that all forms of

contact have a similar effect on well-being, independent of each other. Next, the sample size of 457 participants is also noteworthy, which provided robust statistical power and ensured the detection of small effects in a cross-sectional design (Mendoza et al., 2000). In addition, the distribution of male and female students in the sample was balanced.

Despite valuable findings, the present study is characterised by some limitations. Firstly, the cross-sectional design limits the inference of causal relationships between the study variables. Second, the study relied on online self-report surveys, which are susceptible to response biases, such as social desirability bias (Andrews et al., 2015). Participants may have given responses that they considered socially acceptable. After all, face-to-face contact was restricted and sanctioned during lockdown. A further limitation in generalisability could have been caused by participation bias. Participants were recruited via convenience sampling, which could lead to disproportionality of participants with certain characteristics. This could have affected participation, dropout or outcomes (Elston, 2021). Moreover, while this study highlights the importance of online and face-to-face contact for the well-being of university students, it is essential to approach these findings critically, as convenience sampling in the university context predominantly represents mainstream communities. Eventually, considerable limitations arise from the self-constructed questionnaires for measuring social contacts. One advantage of the questions was the direct data collection from the original context, namely the unexpected lockdowns. However, a self-constructed social contact questionnaire may affect the validity and reliability of the results. Furthermore, the study only focused on the quantity of social contacts without sufficiently differentiating the depth and quality of these interactions.

Future Research

First, the distinct and complementary roles of face-to-face and online social contact in promoting students' well-being could be further investigated. Experimental studies could manipulate the availability of face-to-face contact to examine how people rely on online channels under varying conditions of lockdowns. In a longitudinal research design, studies could explore whether online contact can effectively substitute for face-to-face contact during periods of limited social access. Longitudinal studies could help to validate the underlying causal associations between the constructs. This could shed light on the existing controversial research results. In addition, future research could consider the frequency and closeness of social contact with friends and family. This could be done by using detailed surveys via apps to track the number of interactions and their perceived emotional support over time. For example, Subscales of the Relationship Closeness Inventory (RCI) could be used (Berscheid et

al., 1989). The RCI has been validated in various studies and is widely used to assess the closeness of interpersonal relationships, including friendships and family relationships. Using the RCI, future research could also address the validity and reliability concerns about using a self-structured test. By measuring how close and supportive these interactions feel, research could gain deeper insights into the quality of social contacts in different forms and their impact on well-being.

Next, longitudinal studies could investigate how resilience enhances well-being in scenarios where only certain social contacts are possible. In particular, it could be investigated whether resilience can compensate for the absence of face-to-face social contact by promoting well-being through alternative means. This could be investigated in mixed-group experiments to determine how resilience interacts independently and is sufficient to ensure well-being. Additionally, longitudinal studies are needed to explore the long-term effects of resilience on well-being. By tracking individuals over time, such research can provide valuable insights into how resilience influences and sustains well-being over a longer period. Moreover, future research could explore further possible moderating effects between resilience, well-being and social support. For example, Li et al. (2021) discovered that social support moderated the association between resilience and well-being during the COVID-19 pandemic. This means that while resilience is related to well-being, its impact can be amplified by the quantity and quality of social support. All further longitudinal studies could provide valuable insights into the interplay between all constructs over time, particularly during different phases of social isolation and stressful situations. A recommended approach would include tracking the same cohort before, during, and after periods of crisis. This would help shed light on the relationships' directionality and reveal whether the benefits of resilience and social contact persist or change over time.

Lastly, even if the scope of this research was to investigate university students during the COVID-19 pandemic, future research could benefit from focusing on other cohorts, such as marginalised communities, for whom online communication has long been a crucial source of social contact, enhancing well-being (e.g. Cheatham, 2012; Duplaga & Szule, 2019). For people with various disabilities, online social contact can be a vital substitute for their limited social interaction in the real world (Birnie & Horvath, 2002; Griemaldie & Goette, 1999). Future studies with cohorts that are more dependent on online social contact could offer deeper insights into how different forms of social contact contribute to well-being in various circumstances.

Conclusion

The present study provided important insights into the role of social contact and resilience during the COVID-19 pandemic. Key findings showed that students' online and face-to-face social contact with friends and with family increases well-being, with each form of social contact contributing to all facets of emotional, social and psychological well-being in unique ways. This underscores that maintaining social contact, regardless of the medium, is an essential factor in promoting mental health in times of crisis and isolation. In addition, the study showed a strong positive correlation between resilience and well-being. Enhancing resilience in students can be crucial in coping with psychological challenges that can arise from crises such as the COVID-19 pandemic. However, resilience did not affect the association between social contact and well-being, which suggests that the benefits of social contact are consistent across different levels of resilience.

Disclosure Statement

No potential conflict of interest was reported. The research met the required ethical standards.

Statement of Utilizing AI Assistance Tools

In the process of this work, I used ChatGPT-4o predominantly to generate a structure and work on codes for R Studio. Further, I used Grammarly to check the clarity and correctness of my writing. After using these tools, I thoroughly reviewed and edited the content as needed, taking full responsibility for the outcome.

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Appendix A

Questionnaires

Brief Resilience Scale (BRS) (Smith et al., 2008)

1. I tend to bounce back quickly after hard times.
2. I have a hard time making it through stressful events.
3. It does not take me long to recover from a stressful event.
4. It is hard for me to snap back when something bad happens.
5. I usually come through difficult times with little trouble.
6. I tend to take a long time to get over setbacks in my life.

Note. The responses varying from 1-5 for all six items giving a range from 6-30.

Mental Health Continuum Short Form (MHC-SF)

Table 3

Dimensions of Well-being and Associated MHC-SF Item.

Theoretical dimension	MHC-SF item: "In the past month, how often did you feel…"
Emotional well-being	
Happiness	1. happy
Interest	2. interested in life
Life satisfaction	3. satisfied with life
Social well-being	
Social contribution	4. that you had something important to contribute to society
Social integration	5. that you belonged to a community (like a social group, your neighbourhood, your city)
Social actualisation	6. that our society is becoming a better place for all people
Social acceptance	7. that people are basically good
Social coherence	8. that the way our society works makes sense to you
Psychological well-being	
Self-acceptance	9. that you liked most parts of your personality
Environmental mastery	10. good at managing the responsibilities of your daily life
Positive relations with others	11. that you had warm and trusting relationships with others

Personal growth	12. that you had experiences that challenged you to grow and become a better person
Autonomy	13. confident to think or express your own ideas and opinions
Purpose in life	14. that your life has a sense of direction or meaning to it

Note. The responses varied from 1-5 for all six items giving a range from 6-30.

Social Contact Questionnaire Items

1. How much FACE-TO-FACE contact do you currently have with friends and/or fellow students (e.g. sporting together, eating together)?
   (More than once a day; Once a day; Several times a week; Once a week; Several times a month; Once a month or less)
2. How much FACE-TO-FACE contact do you currently have with family (e.g. eating together, doing something fun together)?
   (Every day; Several times a week; Once a week; Several times a month; Once a month or less; I have no face-to-face contact with family
3. How much VIRTUAL contact do you currently have with friends and/or fellow students (e.g.: sending apps, making phone calls, video calls, social media)?
   (Throughout the day; Several times a day; About once a day; Several times a week; Once a week or less)
4. How much VIRTUAL contact do you currently have with family (e.g.: sending apps, zooming)?
   (Every day; Several times a week; Once a week; Several times a month; Once a month or less; I have no virtual contact with my family)

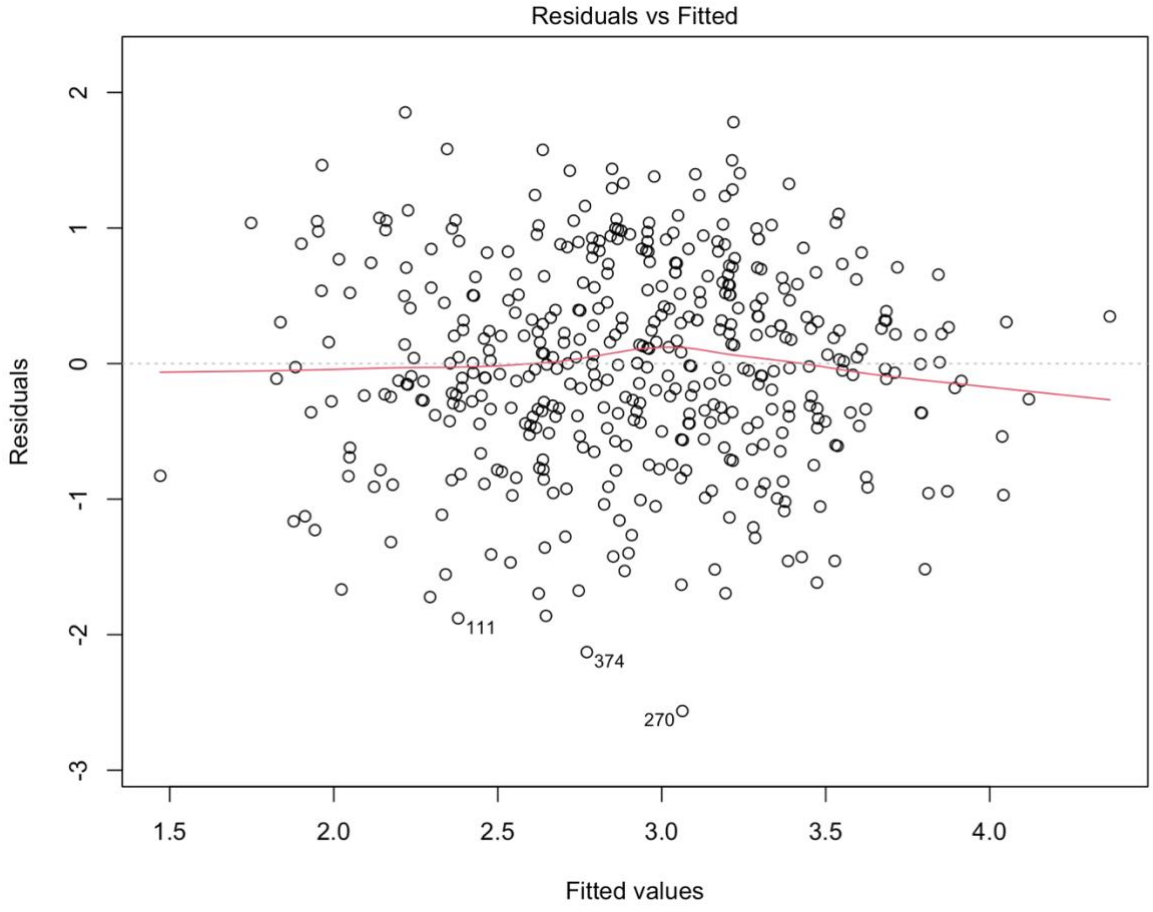
Appendix B

Assumption Check of the Multiple Linear Regression Model

For checking linearity, residual scatterplot examinations scrutinized each predictor's relationship with the dependent variable for linearity, revealing no deviations from linear expectations (see Figure 1). Next, the Shapiro-Wilk test substantiated the normality of the residuals ($W = .99$, $p = .03$), thereby satisfying the normality criterion. Normality was further checked using a Q-Q plot (see Figure 2). Homoscedasticity, the uniform variance of residuals across the range of predicted values, was confirmed via the Breusch-Pagan test ($\chi^2 = 8.31$, $p = 0.15$). Homogeneity was further approved in Figure 1. Furthermore, the Durbin-Watson statistic stood at 2.02, effectively ruling out autocorrelation among residuals and attesting to the independence of errors. Lastly, the Variance Inflation Factor (VIF) for each predictor was well below the threshold of 5, dispelling multicollinearity concerns. Concluding, these diagnostic tests collectively validated the key assumptions underpinning the multiple linear regression model. This provided a solid groundwork for the subsequent analysis.

Figure B1

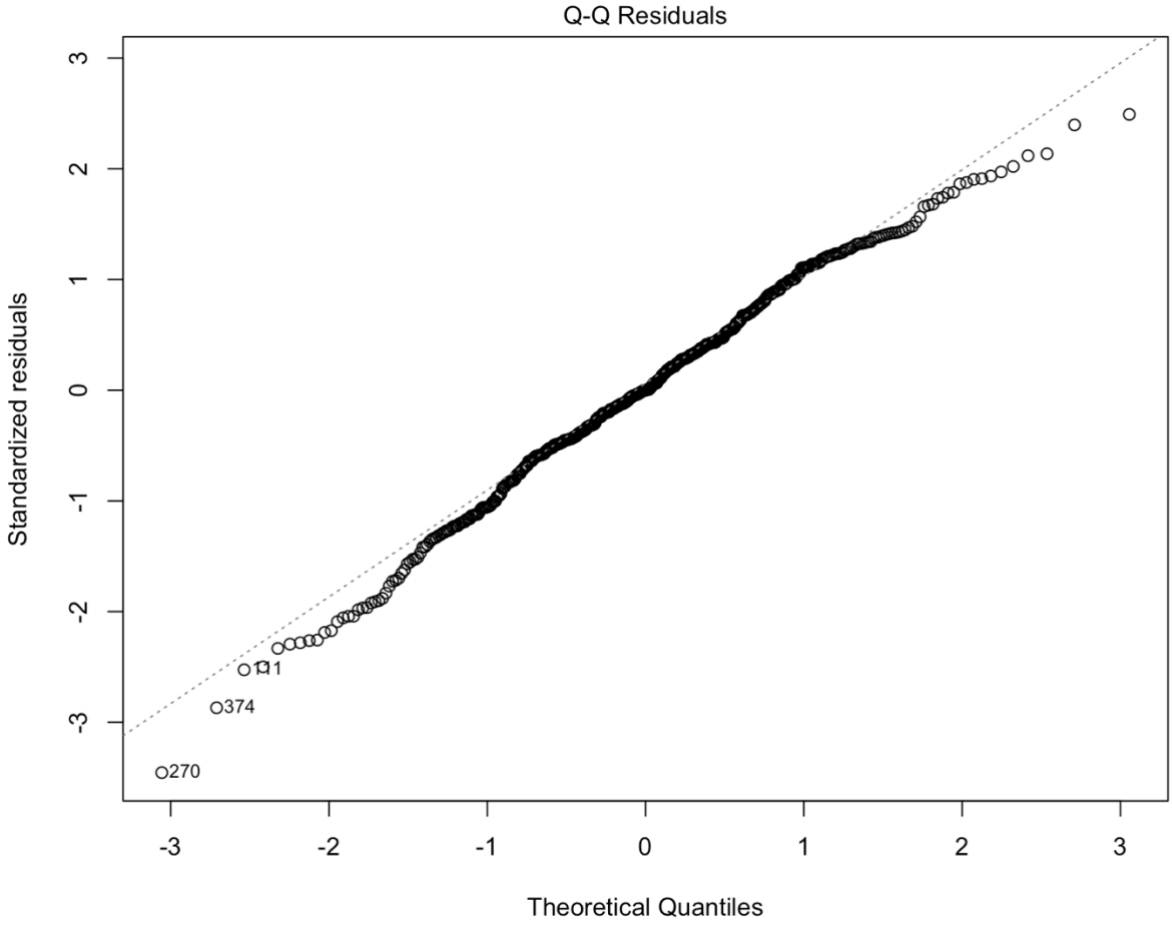
Linearity and Homoscedasticity Check *of the Data from the Multiple Regression Model*



Note. The residual plot does not show a fitted pattern. A linear relationship can be assumed. Further, the assumption of homogeneity can be rejected, and homoscedasticity can be suggested.

Figure B2

Normality of Residuals to Check Normality Assumption



Note. All residuals fall approximately along this reference line, so normality can be assumed.

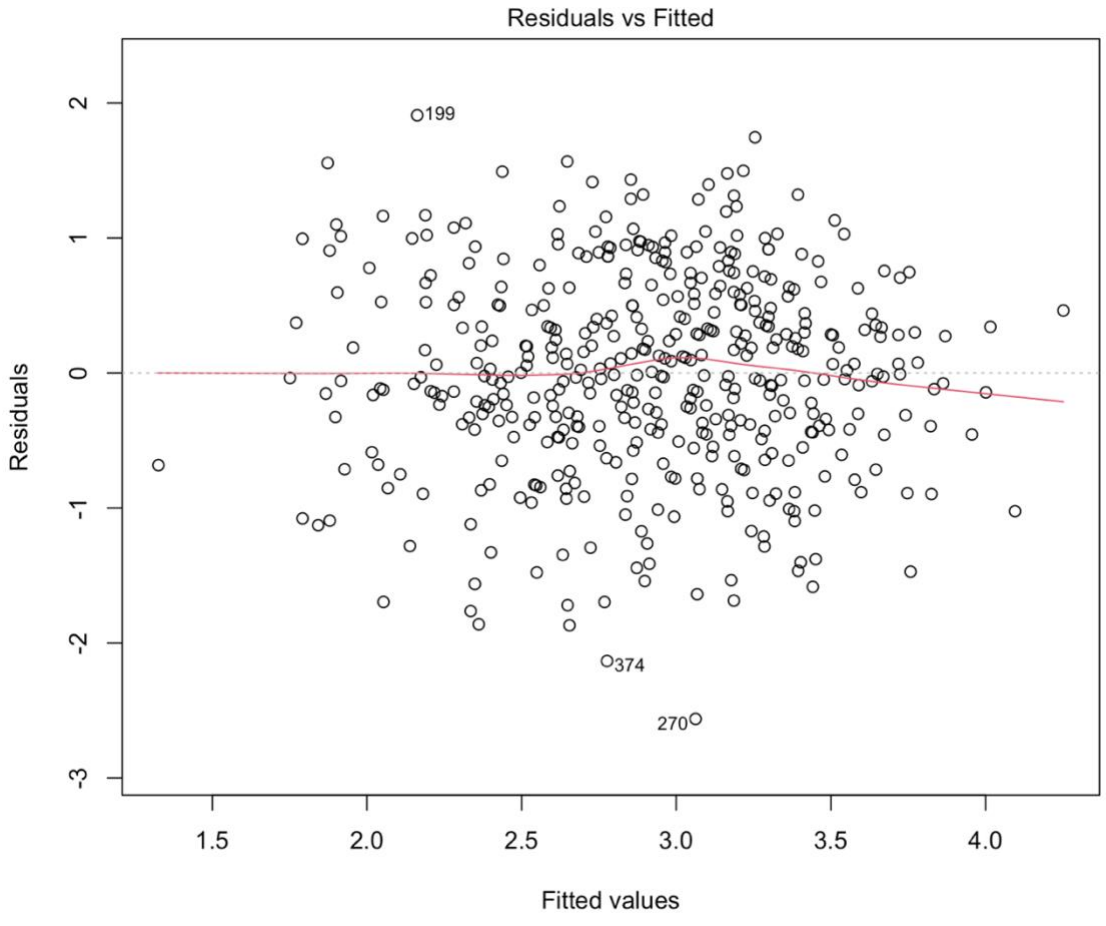
Appendix C

Assumption Check of the Moderation Model

For checking linearity, residual scatterplot examinations scrutinized each predictor's relationship with the dependent variable for linearity, revealing no deviations from linear expectations (see Figure 3). Next, the Shapiro-Wilk test substantiated the normality of the residuals ($W = .99$, $p = .05$), thereby satisfying the normality criterion. Normality was further checked using a Q-Q plot (see Figure 4). Homoscedasticity, the uniform variance of residuals across the range of predicted values, was confirmed via the Breusch-Pagan test ($\chi^2 = 9.89$, $p = 0.36$). Homogeneity was further approved in Figure 3. Furthermore, the Durbin-Watson statistic stood at 2.03, effectively ruling out autocorrelation among residuals and attesting to the independence of errors. Lastly, the Variance Inflation Factor (VIF) for each predictor was well below the threshold of 5, dispelling multicollinearity concerns. Concluding, these diagnostic tests collectively validated the key assumptions underpinning the moderation model. This provided a solid groundwork for the subsequent analysis.

Figure C1

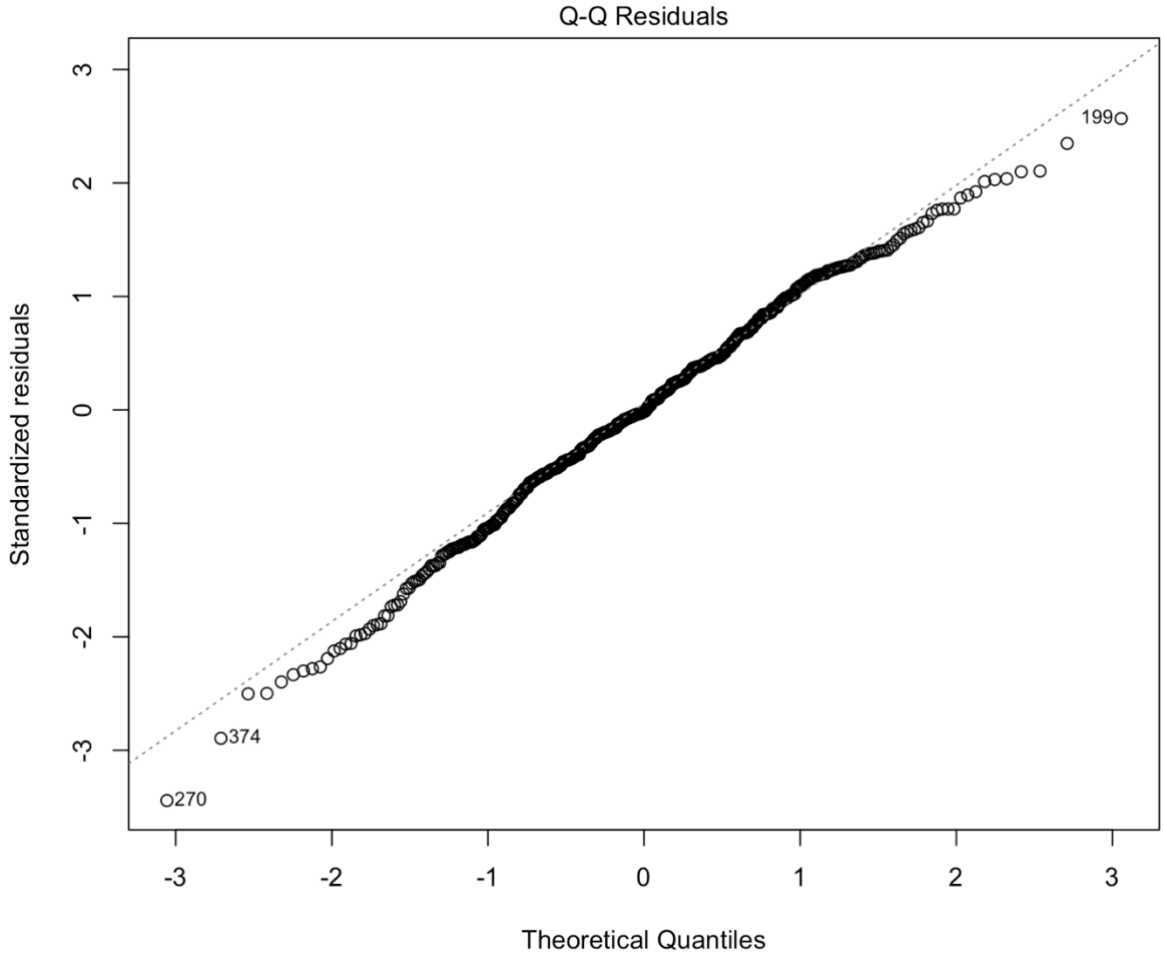
Linearity and Homoscedasticity Check *of the Standardized Data from the Multiple Regression Model*



Note. The residual plot does not show a fitted pattern. A linear relationship can be assumed. Further, the assumption of homogeneity can be rejected, and homoscedasticity can be suggested.

Figure C2

Normality of Residuals to Check Normality Assumption



Note. All residuals fall approximately along this reference line, so normality can be assumed.