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The Psychological Effects Of Social Isolation During The Covid-19 Pandemic Mediated By Peer Relationships

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Author

Pena Pelayo, Mariana

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THE PSYCHOLOGICAL EFFECTS OF SOCIAL ISOLATION DURING THE COVID-19

PANDEMIC MEDIATED BY PEER RELATIONSHIPS

By

Mariana L. Pena Pelayo

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APPROVED

Dr. Kalina Michalska
Department of Psychology

Dr. Richard Cardullo, Howard H Hays Jr. Chair
University Honors

Abstract

The COVID-19 pandemic has caused college students to struggle emotionally while navigating an unexpected online curriculum (Butnaru et. al, 2021). In particular, virtual learning in higher education has led to an increase in virtual learning fatigue (Mariappan & Nordin, 2021) and a lack of social interaction – both potential contributors to deteriorating mental health. Online learning has also been associated with difficulties in maintaining peer relationships (Galea et. al., 2021). However, less is known about how the global pandemic has affected college students' ability to make and maintain peer relationships through a virtual learning environment. The current study looks at the psychological effects of a lack of social interaction during the global pandemic and characteristics that predispose students to develop mental health problems. This study focuses on internalizing symptoms (anxiety and depression) brought upon by the social isolation of virtual learning. Specifically, I test whether students' personality traits and cultural values affect how students maintain peer relationships during online and hybrid learning. I will look at two related facets of peer relationships: (a) forming new relationships and (b) maintaining existing relationships. Additionally, the study compares the differences in peer relationships and internalizing traits of commuters' versus on-campus students. Personality traits will be self-reported via the Big 5 Inventory (John et. al., 1991), depression will be measured using Beck's Depression Inventory (Beck et al., 1961), and social anxiety will be measured using the Liebowitz Social Anxiety Scale, or LSAS (Heimberg et. al., 1999). We used linear regressions to test the association between introversion and mental health and found that our work did not replicate prior findings. Additionally, we conducted mediation analyses to test whether peer relationships are a mediating factor between introversion and internalizing symptoms. We did not find any significant mediating or moderating variables.

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Introduction

The COVID-19 pandemic has impacted the lives of college students all over the world for the past three years, causing disruptions in their daily lives and abruptly switching to virtual learning for students. As educational institutions temporarily closed their campuses to control the spread of COVID-19, students were obliged to study at home and get used to an online curriculum. The full effects of the pandemic on students' health outcomes are only starting to be understood, with emerging long-lasting effects on mental health and overall well-being.

College students today increasingly struggle with mental health and treatment seeking (Auerbach et al., 2016). One in 5 students meet a diagnostic criterion for a mental health disorder during their postsecondary education years (Auerbach et al., 2018). Due to the global pandemic, students have been faced with a set of new challenges like an end to their extracurricular activities, social gatherings, and normal routines, adversely affecting their mental health and potentially compounding existing vulnerabilities. Less is known about the severity of students' mental health and what factors may have predisposed students to develop internalizing symptoms compared to their peers during this time. For this reason, it is important to examine the effects of the pandemic on students' mental health. One salient factor that affected students is social isolation due to lack of connection to peers during virtual learning.

Personality traits are associated with several key mental health outcomes (Bucher et al., 2019). Meta-analytic reviews show that personality assessments aid therapists with case conceptualization by identifying the best treatment options for clients. In particular, neuroticism and extraversion influence the affective components of mental health through behavioral components (Lamers et al., 2012). Extraverted individuals tend to engage in more social

situations that aid in increasing their level of positive emotions (Lamers et al, 2012). Further studies demonstrate that high neuroticism, low agreeableness, low conscientiousness, and low extraversion are all patterns of traits associated with internalizing disorders (Malouff et al., 2005). In addition, the Big Five personality traits (neuroticism and extraversion) are strong and consistent predictors of emotional well-being. For this reason, understanding how personality traits affect students' psychological well-being is important in the context of the global pandemic.

The objective of this study was to test whether any observed associations between personality traits and internalizing symptoms (anxiety and depression) during the ongoing COVID-19 pandemic were mediated by peer relationships. Students reported an increase in stress and anxiety and difficulties concentrating during a fully online learning experience due to social and affective challenges of isolation and social distancing, beyond just technology and instructional challenges (Lemay et al., 2021). Lemay et al. (2021) defined social challenges as difficulty interacting with others and affective challenges were defined as emotional responses to social isolation. By trying to understand the differential impact of social isolation on students' mental health, we hope to inform higher education institutions about avenues for prevention efforts that target modifiable pathways to enhancing student wellbeing.

The Association Between Peer Relationships and Online Learning

College students' sense of belongingness is an important predictor of mental health during the global pandemic and generally (Gopalan et al., 2021). Students experienced a significant increase in social isolation, anxiety, and depression during the pandemic and underrepresented first-generation and ethnically minoritized students in particular reported a

lower sense of belonging to campus compared to their peers (Gopalan et al., 2021). Thus, first-generation students are critical for understanding how this lack of belongingness may affect their ability to form new relationships. A decrease in undergraduate student interpersonal networks during the pandemic caused a disruption in their ability to form new relationships (Smith et al., 2022). This disruption of social networks in student life may have a significant impact on their ability to form and maintain peer relationships in their transition back to in-person classes.

The COVID-19 restrictions caused a disruption in college students' ability to make new friendships and establish themselves into larger peer groups. Adolescence and young adulthood is a critical period for social development in which many college students' fall into (Orben et al., 2020). Disruption in social interaction enhances the risk of mental health problems by increasing loneliness (Orben et al, 2020). In addition to the number of social relationships a student has, the quality of their existing peer relationships may additionally moderate associations between social restrictions and mental health outcomes (Foulkes and Blakemore, 2021). These individual differences in students such as their ability to maintain high-quality friendships virtually ultimately determines whether they had a difficult time during virtual instruction (Foulkes and Blakemore, 2021). For this reason, the current study looked at peer relationships as a possible mediating factor between personality traits and mental health. One personality trait known to predict anxiety symptoms is introversion, or a preference for obtaining gratification from one's own mental life: lack of social involvement (McCord et al, 2020).

Association Between Introversion and Internalizing Symptoms

Higher degrees of introversion are associated with an increase in internalizing symptoms (e.g., anxiety and depression) (Buecker et al., 2020). Previous work has shown that introversion

(or low extraversion) is positively associated with mental health problems. Highly introverted individuals have greater sensitivity to feelings and emotions and frequently score high on neuroticism which escalates depression symptoms (Janowsky, 2001). Furthermore, people who suffer from major depression and have a higher degree of introversion are more likely to also have social anxiety (Jylhä, Melartin, & Isometsä, 2009). In addition, introverted individuals have experienced more loneliness than extroverts which is associated with depression (Cheng & Furnham, 2002). In one study, researchers found that anxiety had a significant correlation with introversion (Wenjuan, 2020). Overall, research has shown a significant association between introversion and internalizing symptoms. Prior work has shown that college students' peer relationships were impacted during virtual learning, so we are interested to know whether this mediated the association between introversion and mental health.

Impact of Social Isolation on Mental Health

Students experienced a significant negative change in their physical activity, relationships, studies, financial situations, and life satisfaction because of social isolation during the pandemic (Lukács, 2021). The unprecedented global pandemic caused widespread campus closures and transitions to an online virtual learning environment that presented new challenges to college students.

A longitudinal study comparing mental health scores before and after the pandemic found that depressive symptoms significantly increased from before to during the pandemic (Barendse, 2022). In addition, students in areas with higher levels of government restrictions, social isolation, and cancellation of in-person school activities reporter greater depression levels (Barendse, 2022). Another longitudinal study found adolescents experienced a significant

increase in anxiety and depressive symptoms and a decrease in life satisfaction after the implementation of stay-at-home orders (Magson et. al., 2020). Moderation analyses demonstrated that online learning difficulties and COVID-19 health concerns were significant predictors in mental health problems (Magson et. al., 2020). These studies demonstrate the significant effects of pandemic caused social isolation on students' mental health.

Association between Personality Traits and Social Isolation

The lack of social interaction during the COVID-19 lockdowns, may have detrimental effects on students' mental health as they were forced to learn to navigate an online curriculum while at home. Prior research has shown that social isolation brought forth by the pandemic may be particularly strenuous on those individuals who are extraverted since extraversion is a highly social trait (Barrick & Mount, 1991). Further research has explored the relationship between personality traits and mental health during online classes. This possible link between personality traits and mental health during COVID-19 can help explain why certain students are affected more by social isolation. As previous research has found these important interactions between personality traits and mental health, introversion-extroversion is an important variable to further study.

First-Generation Status and The Global Pandemic

First-generation students were particularly affected by changes in their mode of instruction during COVID-19 because of several factors such as financial hardships, living conditions, and higher rates of mental health (Soria et. al., 2020). First-generation college students experienced more obstacles while adapting to online instruction compared to continuing-generation students. These challenges included lost wages from family members,

increased technology expenses, and lack of adequate study spaces which impacted their ability to meet during virtually scheduled classes (Soria et. al., 2020). Another prominent factor affecting first-generation college students is imposter syndrome. First-generation college students are more likely to come from racially ethnic minorities and low-income families, placing them at an academic disadvantage because of the lack of resources at home and incomplete understanding from their families about the high demands of higher education (Holden et. al. 2021). Imposter syndrome is more associated with stress among first-generation college students (Holden et. al., 2021). Although imposter syndrome affects every college student, first-generation students are particularly affected. The pandemic could have exacerbated these challenges and for this reason we determined first-generation students as a population of interest. Since social isolation during the global pandemic affected students in several ways, the current study aimed to determine whether first-generation status moderates the association between extraversion and mental health.

Hypotheses

Based on the above literature, I formulated three research questions and related hypotheses:

Q1: Is there an association between introversion and internalizing symptoms (depression and social anxiety)?

H1: There is a positive association between introversion and internalizing symptoms.

Q2: Do peer relationships mediate any association between introversion and internalizing symptoms?

H2: Making and maintaining friendships during COVID-19 mediates the association between introversion and internalizing symptoms such that students who score low on extraversion will have more difficulty making and maintaining friendships and thus will report a greater increase in internalizing symptoms.

Q3: Does first-generation and commuter status moderate any association between introversion and depression?

H3: First-generation and commuter status moderate the association between introversion and depression such that first-generation and commuter status strengthen the relationship between introversion and depression.

Methods

Participants

We recruited undergraduate participants (n = 493) over the age of 18 years using the psychology SONA system. Their ages ranged from 18 to 39 years (M = 20, SD = 2.18). These students volunteered to complete the survey to receive 1 SONA credit for their time.

Table 1. *Demographics of Participants*

Participants (N = 493)	Descriptive Statistics	%
Age		
Mean (SD)	20.15 (2.18)	
Range (years)	18 – 39	
Female-Identifying	291	59%
Ethnicity		
White	43	8.7%
Black	35	7.1%
Hispanic	164	33.3%
Asian, Pacific Islander	222	45%
Other/Mixed	29	5.9%
Commuter Status	180	36.5%
Non-Commuters	313	63.5%
First-Generation Status	253	51.3%
Non-First Generation	240	48.7%
Peer Relationships	400	

Note. Participants completed a free-response for Ethnicity, then categorized. The last variable depicts the number of participants who responded that they had trouble making and maintaining peer relationships.

Materials

Big Five Inventory (BFI)

Personality traits were measured using the self-reported Big Five Inventory (John et. al., 1991). This is a 44-item self-rating scale that is used to measure the big five personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness) (John et. al., 1991).

For this study, we only focused on extraversion scores and reversed these scores to find introversion.

Beck Depression Inventory (BDI)

Depression symptoms were self-reported using the Beck Depression Inventory (Beck et. al., 1961). This is a 21-question self-report scale that measures depression severity in an individual (Beck et. al., 1961). For this study, we excluded question number 9 which asks about suicidal ideation to reduce any harm and potential discomfort to the participant. Participants scoring between 0 to 10 are considered to have normal levels of depression. Those scoring between 11 to 16 are considered to have mild mood disturbances and those scoring between 17 to 20 are considered to have borderline clinical depression. In addition, participants scoring between 21 to 30 have moderate depression levels, while those scoring between 31 to 40 are diagnosed as having severe depression. Finally, anything above a score of 40 is considered extreme depression.

The Liebowitz Social Anxiety Scale (LSAS)

Anxiety was self-reported using the Liebowitz Social Anxiety Scale, or LSAS (Heimberg et. al., 1999). This is a 24-item, self-reported scale used to determine how social anxiety plays a role in one's daily life across various situations (Heimberg et. al., 1999). The cutoffs for social anxiety are as follows. Participants scoring between 0 to 29 have no social anxiety. Those scoring between 30 to 49 are considered to have mild social anxiety, while those scoring between 50 and 64 have moderate social anxiety. Moreover, scores between 65 and 79 are considered marked social anxiety, while scores between 80 to 94 are considered severe social anxiety. Any score above a 95 is categorized as very severe social anxiety.

Table 2. *Means and Standard Deviations*

Measure	*n*	*M*	*SD*
BDI Total	493	13.53	3.3
LSAS Total	493	56.07	1.25
BDI Total (Introversion)	493	23.54	5.98
PR Total	493	N/A	N/A
First-Generation	253	1.48	0.50
Commuter Status	180	1.63	0.48

Note. PR stands for peer relationships, and it is our mediator variable. A total of 493 students responded to this question.

Questionnaire Form

A questionnaire was created to gather demographic information about each student such as age, gender, commuter vs on-campus, first-generation status, and underrepresented ethnic and racial groups. Ethnicity was a free response question that was then categorized during data analysis. This was a self-reported measure that included questions about their peer relationships during the pandemic. Peer relationship was measured by asking participants to answer the following question: Did you have trouble 1) making new friends and/or 2) maintaining existing friendships during the pandemic? Participants were then given four options which were: 1) I had trouble making new friends, 2) I had more trouble maintaining existing friendships, 3) Both, and

4) neither. When analyzing our data, we coded this question as a binary variable instead of a categorical variable. We grouped responses 1 to 3 as 1 and response 4 as 0.

Procedure

The study was conducted via an online platform that students accessed using a link provided after they signed up in the psychology SONA system. Students were prompted to sign an informed consent form prior to beginning the survey. They also read a short description instructing them on how to fill out the survey accurately. After accepting and reading the consent form, students completed the survey through Qualtrics. The duration of the study was approximately 1 hour. All the data collected through Qualtrics were de-identified and only contained information on each student's age, gender, race/ethnicity, and survey responses.

Participants were asked to retrospectively respond to these questions based on their experience during the global pandemic.

Using statistical software R (v4.3.0; R Core Team 2023), we ran several regression analyses using six main variables. These variables were depression, introversion, social anxiety, peer relationships, commuter status, and first-generation status. Introversion was used as an independent variable, depression and anxiety were dependent variables, peer relationships was used as a mediator, and commuter status and first-generation status variables were our moderators. We excluded entries with missing values for our LSAS scale, BFI scale, and our BDI scale (n=5). After these exclusions, our sample size was n = 493.

For our *H1*, that there is a positive association between introversion and internalizing symptoms (depression and social anxiety), we completed two separate linear regression analysis

to test the association between (a) introversion and depression and (b) introversion and social anxiety. For *H2*, that peer relationships mediate the association between introversion and mental health, we ran a mediation analysis using the lavaan package in R. We ran two separate mediation models with peer relationships as the mediator: introversion and depression and introversion and social anxiety. Finally, for *H3*: we ran two regression moderation models to test whether commuter status and first-generation status moderated the association between introversion and depression.

Results

Association between Introversion and Internalizing Symptoms

Pearson correlation analysis revealed a non-significant correlation of 0.077 between introversion and depression, I = 0.086. Linear regression likewise showed a non-significant effect [$F(491) = 1.7183$, $p = 0.086$] with an $R^2 = 0.006$ (see Figure 1). A simple linear regression was calculated to check for the association between introversion and social anxiety. The results depicted a non-significant regression [$F(491) = 1.9562$, $p = 0.051$] with an $R^2 = 0.008$ (see Figure 2). The Pearson correlation between introversion and social anxiety in our sample was found to be 0.088. Despite a non-significant regression, our *p*-value of 0.051 is fairly close to a statistically significant value of $p = 0.05$. We decided to run an exploratory analysis separately by gender to determine if there were any sex differences that would reveal significant associations.

Peer Relationships as a Mediator for Introversion and Internalizing Symptoms

Even though results above did not replicate prior findings, we tested our next hypotheses that peer relationships (PR) mediated the association between introversion and internalizing symptoms, two mediation analyses were performed using lavaan in R for depression and social anxiety respectively. The outcome variable for analysis was depression for the first mediation model. The predictor variable for the analysis was introversion. The mediator variable for the analysis was peer relationships. This variable was coded as a binary variable, so we focused on the response of 1 which refers to participants who had trouble making and maintaining relationships during the pandemic. The results of mediation model 1 revealed a non-significant indirect effect of introversion on depression ($\beta = 0.119$, $p = 0.101$) (see Figure 3). The total effect of introversion on depression was ($\beta = 0.129$, $p = 0.085$), with the inclusion of the mediator (PR) the direct effect (c' path) was ($\beta = 0.010$, $p = 0.588$). This shows that the peer relationship variable did not mediate the relationship between introversion and depression. Hence, our H2 was not supported. The second mediation model used social anxiety as the outcome variable. The predictor variable for the analysis was introversion. The mediator variable for the analysis was peer relationships. The results of mediation model 1 (see Figure 4) revealed a non-significant indirect effect of introversion on social anxiety ($\beta = 0.408$, $p = 0.051$). The total effect of introversion on social anxiety was ($\beta = 0.410$, $p = 0.05$), with the inclusion of the mediator (PR) the direct effect (c' path) was ($\beta = 0.002$, $p = 0.794$). This shows that the peer relationship variable does not mediate the relationship between introversion and social anxiety. Hence, our H2 was not supported.

First-Generation and Commuter Status as a Moderator of Associations between Introversion and Depression

To investigate whether first-generation and commuter status moderate the association between introversion and depression, two moderator analyses were performed using PROCESS in R. The outcome variable for analysis was depression. The predictor variable for the analysis was introversion. The moderator analysis for model 5 was first-generation status. The interaction between introversion and depression was not found to be statistically significant [R^2 = .0076, ΔR^2 = 0.0002, 95% C.I., $F(1, 489)$ = 0.0780, p = 0.78]. These results identify first-generation status as a non-moderator of the association between introversion and depression. The next moderator model was for commuter status. The outcome variable for analysis was depression. The predictor variable for the analysis was introversion. The moderator analysis for this model was commuter status. The interaction between introversion and depression was not found to be statistically significant [R^2 = .0065, ΔR^2 = 0.0005, 95% C.I., $F(1, 489)$ = 0.2340, p = 0.63]. Our H3 was not supported.

Exploratory Analysis

As shown through our results above, our three hypotheses were not supported. We decided to run exploratory analyses separated by gender, given sex differences in prevalence of internalizing symptoms (McLean et al., 2011). We ran several analyses using our introversion and social anxiety variables because the p-value between these two variables was fairly close at p = 0.05101.

Pearson correlation analysis revealed a moderate correlation of 0.152 between introversion and social anxiety in females, p < 0.01. Linear regression likewise showed a statistically significant effect [$F(289)$ = 9.28, $p < 0.01$] with an R^2 = 0.031 (see Figure 5). Next, we ran the same analysis in males and found a non-significant correlation of 0.0015 between introversion and social anxiety, p = 0.9827. A simple linear regression likewise showed a non-

significant regression [$F(200) = 0.2062$, $p = 0.65$] with an $R^2 = 0.001$ (see Figure 6). These results show a significant association between introversion and social anxiety in female college students.

Discussion

The purpose of this study was to gain a better understanding of the psychological effects of social isolation during the COVID-19 pandemic on college students' mental health. Our first question was whether there is an association between introversion and internalizing symptoms (depression and social anxiety). We did not find a significant association between introversion and internalizing symptoms. These results were not significant for both depression and social anxiety. However, for our social anxiety variable our p-value was 0.051 suggesting marginal significance and a pattern that was qualitatively similar to our prediction. Since our first hypotheses was not supported, we conducted exploratory analysis by separating the analysis by gender as it could be that highly introverted females experienced higher levels of social anxiety as opposed to males.

Our exploratory analyses findings showed that there was a statistically significant association between introversion and social anxiety in female college students. Moreover, we conducted a linear regression analysis in 291 female students and found a significant p-value despite our overall findings. These results correspond to previous literature about the prevalence of social anxiety in women compared to men (McLean et al., 2011). Future studies should control for gender when exploring the effects of social isolation during the global pandemic on college students' mental health.

In addition, our second research question explored whether peer relationships mediated the association between introversion and internalizing symptoms. We did not find peer relationships to media between introversion and internalizing symptoms. These results were not significant for both depression and social anxiety. One possible explanation for this non-significant result for our social anxiety variable is that some questions in this survey ask participants related to public actions that are not related to experiences participants can relate to during the pandemic lockdown restrictions. For instance, statements such as "Eating in public places", "Urinating in a public bathroom", "Going to a party", and "Telephoning in public" all involve experiences that people did less often during these COVID restrictions. Moreover, these questions could have weakened the results of anxiety if individuals were more concerned about staying home and following lockdown procedures. Thus, we see less individuals suffering from social anxiety since these experiences occurred less often.

Finally, our third research question was whether first-generation and commuter status moderated the association between introversion and depression. Again, our hypotheses were not supported as we found no statistically significant effect of these two moderating variables on introversion and depression. These results were surprising because we did not find first-generation status to strengthen the relationship between introversion and depression. Future studies should first find whether there is an association between introversion and depression in females and whether this association is moderation by first-generation status.

Limitations and Future Directions

A limitation of this study includes the use of retrospective data which may have impacted the data we collected. Students who are reporting retrospectively may overestimate or

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underestimate their situation in each scenario. In addition, a potential confounding variable is the type of major students' are pursuing which can potentially affect the outcome of their internalizing symptoms. For example, students in certain STEM majors who require in-person lab courses but had to switch to a virtual lab environment might have been particularly affected and experienced more stress.

Additionally, another limitation of this study is that students were SONA-recruited participants that were taking psychology 1 and 2 courses. These students are primarily in their first and second year of undergrad meaning that they were probably still in high school when the COVID-19 restrictions were in place. Perhaps, these students had a different experience in high school with the switch to an online curriculum than students who experienced rigorous college courses in an online setting. Future work should focus on recruiting participants who were in college during the pandemic and took college classes virtually.

One third limitation of this study occurred during the data analysis portion. We first measured our mediating variable, peer relationships, as a categorical variable with four responses. However, we faced difficulties when trying to run a mediation analysis with a continuous predictor and outcome variable and a categorical variable. We then had to recode our mediating variable as a binary variable where responses 1 to 3 were categorized as 1 and response 4 was 0. Future studies looking at peer relationships as a possible mediating variable should code it as a continuous variable.

Future research should consider evaluating the long-term effects of undergraduate students who experienced the abrupt switch to virtual learning during their college years. In addition, future studies should look at the gender differences within these associations to

determine whether sex plays a role in developing internalizing symptoms during social isolation. Our study did observe high levels of depression and social anxiety, particularly in females, thus future work should examine longer-term effects of potential risk factors in females.

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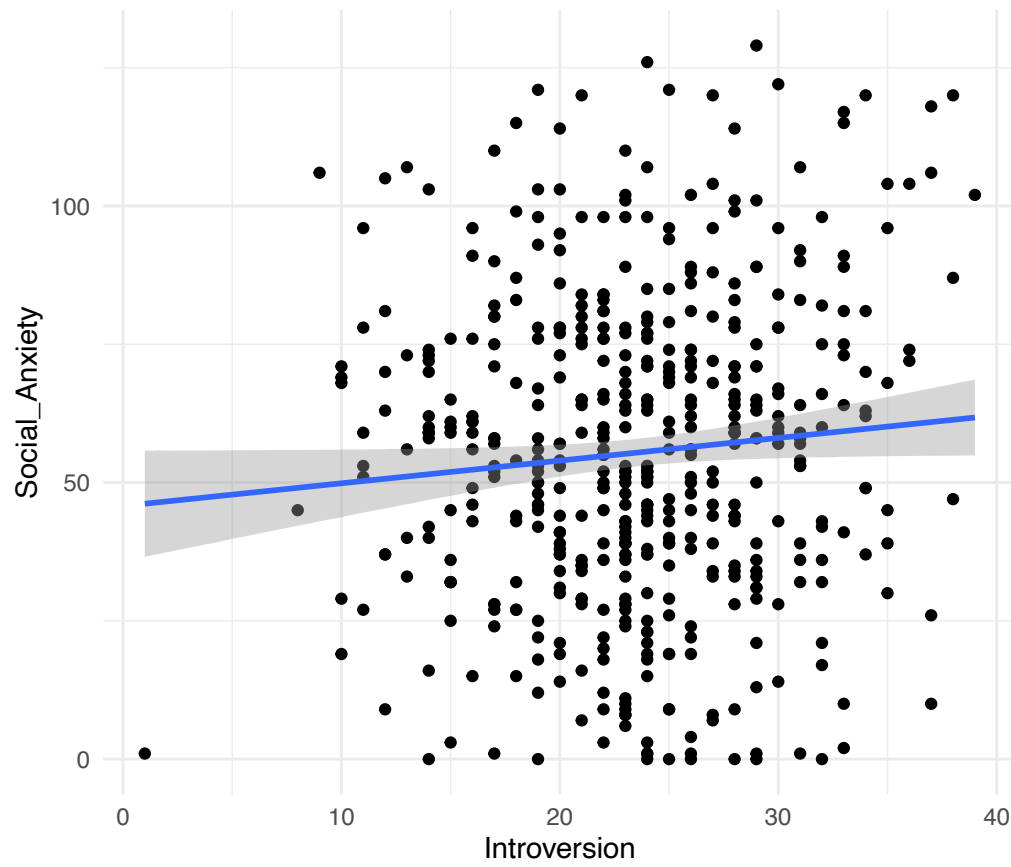
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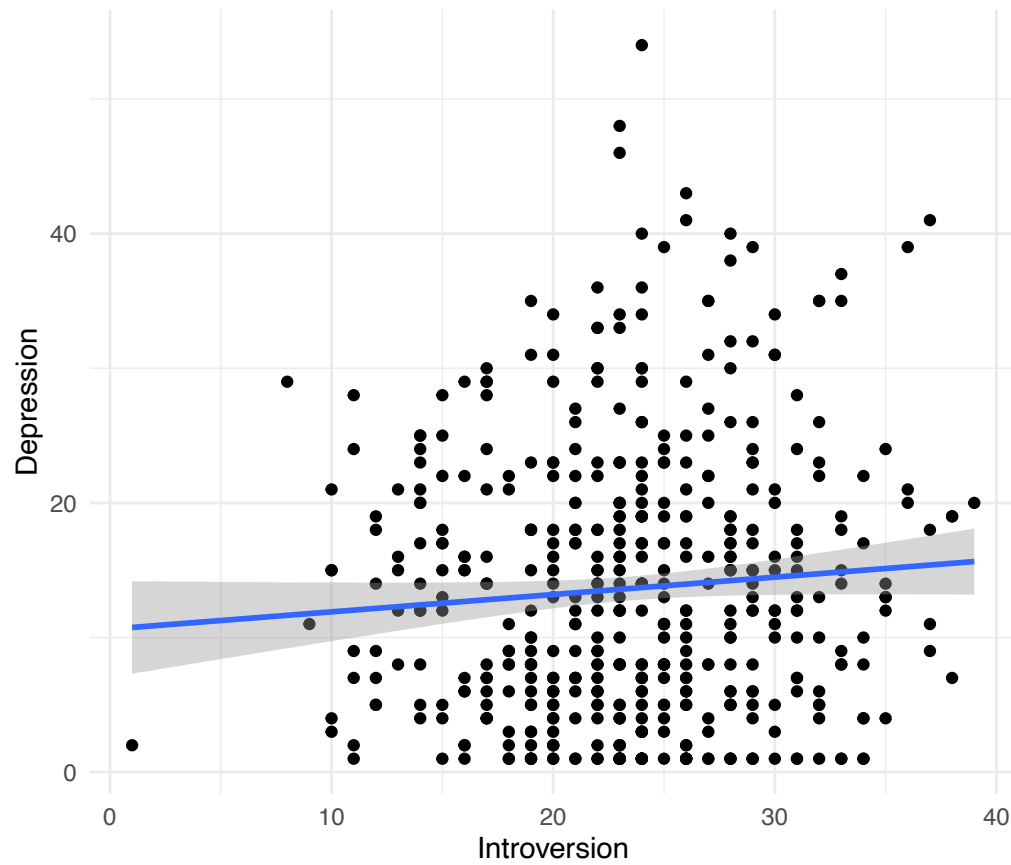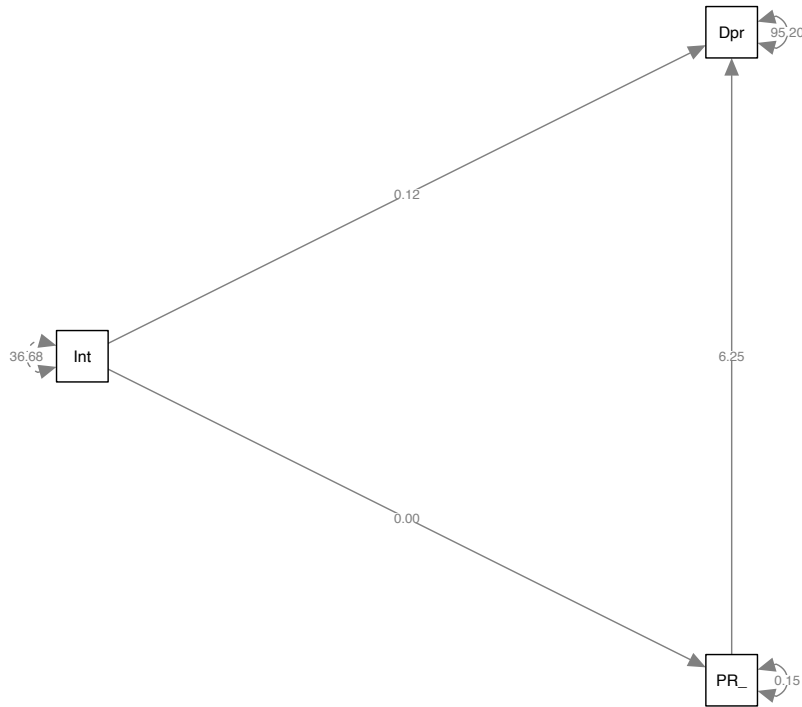
Figures

Figure 1.

Note. Contrary to our hypotheses, correlations revealed a non-significant association between introversion and depression scores, $R^2 = 0.006$, $p = 0.086$.
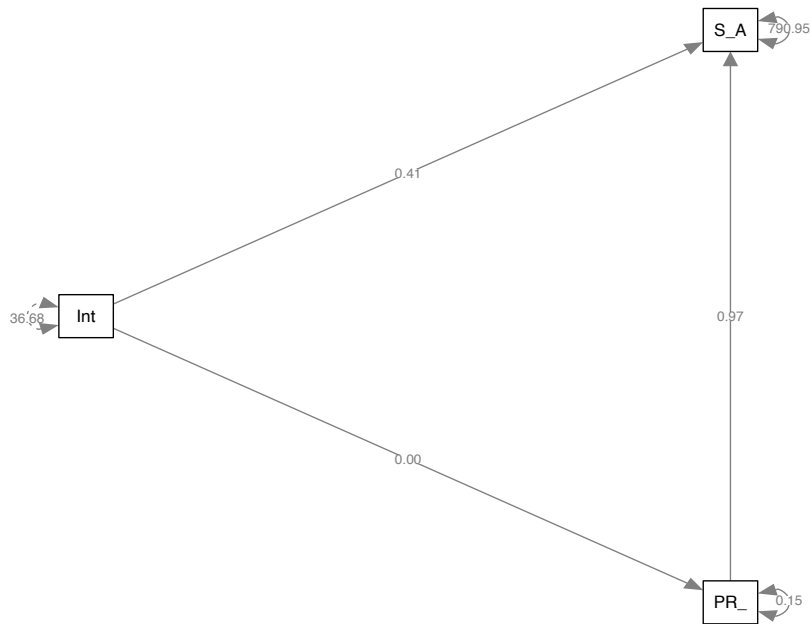
Figure 2.

Note. Contrary to our hypotheses, correlations revealed a non-significant association between introversion and social anxiety scores, $R^2 = 0.008$, $p = 0.051$.
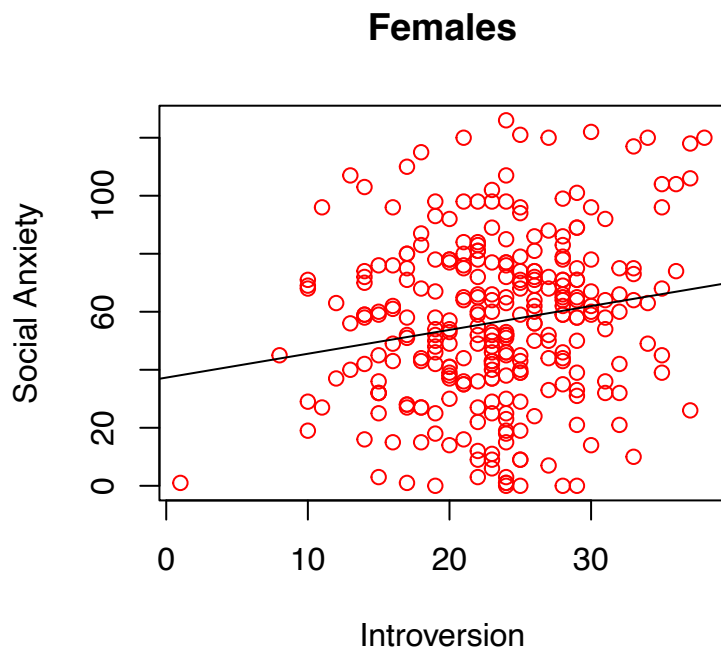
Figure 3.

Note. Contrary to our hypotheses, a mediation analysis revealed a non-significant mediation. Peer relationships did not mediate the association between introversion and depression scores. Results showed a non-significant indirect effect of introversion on depression ($\beta = 0.119$, $p = 0.101$). The total effect of introversion on depression was ($\beta = 0.129$, $p = 0.085$), with the inclusion of the mediator (PR) the direct effect (c' path) was ($\beta = 0.010$, $p = 0.588$)
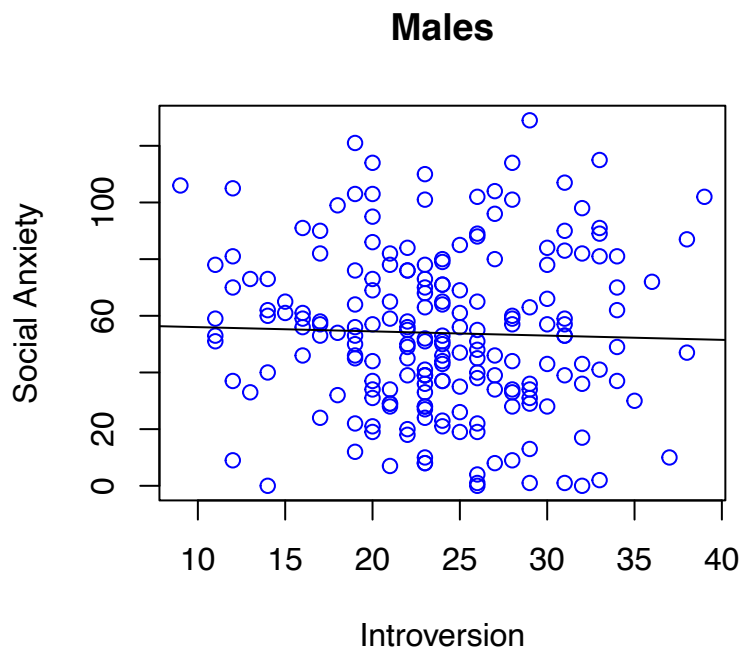
Figure 4.

Note. Contrary to our hypotheses, a mediation analysis revealed a non-significant mediation.

Peer relationships did not mediate the association between introversion and depression scores.

Results showed a non-significant indirect effect of introversion on social anxiety ($\beta = 0.408$, $p = 0.051$). The total effect of introversion on social anxiety was ($\beta = 0.410$, $p = 0.05$), with the

inclusion of the mediator (PR) the direct effect (c' path) was ($\beta = 0.002$, $p = 0.794$)
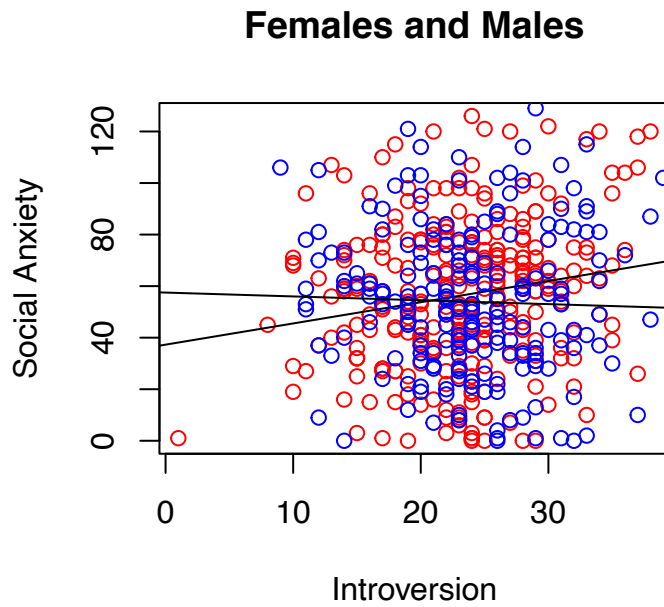
Figure 5.

Females

Note. Statistically significant positive association between introversion and social anxiety in female participants, $R^2 = 0.031$, $p < .01$.

Figure 6.

Males

Note. Non-significant association between introversion and social anxiety in male participants,

$R^2 = 0.001$, $p = 0.65$.

Figure 7.

Females and Males

Note. This figure shows both female and male participants plotted to show association between introversion and social anxiety.