Predictors of emotional health across autistic and non-autistic students' first semester of college

Erin E. McKenney
Rowan University

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PREDICTORS OF EMOTIONAL HEALTH ACROSS AUTISTIC AND NON-AUTISTIC STUDENTS’ FIRST SEMESTER OF COLLEGE

by

Erin E. McKenney

A Thesis

Submitted to the
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Abstract

Erin E. McKenney
PREDICTORS OF EMOTIONAL HEALTH ACROSS AUTISTIC AND NON-AUTISTIC STUDENTS’ FIRST SEMESTER OF COLLEGE
2021-2022
Katherine Gotham, Ph.D.
Master of Arts in Clinical Psychology

The prevention and treatment of mental health concerns, including depression, are significant priorities for autistic adults. While several theories have been proposed to explain the high prevalence of depression in autistic populations, little longitudinal research has been done on potential causal mechanisms. Additional research is needed to explore how proposed contributors to depression from general population research -- namely, negative repetitive thinking, lack of social opportunity, and attributional style -- predict and/or moderate the development of depressive symptoms in autistic individuals. The current study investigates these potential predictors’ relationship to internalizing symptoms over the course of college students’ first semester. We found that more elevated trait-like negative repetitive thinking and depressive attributional styles were predictive of sadness across the semester. Additionally, greater negative repetitive thinking and greater social dissatisfaction were synchronously related to elevated sadness. While these relationships were true across neurotypes, autistic students were more likely than their non-autistic peers to experience negative repetitive thinking, social dissatisfaction, and heightened depressive attributional style, as well as depressive symptoms, at some time points. Although these findings are preliminary, they highlight specific mechanisms that may be useful prevention and intervention targets to aid in reducing the elevated depression and anxiety rates in the autistic community.
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Chapter 1

Introduction

Autism is a neurodevelopmental condition characterized by atypical styles of social interaction and the presence of restrictive and repetitive behaviors or interests (American Psychiatric Association, 2013). While autistic traits must be present in childhood for an individual to meet criteria for diagnosis, autism persists across the lifespan. Estimates made from simulation and Bayesian hierarchical models suggest that approximately 2.2% of adults in the United States currently are autistic¹ (Dietz et al., 2020).

Autism frequently co-occurs with mood disorders, with depression being one of the most common (Hofvander et al., 2009; Lever & Geurts, 2016). Meta-analyses have suggested that autistic individuals are approximately four times more likely than non-autistic individuals to experience depression in their lifetime, and due to disproportionately pediatric samples, it is likely that even this is an underestimate (Hudson et al., 2019). Depression has numerous negative effects on autistic individuals, much as it does in the general population (Angermeyer et al., 2002). In the autistic community, depression has been associated with distress and lower quality of life (Lawson et al., 2020; Park et al., 2019), greater service use (Joshi et al., 2013), lost work days (Park et al., 2019), and self-injury and suicidality (Cassidy et al., 2018).

The magnitude of health concerns associated with depression means that understanding its onset and maintenance in autistic adults are top priorities. However,

¹ The majority of people diagnosed as autistic prefer identity-first language (e.g., “autistic person”) over person-first language (e.g., “person with autism”) (Bottema-Beutel et al., 2020; Bury et al., 2020; Kenny et al., 2016). Language in this paper is chosen accordingly, to align with community preferences.
anxiety also presents serious concerns: Autistic adults are at an increased risk of anxiety disorders, with a lifetime prevalence estimated to be approximately 42% (Hollocks et al., 2019). In the general population, anxiety is associated with a variety of physical health concerns and impaired quality of life (Brenes, 2007; Salovey et al., 2000). This relationship between anxiety and negative health outcomes has been observed in autistic individuals as well. Although anxiety is more weakly related to reduced quality of life than depression (Park et al., 2019), anxiety is related to difficulty coping with change (Gillott & Standen, 2007) and increased physical health concerns in autistic populations (Taylor et al., 2021). Additionally, the development of both depression and anxiety are highly intertwined and therefore may affect one another (Lamers et al., 2011). Depression and anxiety thus are significant concerns for the autistic community and other stakeholders; autistic adults have consistently called for better understanding of and interventions for these conditions among their top priorities for clinical research and services (Benevides et al., 2020; Crane et al., 2019; Pellicano et al., 2014; Van Hees et al., 2015).

While this call for mental health prioritization has come from autistic people and stakeholders across the lifespan (e.g., Pellicano et al., 2014), there has been a particular emphasis from autistic young adults, including college students. An increasing number of students diagnosed as autistic have entered college (White et al., 2011) and have reported particularly salient mental health concerns (Van Hees et al., 2015). Autistic adults have described “feeling overwhelmed, stressed, anxious, depressed, tired and isolated” as college students (Van Hees et al., 2015, p. 19), and success at accessing support and
resources varies greatly (Crane et al., 2019). Further research is needed to learn how to best support autistic students, including preventing and treating mental health concerns.

In addition to improving quality of life in autistic adults overall, focusing on this student population’s mental health concerns likely would aid in supporting the transition to college, during which students with more autistic traits tend to struggle more than their peers (Trevisan & Birmingham, 2016). Autistic college students are less likely to graduate with a college degree: In 2009, the percentage of autistic students who had graduated with a college degree up to eight years after high school graduation (38.8%) was lower than that of students with any disability (40.7%) and the general population (52.4%; Newman et al., 2011). This suggests that the retention and success of autistic college students is a large concern. Given that lower educational status is associated with increased emotional and physical distress later in life, the consequences of this retention problem may be long-lasting (Ross & Van Willigen, 1997; Kaplan et al., 2017) and exacerbate the challenges facing the already-underserved community of autistic adults.

College provides important opportunities for autistic students, including increasing the likelihood of employment and livable wages post-graduation (Flegenheimer & Scherf, 2021; Migliore et al., 2012). However, college also comes with challenges such as lower social support, less structure, and unfamiliar social scenes (Bailey et al., 2020; Van Hees et al., 2015; White et al., 2016). While these social factors may affect most first-year students regardless of autistic status, they do not affect all students equally. Core features of autism, including repetitive thinking (Keenan et al., 2018), as well as an increased risk of social disappointment (Gelbar et al., 2014; Kapp et
al., 2011), may make autistic students particularly susceptible to negative mental health consequences during their transition to college.

**Theoretical Factors Contributing to Depression and Anxiety in Autistic Adults**

Several factors have been suggested as contributing to the high prevalence of depression and anxiety in autistic populations. In our proposed study we focus on negative repetitive thinking, social dissatisfaction, and depressive attributional style. While all three of these have a strong evidence base linking them to the development of depression in non-autistic populations, each has more limited research in autistic populations, with few to no longitudinal studies of these possible causal contributors to depression and anxiety in autistic adults.

**Negative Repetitive Thinking**

Rumination is a type of negative repetitive thinking that focuses on one’s distress without making active efforts to solve the problem (Nolen-Hoeksema et al., 2008). Prior research has shown that rumination both maintains and predicts the onset of depression and anxiety symptoms in the general population (Abela & Hankin, 2011; Nolen-Hoeksema, 1991; Nolen-Hoeksema, 2000; Treynor et al., 2003), and is related to other negative outcomes such as physical health problems (Thomsen et al., 2004; Watkins, 2008) and suicidality (Miranda & Nolen-Hoeksema, 2007). The relationship between rumination and increased depressive symptoms has been suggested to be driven by the “moody pondering” subcomponent of rumination known as *brooding* (Treynor et al., 2003).

Repetitive thinking, including rumination, is likely a cognitive characteristic of autism that contributes to depression (Crane et al., 2013). Repetition in speech, interests,
and behavior are core diagnostic components of autism (American Psychiatric Association, 2013). Additionally, it has been suggested that a more repetitive and detail-focused cognitive style may underlie other forms of behavior associated with autism (Chen et al., 2008; Frith, 2003). Autistic individuals who engage in more repetitive behaviors (e.g., hand flapping) tend to perform better at a task requiring them to be highly detail-oriented in detecting hidden figures (Chen et al., 2008). Overall, autistic people also tend to perform better on this task than non-autistic individuals (Jolliffe & Baron-Cohen, 1997). This body of literature suggests there is a link between the presence of repetitive behaviors and a more detail-oriented, potentially repetitive cognitive style (Chen et al., 2008), and that this particular cognitive style is more common in autistic individuals (Jolliffe & Baron-Cohen, 1997).

In addition to engaging in more repetitive cognitive patterns overall, cross-sectional evidence suggests that autistic adults engage in more negative repetitive thinking than their non-autistic peers (Crane et al., 2013; Gotham et al., 2014). These higher rumination scores are also associated with depression symptom endorsement in autistic adults (Gotham et al., 2018; Keenan et al., 2018). Importantly, only one longitudinal study has investigated potential links between rumination and depression in autistic children, finding that rumination prospectively predicts depression (Rieffe et al., 2014). To our knowledge, this longitudinal work has not been evaluated within an autistic adult sample.

**Lack of Social Opportunity and Support**

Social support is a subjective experience, defined by an individual’s own perception of how cared for and respected they are by others (Taylor, 2007). While there
are many types of social support that can come from a variety of people in one’s life, social support in general is associated with improved wellbeing and decreased risk in a variety of domains (Sarason et al., 1997; Taylor, 2007). Most relevantly, those with stronger perceived social support are less likely to experience depression and anxiety, especially when under pressure or chronic stress (Lin et al., 1999; Taylor, 2007). Where social support is the positive subjective experience of being cared for, loneliness is in some ways its opposite. Loneliness is a subjective experience of being isolated from others, whether or not an individual is actually alone (Hawkley & Cacioppo, 2010). In the general population, loneliness is associated with many negative physical and mental health consequences (Hawkley & Cacioppo, 2010), including an increased risk of suicide (Goldsmith et al., 2002) and increased depressive symptoms (Cacioppo et al., 2006; Wei et al., 2005). While the relationship between depression and loneliness is likely somewhat bidirectional (Segrin, 1999), there is evidence that loneliness predicts depression in one-year intervals (Cacioppo et al., 2010). In these same intervals, depression does not predict increased loneliness (Cacioppo et al., 2010). This may suggest loneliness plays some causal role in depressive symptoms, at least under some circumstances.

Autistic individuals appear to be negatively affected by loneliness and lack of social support similarly to -- or more so than -- the general population. As one might expect from the general population literature, cross-sectional evidence also suggests that poor social support is related to loneliness and depression in autistic adults (Han et al., 2019; Mazurek, 2014). Autistic adults also tend to report more loneliness than their non-autistic peers (Ee et al., 2019). For autistic adults, barriers to socialization may include
difficulty with social communication and past negative experiences, in addition to environmental factors (Ee et al., 2019).

Based on a systematic review, Smith and White (2020) suggest that it is the individualized and idiosyncratic discrepancy between desired and achieved social interaction that leads to loneliness and eventual depression in autistic adolescents and adults, rather than an objective ideal level of social connection needed to achieve social satisfaction. Under this social motivation model of depression, autistic individuals who have high social motivation and low social success may be more at risk of depressive symptoms due to increased loneliness (see Figure 1; Smith & White, 2020). There has been some supporting evidence for this. For example, Han and colleagues (2019) found that autistic adults with high social motivation were more likely to be lonely if they had more autistic traits and greater social impairment; loneliness, in turn, was the strongest predictor of depression in this study (Han et al., 2019). However, Smith and White (2020) also hypothesized that, under their model, those with low social motivation would be less likely to develop loneliness. This has not been well-supported to this point: Autistic adults with low social motivation still tend to report high levels of loneliness, which are strongly related to depressive symptoms (Ee et al., 2019; Han et al., 2019). Therefore, the evidence for this social motivation model of depression is mixed, and further longitudinal research is needed to better investigate how social motivation -- and matching versus discrepant social opportunity -- may affect loneliness and depressive symptoms. Notably, autistic college students who do not feel as socially connected or supported tend to report lower subjective well-being and greater difficulty balancing the demands of school
(Bailey et al., 2020), so this may be a particularly important subpopulation in which to study social connectedness.

**Figure 1**

*Social Motivation Model for Development of Depression in Autistic Individuals Proposed by Smith and White (2020)*

![Diagram of Social Motivation Model](image)

**Attributional Style**

Finally, a seminal report by Seligman and colleagues (1979) found that depressed college students tended to attribute “bad outcomes to internal, stable, and global causes” (p.242). Causal explanations of negative events that are internal, global, and stable have come to be referred to as a *depressive attributional style* (also referred to as depressive explanatory style). In this model, an individual believes that negative outcomes arose because of traits or actions within oneself (internal), which tends to be associated with guilt and self-blame (Harvey & Martinko, 2009). Stability implies that the cause of the negative event (e.g., one’s own cowardice or intelligence) is permanent and unchanging.
Global implies that the attribution will occur broadly across contexts (e.g., “I got a D on this exam, so I’m a failure”). In an example of the depressive attributional style taken from Myers & DeWall (2017; see Figure 2), a negative event such as a breakup may elicit feelings in an individual that it was all their fault, due to their own inherent unlovability (internal), that they will never recover or form better relationships because they will always be unlovable (stable), and that they will fail across contexts as they did in their romantic relationship (global). Whereas this internal, global, and stable pattern of attributions is associated with depression, the opposite (i.e., external, specific, temporary; see Figure 2 taken from Myers & DeWall, 2017) is more common in nondepressed students (Seligman et al., 1979). Since Seligman’s initial finding, a prospective relationship between attributional style and depression scores has been supported by a significant body of research, including meta-analyses (Joiner & Wagner, 1995; Sweeney et al., 1986).
Seligman additionally connected depressive attributional styles to learned helplessness. This term was first discussed in the context of dogs who failed to attempt to escape electric shocks, after previously being exposed to these adverse stimuli when they were inescapable (Seligman, 1972). Learned helplessness has since come to refer to a more generalized feeling of powerlessness that is learned from previous experiences. Again, those with a more depressive attributional style tend to attribute negative events to
themselves and assume that they are stable over time: because they are the source of their own difficulties and the situation will never improve, they come to believe that they are helpless to change it, thus engaging in learned helplessness (Seligman, 1972). This is more common in individuals who have had negative or traumatic experiences that were inescapable previously (Maier & Seligman, 1976). Some individuals also seem to have a personality more prone to believe circumstances are due to external factors outside their control, and they may be quicker to engage in learned helplessness than others (Maier & Seligman, 1976).

Barnhill and Myles (2001) observed a similar relationship in autistic adolescents - specifically their sample was composed of 33 12-18 year olds with a diagnosis of Asperger's Syndrome, the majority of whom were white (n=32; 97%) and male (n=30; 91%). Those with a more depressive attributional style (stable, internal, and global in the face of negative events) reported more depressive symptoms cross-sectionally (Barnhill & Myles, 2001). Qualitative work has also identified similar themes. For example, in a study on alexithymia, one female autistic participant wrote a letter to the investigators and reported “When I am able to get people to understand me, my view of life is positive, but when I am battling against the prejudice I feel very low. This feeling comes from the powerlessness to change my situation in which I find myself” (Hill et al., 2004, p. 233). This description of powerlessness leading to depressive symptoms seems to mirror findings on learned helplessness. Further research is needed to investigate this relationship between attributional style and depressive symptoms in autistic adults longitudinally and with a more diverse participant group. Additionally, the current literature does not describe how stress affects attributional styles in autism.
In unpublished results from our lab (from a Fall 2020 pilot study of the project to be described under Methods), incoming college students with a more depressive attributional style at baseline (whether autistic or non-autistic) began the semester with higher weekly reports of sadness than those with a less depressive attributional style, and they maintained greater sadness scores across the semester. Due to the low sample size, statistical differences between groups could not be determined, but this suggests that depressive attributional style may be a particularly relevant mechanism to study further.

**Current Objectives**

In the current study, we aimed to learn more about the cognitive and social factors that predict increases in depression and anxiety scores in incoming college students. By understanding contributors to the development or maintenance of internalizing symptoms, we may be able to better tailor mental health intervention content for greater effectiveness, or find more precise "points of entry" at which to intervene. We compared those potential mechanisms across autistic and non-autistic students, to see in what ways the prevalence or effects of these contributors may vary across groups. We also compared data collected in Fall 2021 with previous data from 43 students in Fall 2020, which were collected in a unique time amidst the COVID-19 pandemic.

In line with these goals and previous research, the following a priori hypotheses were formed:

1. Incoming college students who reported greater negative repetitive thinking at baseline would report increased depression and anxiety symptoms over the course of their first semester compared to those with lower baseline repetitive thinking.
2. Students who report higher social motivation and lower cross-semester social involvement would report increasing depressive symptoms over time.

3. Students who reported an internal, stable, and global attributional style at baseline would exhibit greater depressive symptoms over time, particularly in response to stress.

4. We hypothesized no difference in the model of these mechanisms across autistic and non-autistic student groups, but anticipated that a higher proportion of autistic students (versus non-autistic) would exhibit lack of social fulfillment (Hypothesis 1) and greater repetitive thinking (Hypothesis 2), as well as greater depression scores on average.

We additionally anticipated that, due to the unique setting of the COVID-19 pandemic, sadness and anxiety ratings would be lower, and social satisfaction higher, in Fall 2021 than in our Fall 2020 pilot data. We had expected that social life would be closer to pre-pandemic conditions in Fall 2021 due to COVID-19 vaccine availability and that this would be associated with increased social opportunities and improved mood.
Chapter 2

Methods

We recruited incoming college students from four similarly sized Northeastern universities (Rowan University, Montclair State University, Stony Brook University, and College of Staten Island) to participate in this fully online study. After confirming eligibility, participants completed a baseline questionnaire battery about their diagnostic and mental health history, brief surveys twice per week throughout their first semester on campus, and then an endpoint battery.

Participants

Data were collected in two waves -- first from a small pilot group of Rowan University students in Fall 2020, and then from a larger group from four universities in Fall 2021. Given certain updates to instrumentation, as well as our interest in comparing these data taken at different timepoints in the pandemic, we will consider these separate samples; the current paper primarily focuses on Fall 2021 data.

In Fall 2021, 96 participants completed baseline (n=60 non-autistic, n=36 autistic) and 61 completed endpoint. Participants were recruited from the four participating universities (Rowan University, Montclair State University, Stonybrook University, and College of Staten Island; see supplemental table in Appendix B) during the summer prior to the Fall 2021 semester. Each university recruited both autistic and non-autistic students, using emails to incoming first-year student listservs, flyers posted in common gathering spaces, and invitations sent through offices of disability and/or accommodations.
Eligible participants were required to be in their first semester enrolled as a student at each respective campus. Exclusion criteria include current concerns of psychosis, bipolar disorder, or significant substance-use disorders, as these may obscure comparisons across our cohorts of interest. Students were assigned to the autistic or non-autistic cohort based on self-report: individuals who reported either prior autism diagnoses or a history of thinking (or others commenting that) they may be autistic were assigned to the autistic group. (These reports were responses to the following questions: “Have you ever received a diagnosis of an autism spectrum disorder?” and “Have you or others around you ever suspected that you had an autism spectrum disorder?”). Students with no prior history of autism diagnosis or consideration of themselves as autistic were assigned to the non-autistic group. Due to disparities in access to formal diagnoses (Wiggins et al., 2020), allowing for self-defined autism groups may help better include autistic adults who are often under-represented in other research but might be an important portion of the autistic college student population.

Social Responsiveness Scale, 2nd edition (SRS-2) (Constantino & Gruber, 2012) scores, as a gold-standard self-report of autistic traits, were used as an indicator of (self-)diagnostic accuracy. The autistic group did have a significantly higher SRS-2 T-score ($M=63.50$, $SD=10.24$; see Table 1) than the non-autistic group ($M=53.83$, $SD=8.31$) as we would expect, $F(1,101)=12.40$, $p<.001$. Average SRS-2 scores of the autistic group fell in the range of mild to moderate social interaction deficits (T-scores of 60-65) on this instrument, and the non-autistic group’s average score fell below threshold, thus supporting a meaningful difference between groups’ autism-related features and likelihood of meeting criteria for autism. However, the autistic group’s SRS-2 scores
ranged from 42-85, thus ranging from subthreshold symptoms of social deficit to severe deficits and high likelihood of autism.

We enrolled all autistic students (diagnosed or self-identified) and then attempted to match non-autistic participants to our autistic cohort as closely as possible based on university, race/ethnicity, gender, and least educated parent’s highest level of education, in order to create comparable diagnostic cohorts (see Table 1). Given the increased prevalence of depression in autistic individuals, we also chose to oversample non-autistic participants to increase the likelihood of having a comparable number of students within each cohort who would go on to develop significant symptoms of depression and anxiety over the course of the semester. When enrolling these additional students, we continued to oversample non-autistic students who were older than 18, nonbinary, and/or transgender to better match the autistic student group characteristics. These students were enrolled in order of screener survey response.
Table 1

Demographics and Comparisons of Autistic and Non-Autistic Participants

<table>
<thead>
<tr>
<th>Mean (SD) Range</th>
<th>Non-autistic (n=60)</th>
<th>Autistic (clin dx. or self ID) (n=36)</th>
<th>Group Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in Years</td>
<td>19.42 (3.46)</td>
<td>20.78 (5.95)</td>
<td>F(1, 105)=1.18, p=0.28</td>
</tr>
<tr>
<td>Gender (% F/Nonbinary or Other)</td>
<td>48/10%</td>
<td>41/19%</td>
<td>F(1, 106)=0.16, p=.69</td>
</tr>
<tr>
<td>Non-white/Hispanic Least Educated Parent (% HS or Less)</td>
<td>47%</td>
<td>31%</td>
<td>F(1, 106)=2.66, p=.11</td>
</tr>
<tr>
<td>SRS-2 T-scores</td>
<td>53.83 (8.31)</td>
<td>63.50 (10.24)</td>
<td>F(1,101)=12.40, p&lt;0.001***</td>
</tr>
<tr>
<td>BDI-II</td>
<td>13.08(11.47)</td>
<td>15.03(10.23)</td>
<td>F(1,162)=1.20, p=.27</td>
</tr>
<tr>
<td>GAD7</td>
<td>5.78(5.44)</td>
<td>7.60(5.03)</td>
<td>F(1, 161)=4.50, p=.03*</td>
</tr>
<tr>
<td>RepT</td>
<td>22.39(8.69)</td>
<td>27.90(5.81)</td>
<td>F(1,157)=18.72, p&lt;0.001***</td>
</tr>
<tr>
<td>ACIPS</td>
<td>83.70(12.25)</td>
<td>79.98(12.80)</td>
<td>F(1, 156)=3.29, p=.07</td>
</tr>
<tr>
<td>NIH Friendship</td>
<td>29.21(7.69)</td>
<td>26.83(6.94)</td>
<td>F(1,156)=3.81, p=.05</td>
</tr>
<tr>
<td>DAQ</td>
<td>20.68(14.07)</td>
<td>27.07(10.92)</td>
<td>F(1,151)=8.81, p=.003**</td>
</tr>
</tbody>
</table>

Note. SRS-2 = Social Responsiveness Scale, Second Edition (only measured at baseline); BDI-II = Beck Depression Inventory, 2nd edition; GAD7 = Generalized Anxiety Disorder Scale; RepT = Repetitive Thinking; ACIPS = Anticipatory and Consummatory Interpersonal Pleasure Scale; NIH Friendship = National Institute of Health Toolbox Friendship Scale; DAQ = Depressive Attributions Questionnaire; each mean represents the average score from baseline and endpoint packets; *=p<.05, **=p<.01, ***=p<.001

Participation at each biweekly survey timepoint ranged from 31 to 73 students, with an average of approximately 55 respondents per timepoint. This variability is largely...
due to unexpected changes to one major phone carrier’s spam filter mid-study, which resulted in 27 participants missing a portion of the biweekly survey alerts (5-7 survey points from November 7th to December 1st). The study team was unaware of these changes, and thus the reason for this sudden attrition, until after the conclusion of data collection. All participants successfully had access to the endpoint survey. Outside of the phone carrier attrition, there were 19 participants who completed baseline but did not complete any biweekly surveys. These participants were primarily non-autistic (84%) and similar in age to the average of our overall sample ($M=19.99$, $SD=4.74$). Given that we may expect particular groups of participants (such as those that are the most depressed or anxious) to have the most difficulty completing biweekly surveys, we further evaluated for attrition bias. We found no significant differences in baseline scores of interest (BDI-II, GAD-7, SRS-2, RepT, ACIPS, NIH Toolbox Friendship Measure, and DAQ; measures described further in Table 2) between those who completed no biweekly surveys and the overall sample, suggesting that attrition is likely not biased by variables of interest.

In the initial pilot study in Fall 2020, there were 43 participants at baseline ($n=28$ non-autistic, $n=15$ autistic), all in their first semester at Rowan University. While the methods were quite similar across both semesters of data collection (Fall 2020 and Fall 2021), some measures were changed and scales were adjusted prior to Fall 2021 data collection (e.g., the “satisfaction with social connection” scale on the biweekly survey was changed from a 5-point Likert scale to a 100-point visual analogue scale). Since biweekly measures differed between the two waves, current analyses focus on Fall 2021 data. A between-year comparison is included on a select few analyses of interest.
(depression, anxiety, and perceptions of friendships) to evaluate for historical effects (see Statistical Analyses for further details). We later discuss the implications of those comparisons in terms of differing current containment efforts related to the coronavirus pandemic, especially as they may affect satisfaction with social connectedness.

**Procedures**

Interested students were asked to complete a brief eligibility screener through Research Electronic Data Capture (REDCap), a survey and data management platform developed specifically for use in electronic acquisition and storage of sensitive data (Harris et al., 2009, 2019). In this screener, students noted the university they attend, their age, year in school, gender, and relevant diagnostic history. We used this survey to match participant groups and ensure all participants met eligibility criteria, as previously described (see Table 1). Participants deemed eligible were then given access to the baseline packet one week prior to the start of their semester and had approximately three weeks to complete it. Since the timeline was based around each university’s semester calendar, the participants began survey participation at slightly different dates, depending on which university they attend. The baseline packet took approximately 45 minutes to complete, and thus participants were encouraged to do so on a computer rather than their smartphones. Participants had the option to complete the baseline packet all in one session or to complete a portion and then return to it at a later time, using the same link.

Following the baseline packet, a link to a single brief survey was texted to participants’ smartphones every Sunday and Wednesday evening throughout the semester. This biweekly survey, securely hosted on REDCap, was comprised of 12 questions and took approximately 2 minutes to complete on a smartphone (see Measures
for more details). At the conclusion of the semester, participants received a REDCap link to a final battery of surveys, similar to baseline, and again were encouraged to complete these on a computer. The full timeline for participants from each university is shown in Figure 3. Each measure is described in more detail below.

Participants received up to a total of $75 in Amazon gift codes for completing all study procedures. Gift codes were emailed as $15 each after completing the baseline and endpoint survey batteries, and $40 for completing at least 75% (i.e., 18 out of 24 possible) of the brief biweekly surveys throughout the semester. Participants who completed all these steps received an additional $5 incentive for full participation, for a total of $75 per participant. Those with a biweekly response rate lower than 75% overall received $2 per completed survey at the semester’s end.

Figure 3

Timeline of Participation for Each University

Note. RU = Rowan University, MSU = Montclair State University, SBU = Stony Brook University, CSI = College of Staten Island
Measures

Baseline

The initial battery of surveys, completed by participants within two weeks of the start of their semester, collected baseline data about key constructs related to emotional, social, behavioral, and physical health, as well as demographics. The packet included a series of fill-in and multiple-choice questions and took participants about 45 minutes to complete.

Baseline instruments are listed in Table 2, organized by the constructs they measure. Three of these measures were used to assess autistic traits (Social Responsiveness Scale 2nd edition, Adult Repetitive Behaviors and Interests Questionnaire, Interests Scale), in order to describe our sample and make comparisons across cohorts. Five others provided information on baseline mental health (Beck Depression Inventory 2nd Edition, General Anxiety Disorder, Brief Fear of Negative Evaluation Straightforward version, Mini Social Phobia Inventory, Perceived Stress Scale), including depressive, general anxiety, and social anxiety symptoms and perceived stress. Additionally, there were measures corresponding to our primary hypotheses: A short form of the Penn State Worry Questionnaire and a novel repetitive thinking questionnaire, which was based on several years of our lab’s federally-funded research on repetitive thinking in autistic adults, together allowed us to assess baseline levels of repetitive thinking through 11 items. The Depressive Attributional Questionnaire (DAQ) assessed attributional style through 15 Likert scale items, which asked participants to reflect on how they react to good or bad events in their life, assessing when and whether they attribute negative events to themselves or to their environment. Finally, baseline social motivation and participation was assessed through ACIPS and the NIH Toolbox.
Friendship Measure. The ACIPS examined participants’ experiences of pleasure within a variety of social situations, using 17 Likert scales. The NIH Toolbox Friendship Measure asked participants about their day-to-day social relationships, in an effort to quantify how much social support a participant received. More information on each of these measures, including discussion of validation in autistic samples, is available in Appendix A.
<table>
<thead>
<tr>
<th>Construct(s)</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autism screening</td>
<td>Social Responsiveness Scale, 2nd edition (SRS-2) (Constantino &amp; Gruber, 2012);</td>
</tr>
<tr>
<td></td>
<td>Adult Repetitive Behaviors and Interests Questionnaire (ARBI-Q) (Z. Williams, personal communication, 2021);</td>
</tr>
<tr>
<td></td>
<td>Two items from the Interests Scale (IS) (Bodfish, 2003)</td>
</tr>
<tr>
<td>Mental health</td>
<td>Beck Depression Inventory (BDI-II) (Beck et al., 1996);</td>
</tr>
<tr>
<td></td>
<td>General Anxiety Disorder (GAD-7) (Spitzer et al., 2006);</td>
</tr>
<tr>
<td></td>
<td>Brief Fear of Negative Evaluation Straightforward version (BFNE-S) (Leary, 1983; Rodebaugh et al., 2004);</td>
</tr>
<tr>
<td></td>
<td>Mini Social Phobia Inventory (Mini-SPIN) (Connor et al., 2001);</td>
</tr>
<tr>
<td></td>
<td>Perceived Stress Scale (PSS) (Cohen, 1994)</td>
</tr>
<tr>
<td>Repetitive thinking</td>
<td>Repetitive Thinking (RepT) survey battery, short form (Williams &amp; Gotham; personal communication, May 2021);</td>
</tr>
<tr>
<td></td>
<td>Three-item Penn State Worry Questionnaire (PSWQ) (Berle et al., 2011; Meyer et al., 1990)</td>
</tr>
<tr>
<td>Social motivation and participation</td>
<td>Anticipatory and Consummatory Interpersonal Pleasure Scale (ACIPS) (Gooding &amp; Pflum, 2014);</td>
</tr>
<tr>
<td></td>
<td>NIH Toolbox Friendship Measure (Cyranowski et al., 2013)</td>
</tr>
<tr>
<td>Attributional style</td>
<td>Depressive Attributions Questionnaire (DAQ) (Kleim et al., 2011)</td>
</tr>
</tbody>
</table>
**Biweekly Surveys**

Next, participants were asked to complete the brief 12-question survey twice per week for 12 weeks (approximately equivalent to the remainder of the semester) in order to track changes in key constructs throughout each participant’s semester. Developed by our lab, this brief survey prompted participants to provide information about their mood, thinking patterns, attributional style, and social situation over the “last few days” (i.e., since the previous biweekly survey). Most items were rated on a 5-point Likert scale (1=Almost never, 5=Almost always). Example items include “In the last few days, how often have you been feeling down, sad, or empty?” and “In the last few days, how often have you been brooding, or thinking repetitively, about problems or negative experiences?” Some items, such as those measuring social satisfaction, had a different scale format. For example, a visual analogue scale was used to allow participants to more fully respond to “How satisfied do you feel with your level of social belonging or closeness?” (lowest anchor = Extremely dissatisfied, highest anchor = Extremely satisfied).

**Endpoint**

Finally, participants completed an end-of-semester online survey battery similar to the battery they completed at the start of the semester. The measures were the same as baseline, with a few exceptions. Primarily, we did not repeat the SRS-2, because these scores were expected to be more trait-like and not change significantly over the course of a semester (Wagner et al., 2019). Additionally, the end-point survey contained a brief Autistic Burnout Scale developed by our lab, based on work by Raymaker and colleagues (2020). This was added due to interest in its exploration from the autistic community, as
reported by our collaborator (K. Gillespie-Lynch, personal communication, April 29, 2021), and due to its potential association with depression (Raymaker et al., 2020). Additionally, the endpoint survey included brief questions on satisfaction with academic accommodations, created in collaboration with Helen Rottier (personal communication, January 4, 2021). These questions were exploratory in nature but may help to identify the potential relationship, hypothesized on the basis of qualitative work, between stressful or ableist experiences requesting accommodations and decreased emotional wellbeing (Rottier, 2020). More information on the measures included in the endpoint packet is available in Appendix A.

The current study and measures received approval from the Rowan University School of Osteopathic Medicine Institutional Review Board (study ID Pro2020001172) and Stony Brook University (IRB2021-00266).

**Statistical Analyses**

For all primary analyses, generalized least squares regression with a first-order autocorrelation structure for the errors was used to accommodate the fact that within-person errors are not independent in these longitudinal data. Across the following analyses, sadness was operationalized as 1-5 Likert scale responses to “How often have you been feeling down, sad, or empty?” in which 1 is “Almost Never” and 5 is “Almost Always.”

**Negative Repetitive Thinking**

The relationship between negative repetitive thinking and sadness was assessed in three ways. First, we assessed the relationship between overall repetitive thinking levels,
taken at baseline and endpoint using the lab-made RepT battery, and sadness across the semester. Generalized least squares regression was used for this analysis.

We then explored the shorter-term predictive relationship between negative repetitive thinking and sadness. To do so, we created a lagged variable such that sadness was predicted by negative repetitive thinking at the prior timepoint (e.g., sadness at time 2 was compared to negative repetitive thinking at time 1). We evaluated this predictive relationship using generalized least squares with the lagged variable.

Finally, we evaluated the synchronous association between negative repetitive thinking and sadness within one timepoint. In both the lagged and synchronous analysis, negative repetitive thinking was operationalized using first the biweekly stagnation item (1-5 Likert scale response to “How often have you been concentrating on your (real life) problems without coming up with any answers?”) and then the biweekly brooding item (1-5 Likert scale response to (“In the last few days, how often have you been brooding, or thinking repetitively, about problems or negative experiences?”)). Both analyses were done whenever negative repetitive thinking was the predictor of interest, due to prior evidence that the repercussions of repetitive thinking may vary by the form it takes (Watkins, 2008).

A similar process was followed to assess the relationship between negative repetitive thinking and anxiety symptoms, both lagged and synchronously. For these analyses, anxiety was defined as the 1-5 Likert scale response to "How often have you been feeling nervous, anxious, or on edge?".
**Social Satisfaction**

Generalized least squares regression was used to evaluate both the lagged and synchronous relationship between social satisfaction and biweekly sadness, using the previously described methods. Social satisfaction was measured via a 0-100 visual analogue sliding scale response to "How satisfied do you feel with your level of social belonging or closeness?".

Following this main effect analysis, an interaction effect was then added to evaluate how trait-like social motivation may affect this relationship between more timepoint-specific sadness and social satisfaction. Social motivation was operationalized as the average of each participant’s baseline and endpoint Anticipatory and Consummatory Interpersonal Pleasure Scale scores. Possible scores on this measure can range from 17 to 102.

**Attributional Style**

The relationship between attributional style and reported sadness was also assessed using generalized least squares regression. Attributional style was measured through the Depressive Attributions Questionnaire (DAQ) (Kleim et al., 2011). For this analysis, the average of baseline and endpoint DAQ scores was used.

Following this main effect analysis, an interaction effect was then added to evaluate how biweekly stress may affect this relationship between more trait-like depressive attributional style and sadness. Stress was operationalized as the response to “How much stress have you experienced in the last few days?” on a 0-100 visual analogue scale.
Cohort Differences

Initial hypotheses were that autistic participants would report higher sadness, anxiety, and negative repetitive thinking, as well as reduced social satisfaction, compared to non-autistic participants. When evaluating this hypothesis with generalized least squares regression, self-selected autism groups were utilized. Participants who indicated that they either have received a formal autism diagnosis or had thought or been told that they may be autistic were included in the autistic cohort. Participants with no autism diagnosis and who have not believed themselves to be autistic were included in the non-autistic group.

To evaluate whether the predictive relationships of interest (e.g., negative repetitive thinking and depression, social satisfaction and depression) depended on autism status, an interaction effect was added and evaluated.

Finally, we then compared aggregate results to data from Fall of 2020 to examine if there were differences in overall baseline or endpoint depressive or anxiety symptoms, or social satisfaction, using a general linear model. This was evaluated using sample-averaged BDI-II, GAD-7, and NIH Toolbox Friendship Measure scores. As previously described, all three of these measures were taken at both baseline and endpoint. Initial hypotheses were that participants would be less likely to report satisfying, supportive friendships in Fall 2020 due to more intensive social distancing and isolation. Similarly, we anticipated heightened depression and anxiety in Fall 2020, compared to Fall 2021, for similar pandemic-related reasons.
Chapter 3

Results

Results are described below for each anticipated predictor.

Negative Repetitive Thinking

Overall negative repetitive thinking, measured at baseline and endpoint, was predictive of sadness endorsement across the semester’s biweekly survey ($t=12.85$, $p<.0001$), such that those who endorsed more repetitive thinking on our lab-made measure tended to endorse greater sadness throughout the semester. When testing the lagged variables, prior timepoint negative repetitive thinking did not significantly predict subsequent timepoint sadness ($t=0.58$, $p=.56$ for stagnation; $t=-0.81$, $p=0.42$ for brooding see Table 3). However, synchronous sadness and negative repetitive thinking (i.e., measured at the same timepoint) were significantly related to one another, such that a one-unit increase in stagnation was associated with a 0.46 unit increase in sadness ($t=19.50$, $p<.001$). Similarly, a one-unit increase in brooding was associated with a 0.49 unit increase in sadness ($t=21.41$, $p<.001$). Overall, participants who reported greater negative repetitive thinking were more likely to report greater sadness across the semester. This relationship is represented in Figure 4. In this figure, baseline negative repetitive thinking across the semester is depicted by tertile, such that figure panels show the relationship between week of survey participation and self-reported sadness, as it depends on average biweekly stagnation.
### Table 3

*Predictors of Biweekly Sadness Scores*

| Hypothesized Predictor                              | Coefficient | Estimated Standard Error | t Value (df) | Pr(>|t|) |
|-----------------------------------------------------|-------------|--------------------------|--------------|----------|
| Baseline Rumination                                 | 0.09        | 0.01                     | 12.85 (2, 1307) | <0.001*** |
| Lagged Stagnation                                   | 0.01        | 0.02                     | 0.58 (5, 1251)  | 0.56     |
| Synchronous Stagnation                              | 0.46        | 0.02                     | 19.50 (5, 1251) | <0.001 *** |
| Lagged Brooding                                     | -0.01       | 0.02                     | -0.81 (5, 1251) | 0.42     |
| Synchronous Brooding                                | 0.49        | 0.02                     | 21.41 (5, 1251) | <0.001 *** |
| Lagged Satisfaction with Social Connection          | 0.0007      | 0.001                    | 0.71 (5, 1190)  | 0.48     |
| Synchronous Satisfaction with Social Connection     | -0.01       | 0.001                    | -9.32 (5, 1322) | <0.001 *** |
| Interaction of Satisfaction with Social Connection and Social Motivation | -0.003 | 0.0001                    | -2.57 (4, 1304) | 0.01 **  |
| Attributional Style                                 | 0.06        | 0.004                    | 16.97 (2, 1269) | <0.001 *** |
| Interaction of Attributional Style and Stress       | 0.0003      | 0.0001                   | 3.03 (4, 1267)  | 0.003**  |
| Cohort                                              | 0.34        | 0.15                     | 2.24 (2, 1326)  | 0.03 *   |
Figure 4

Sadness Scores Each Week by Negative Repetitive Thinking Tertile

Note. Trajectory of autistic students is in green. Trajectory of non-autistic students is noted in purple.

The relationship between negative repetitive thinking and anxiety symptoms was also assessed, with similar results: Lagged negative repetitive thinking was not strongly related to anxiety symptoms ($t=0.91$, $p=.36$ for stagnation; $t=-0.34$, $p=0.73$ for brooding), but synchronously, there was a significant relationship between these variables ($t=12.47$, $p<.001$ for stagnation; $t=19.02$, $p<.001$ for brooding; see Table 4). Additionally, the more trait-like repetitive thinking measured at baseline and endpoint was significantly related to anxiety symptoms across the semester ($t=12.46$, $p<.001$).
### Table 4

**Predictors of Anxiety**

| Hypothesized Predictor | Coefficient | Estimated Standard Error | t Value (df) | Pr(>|t|) |
|------------------------|-------------|--------------------------|--------------|----------|
| Baseline Rumination    | 0.08        | 0.01                     | 12.46 (2, 1307) | <0.001*** |
| Lagged Stagnation      | 0.01        | 0.02                     | 0.91 (5, 1251)  | 0.36     |
| Synchronous Stagnation | 0.33        | 0.02                     | 12.47 (5, 1251) | <0.001 ***|
| Lagged Brooding        | -0.01       | 0.02                     | -0.34 (5, 1251) | 0.73     |
| Synchronous Brooding   | 0.44        | 0.02                     | 19.02 (5, 1251) | <0.001*** |
| Cohort                 | 0.30        | 0.14                     | 2.05 (2, 1254)  | 0.04 *   |

**Social Satisfaction**

When testing the lagged variable, prior timepoint social satisfaction did not significantly predict the subsequent timepoint sadness ($t=0.71, p=.48$). However, synchronously, there was a significant relationship between social satisfaction and reported sadness ($t=-9.32, p <.001$). Overall, participants who reported being the most socially dissatisfied also tended to report more sadness across the semester. This is represented in Figure 5 below. In this figure, participants’ overall satisfaction with social connection was divided into tertiles to create three panels. Each panel represents the relationship between week of survey participation and self-reported sadness, for those reporting the lowest, middle, or highest level of average social satisfaction across the semester.
Figure 5

Sadness Scores Each Week by Social Satisfaction Tertile

Note. Trajectory of autistic students is in green. Trajectory of non-autistic students is in purple.

We also assessed whether the relationship between social satisfaction and sadness scores may be moderated by social motivation: This interaction effect was significant ($t=-2.57, p=.01$). While in general, social satisfaction and sadness scores had a negative relationship, this relationship was strongest for those with high social motivation. Participants with greater baseline social motivation seemed to report greater sadness when socially dissatisfied than those with lower baseline social motivation. Similarly, participants with high baseline social motivation and high satisfaction with social connectedness tended to report less sadness than those with similar social satisfaction but less social motivation.
Attributional Style

Attributional style (assessed at baseline and endpoint) was found to be predictive of biweekly sadness scores, such that those who reported a more depressive attributional style were likely to report higher sadness scores across the semester ($t=16.97$, $p<.001$).

An interaction effect was also identified, such that stress moderated the relationship between depressive attributional style and biweekly sadness. When stressed, those with more highly depressive attributional styles were even more likely to report elevated sadness scores than their peers with similar attributional style but less stress ($t=2.02$, $p=.003$). (Although this was not the hypothesized relationship of interest, this interaction effect also operates in the reverse, such that the relationship between stress and sadness depends on attributional style.)

Cohort Differences

Primary effects of cohort were explored, first in terms of dependent variables: Contrary to expectations, autistic adults did not endorse significantly more depressive symptoms on the baseline ($F(1, 97)=0.82$, $p=.37$) or endpoint ($F(1, 63)=0.05$, $p=.82$) clinical measure. When evaluating biweekly reports, autistic students endorsed significantly higher sadness ($t=2.24$, $p=.03$; see Table 3) and anxiety ($t=2.05$, $p=.04$; see Table 4) on average throughout the semester. Being in the autistic-identifying group was also not related to higher anxiety symptoms on clinical screener measures taken at baseline ($F(1, 96)=3.30$, $p =.07$) or endpoint, ($F(1, 63)=0.89$, $p=.36$). (However, the average anxiety was higher on combined baseline and endpoint reports for autistic students; see Table 1).
In terms of our predictor variables, autistic students were likely to report higher repetitive thinking at both baseline \((F(1, 94)=15.71, p < .001)\) and endpoint \((F(1, 61)=4.29, p = .04)\). Similarly, autistic participants were more likely than non-autistic participants to endorse brooding across the semester’s biweekly surveys \((t=3.27, p=0.001)\). However, autistic students were not significantly more likely to endorse engaging in heightened stagnation across the semester \((t=1.91, p = .06)\).

Perceived availability of social support did not differ between cohorts at baseline \((F(1, 94)=0.45, p = .51)\), but there was a significant difference at endpoint \((F(1, 60)=4.87, p = .03)\), such that autistic students reported lower friendship scores than non-autistic students by the semester’s end. Additionally, autistic participants were more likely than non-autistic participants to report social dissatisfaction across the semester (via biweekly survey report) \((t=-3.57, p < .001)\), as shown in Table 5. Self-reported social motivation did not significantly differ at baseline \((F(1, 94)=1.80, p = .18)\) or endpoint \((F(1, 60)=1.53, p = .22)\). Autistic students tended to report a significantly more depressive attributional style at baseline \((F(1, 88)=7.09, p = .009)\), but not endpoint \((F(1, 61)=2.27, p = .14)\).

Table 5

| Relationship                  | Coefficient | Estimated Standard Error | t Value (df)        | Pr(>|t|)   |
|------------------------------|-------------|--------------------------|--------------------|-----------|
| Cohort Effect on Stagnation   | 0.31        | 0.16                     | 1.91 (2, 1326)     | 0.06      |
| Cohort Effect on Brooding    | 0.46        | 0.14                     | 3.27 (2, 1326)     | 0.001**   |
| Cohort Effect on Social Satisfaction | -9.75    | 2.73                     | -3.57 (2, 1325)    | <0.001 ***|

*Note.* See Table 1 for cohort differences from Baseline and Endpoint measures.
Next, we looked at whether the hypothesized mechanisms differed by cohort. These interaction effects, shown in Table 6, were found to be non-significant. As hypothesized, the relationships between the primary predictors of interest and reported sadness did not seem to depend on autism status. In other words, negative repetitive thinking, social satisfaction, and attributional style similarly predicted sadness scores, regardless of whether participants identified as autistic.

Table 6

*Cohort Interaction Effects on Sadness Scores*

| Relationship                  | Coefficient | Estimated Standard Error | t Value (df)         | Pr(>|t|) |
|-------------------------------|-------------|--------------------------|----------------------|----------|
| Cohort*Stagnation             | -0.03       | 0.05                     | -0.64 (4, 1323)      | 0.52     |
| Cohort*Brooding               | -0.04       | 0.05                     | -0.94 (4, 1323)      | 0.35     |
| Cohort*Social Satisfaction    | 0.004       | 0.003                    | 1.35 (4, 1323)       | 0.18     |
| Cohort*Attributional Style    | -0.003      | 0.008                    | -0.40 (4, 1304)      | 0.69     |

*Differences by Year*

Differences on BDI-II total scores (averaged baseline and endpoint) were minimal between the Fall 2020 and Fall 2021, $F(1, 227)=3.88, p=.05$, and if anything, trended in the opposite direction of our hypothesis, with somewhat higher average depression scores in Fall 2021. The effect of year on GAD-7 scores followed a similar pattern, with minimal statistical effect, $F(1, 226)=3.72, p=.05$; see Figures 6 and 7 below. Since we initially expected social opportunities to differ between Fall 2020 and Fall 2021, as
pandemic conditions continued to change, we also assessed differences in perceptions of friends’ availability. There were no statistically significant differences in NIH Toolbox Friendship Measure scores between years; $F(1, 217)=1.16, p=.28$.

**Figure 6**

*BDI-II Scores by Year of Data Collection (Fall 2020 and Fall 2021)*
Figure 7

GAD-7 Scores by Year of Data Collection (Fall 2020 and Fall 2021)
Chapter 4
Discussion

Autistic adults and other stakeholders have repeatedly identified mental health and the transition to adulthood as key research and clinical priorities. While several theories have been proposed to explain the high prevalence of depression and anxiety in autistic populations, virtually no longitudinal research has evaluated potential causal mechanisms. The current study investigated three potential predictors of internalizing symptoms over the course of autistic and non-autistic college students’ first semester. We found support for synchronous relationships between predictors (high negative repetitive thinking and low social satisfaction) and sadness scores, as hypothesized. We also found that students with higher negative repetitive thinking at baseline and endpoint tended to endorse greater sadness across the semester. Similarly, we found that depressive attributional style is predictive of sadness scores, such that students who reported an internal, stable, and global attributional style at baseline exhibited greater depressive symptoms over time, particularly in response to stress. We found evidence for these mechanisms across both autistic and non-autistic cohorts. However, the more immediate temporally predictive relationship -- in which the previous timepoint predictor (e.g., negative repetitive thinking) contributed to the subsequent timepoint sadness -- was not supported for any of the variables. While the autistic cohort tended to endorse greater levels of dependent and predictor variables as we hypothesized, cohort effects were mixed (e.g., no differences in baseline or endpoint depressive symptoms by cohort). We will discuss these findings from a perspective of likely clinical implications.
Primary Predictors of Depression and Anxiety

In the present study, the overall repetitive thinking style -- as measured at endpoint and baseline through the 8-item repetitive thinking battery -- was predictive of cross-semester sadness scores. Additionally, within the biweekly surveys, a synchronous relationship was identified such that negative repetitive thinking was related to reported sadness within individual timepoints. Contrary to our expectations, negative repetitive thinking at the prior timepoint (measured through lagged variables) was not significantly related to later depression or anxiety symptoms.

By integrating these differing temporal findings, we may inform future hypotheses on the timing of predictive relationships of interest. Firstly, we find there is evidence of a predictive relationship between more stable, trait-like repetitive thinking status and sadness over the semester. In our baseline and endpoint RepT battery, participants were asked to rate their agreement with items, such as “When I have a difficult experience or problem, the same thoughts keep going through my mind.” These prompts were not prefaced with a time frame (e.g., “within the last week…”). Therefore, we may expect these responses to apply to participant’s overall tendencies, rather than their behavior in any particular day or week. Participants who endorsed more repetitive thinking on these items tended to report more sadness throughout the semester: This is similar to the research findings from the other known longitudinal investigation of repetitive thinking in autistic populations (Rieffe et al., 2014). In this previous study -- which was done with autistic children, ages 9-15 -- tendencies towards rumination (as measured on the Worry/Rumination Questionnaire for Children, which is similarly not time bound) were related to sadness over an extended period of time (intervals of 9
months) (Rieffe et al., 2014). Therefore, our current finding converges with other evidence that more stable negative repetitive thinking tendencies likely contribute to the prospective prediction of depressive symptoms. We also found evidence of a synchronous relationship between negative repetitive thinking and sadness, although we cannot currently assess the directionality (or bidirectionality) of this relationship.

Although the longer-term prospective relationship was observed, we had also anticipated a more immediate predictive relationship such that repetitive thinking at one timepoint would predict sadness at the next timepoint. This relationship was not found to be significant. Thus, our current data informs new hypotheses of the temporal relationship between negative repetitive thinking and sadness. In this updated model, stable, ongoing negative repetitive thinking may contribute to the development of depression overall. Additionally, in-the-moment negative repetitive thinking is robustly related to discrete instances of sadness, possibly with bidirectional effects. However, discrete instances of repetitive thinking days beforehand may have little relation to sadness at a particular timepoint. At this time, we did not have the power to test how accruing timepoints’ negative repetitive thinking affected single instance future timepoint sadness. We look forward to further exploring this relationship, after further data collection.

A similar pattern was identified with social satisfaction, such that there was a significant synchronous relationship between social satisfaction and sadness, but the relationship between lagged predictors and later sadness scores was not significant. Again, this may inform future temporal hypotheses, such that in the moment social dissatisfaction may have more relation to discrete instances of sadness, versus one’s
social dissatisfaction several days prior. In addition to the significant relationship between synchronous social satisfaction and sadness scores, we also found evidence of an interaction effect with baseline social motivation, such that those with high social motivation were most negatively affected by low social satisfaction. This is in line with the social motivation model of depression in ASD (Smith & White, 2020), in which the degree of an individual’s social motivation is believed to moderate the relationship between social difficulties/satisfaction and depressive symptoms. Overall, our findings on social satisfaction support the idea that the balance between desired and achieved social interaction is related to loneliness and depression and may imply that clinical intervention targeting social support may be more impactful for some clients -- namely, those with high social motivation and low social opportunity -- than others. The current findings also reinforce a theme in autism research literature (e.g., Lee et al., 2022; Sosnowy et al., 2018): There is likely no objectively “correct” level of social interaction or other contexts/behaviors that will lead to ideal mental health outcomes for all individuals. Instead, it may be more important to balance each unique individual’s goals and priorities.

Cohort Differences

The current research supports previous evidence that autistic adults endorse greater feelings of sadness and anxiety than non-autistic adults (Hollocks et al., 2019). This may be affected by increased prevalence of predictors of internalizing symptoms in the autistic cohort: for example, autistic students in our sample were more likely to be dissatisfied with their level of social connection and tended to have a more depressive attributional style compared to non-autistic peers. Autistic students additionally endorsed
significantly higher negative repetitive thinking at baseline and higher levels of brooding throughout the semester. Interestingly, autistic students did not seem to differ in their endorsement of stagnation (one subtype of negative repetitive thinking) when compared to non-autistic peers throughout the semester. This was contrary to expectations: Previously research from our own lab identified stagnant thought -- particularly, perseverating on problems without coming to a solution -- as a statistically central (“influential”) symptom within a community of maladaptive repetitive thinking items in autistic adults (Williams, 2021). We crafted this biweekly survey item on stagnation with those findings in mind. The current finding may indicate that autistic students, while engaging in more negative repetitive thinking broadly, tend not to engage in more stagnant thought specifically in comparison to non-autistic peers. In other words, they may not feel that they tend to think repetitively about problems without coming up with any answers. Instead, they may find that some of this repetitive thinking does result in problem-solving and may be experienced as potentially productive. Alternatively, it is possible that non-autistic college students in Fall 2021, during the context of a global pandemic, were more likely to have heightened stagnation than the comparison groups used in previous studies. Therefore, the previously detectable differences may not have been present due to history effects. Finally, our analyses may have been underpowered to detect effects in stagnation.

Analyses revealed no interaction effects of cohort and predictors of interest. This supports our hypothesis that the mechanisms contributing to internalizing symptoms do not differ between autistic and non-autistic students -- both groups of students’ mental health seems to be similarly affected by negative repetitive thinking, social
dissatisfaction, and depressive attributional styles. Taken together, our evidence suggests that the disproportionate depression rates in the autistic community are likely related to greater levels of known predictors of internalizing symptoms, rather than different mechanisms.

**Differences by Year**

When beginning data collection for Fall 2021, we anticipated seeing reduced sadness and anxiety compared to Fall 2020, due to decreased pandemic-related restrictions. This exploratory hypothesis was not supported. Instead, we saw marginally increased internalizing symptoms in the second year, but overall this difference is not significant. This may be due to COVID-19’s continued influence in the Fall 2021 semester. While many had hoped the effects and limitations of the pandemic would diminish, this was not the reality for many communities. In fact, due to the spread of the Omicron variant, most regions saw a shift to greater restrictions as the Fall 2021 semester progressed. As a result, many individuals may not have had significantly improved circumstances in Fall 2021 compared to Fall 2020. This assumption may be supported by the lack of significant difference between NIH Toolbox Friendship Measure scores when comparing the two waves of data collection (averaging baseline and endpoint scores), suggesting participants did not experience improved social circumstances. Indeed, some portion of the participants may have actually been experiencing greater burnout and fatigue due to the continuation of the pandemic. In future waves of data collection, differences between years will continue to be explored against hypotheses about history effects.
Limitations

As noted previously, our autistic cohort was comprised of both those who had a formal autism diagnosis and those who thought they may be autistic, but had not obtained a formal diagnosis. Due to disparities in access to formal diagnoses (Wiggins et al., 2020), this decision may better reflect autistic adults who are often under-represented in other research but likely comprise a not-insignificant portion of the autistic college student population. However, some members of this group likely would not meet full criteria for an autism diagnosis, as indicated earlier by the range of SRS-2 Scores.

Overall, we had hoped to recruit more individuals who received a formal diagnosis earlier in childhood, but we acknowledge that the college transition may be a challenging time for these students, making them less available for non-essential activities, such as research participation. This may harm the generalizability of our research to the broader formally diagnosed autistic population.

Results may additionally have been affected by the unexpected attrition due to a change in one phone carrier’s spam filter mid-semester (as previously described in Methods), as well as the expected attrition between baseline and biweekly survey responses. While 96 participants completed baseline, 73 then completed the first biweekly survey; however, there were no identifiable significant differences on baseline variables of interest between those who completed biweekly surveys and those who did not. This suggests that attrition bias is of relatively minimal concern.

In the biweekly surveys we collected information on two symptoms related to depression (sadness, anhedonia) and three items related to negative repetitive thinking. In the current analyses, we chose focal items to operationalize the constructs, but plan to
rerun our analyses with combined-item Z-scores for the constructs of depression and negative repetitive thinking. In the future, researchers may also adjust the measurement of the most important variables to explore the depth of symptom impact. In particular, the primary biweekly measure of sadness was focused on frequency (“How often have you been feeling down, sad, or empty?”), but it may be valuable to add a measure of the intensity or impairment related to sadness instead.

For some of the observed relationships, it is unclear to what extent statistical significance carries over to meaningful, clinical significance. For example, there was a strong statistical significance detected between a more depressive attributional style and higher sadness scores, but the coefficient in this relationship was small (0.06). Therefore, the utility of interventions targeting these specific mechanisms is uncertain. A larger sample size may assist in clarifying these relationships further.

Finally, this study, while longitudinal, was short-term in nature. As a result, it is not possible to determine whether there is a slower-growing, or longer-term predictive relationship between mechanisms of interest and subsequent depression and anxiety. Unfortunately, data suggest that many incoming college students -- and perhaps particularly autistic students (Magnuson & Constantino, 2011) -- may have already experienced depression and anxiety in their lifetime. Within our current study, we cannot know how the potentially bidirectional cycle of predictors of interest and negative mental health outcomes has already affected participants and at what “stage” of this cycle they may be in when beginning the semester. While the extant literature does not fully indicate where research should focus, in terms of developmental stage or point in the lifespan, in
order to identify the onset of these patterns, this highly novel work is a helpful starting point.

**Clinical Implications**

Following replication, future research should move toward translating conclusions into prevention and intervention efforts. This may include making adaptations to existing therapeutic techniques to interrupt negative thought “spirals” and challenge the more trait-like depressive attributional style (Rubenstein et al., 2016). Cognitive behavioral techniques such as cognitive restructuring, with distanced self-talk in moments of high distress, may be one effective future direction (Orvell et al., 2021). If the relationship between these mechanisms and depressive symptoms continues to be seen as more synchronous, then interventions might focus on being accessible and useful while a client is actively distressed, as reframing cognitions *before* they lead to sadness may not be as highly relevant. Intervention strategies such as those taught in Rumination-Focused Cognitive Behavioral Therapy (RF-CBT; Watkins, 2018) or Dialectal Behavioral Therapy (DBT; Linehan & Wilks, 2015) may make cognitive techniques more accessible during these high-stress moments.

Social dissatisfaction was predictive of depressive symptoms for both groups, and autistic students were significantly more likely to report feeling dissatisfied with their levels of connection. Therefore, barriers to satisfying social relationships may be one mechanism contributing to mental health disparities between autistic and non-autistic individuals. Future prevention and intervention efforts may target increasing this social satisfaction, particularly for autistic students. These efforts may include providing greater social structures during the transition to college, such as offering social skills groups and
peer mentors (Accardo et al., 2019; Gillespie-Lynch et al., 2017). Due to difficulties associated with the Double Empathy Problem (Crompton et al., 2021), in which bidirectional differences in communication style impede effective relationship-building between autistic and non-autistic individuals, autistic students may also benefit from having explicit avenues to meet and socialize with one another. Future research may explore how accessing neurodiversity-focused clubs or otherwise connecting with autistic peers may affect the social satisfaction and feelings of belonging among autistic students. From a population health standpoint, however, we may be interested in how to apply the current findings to promote the most wellbeing with limited resources: our data suggest that those who would benefit the most from interventions to increase feelings of social belonging are likely those who have the greatest baseline social motivation. While social dissatisfaction was associated with heightened sadness across groups, this relationship was strongest for those with the highest ACIPS scores. Thus, while implementing more opportunities for structured social experiences may benefit many incoming college students, limited resources may best be applied toward students with potential challenges in making social connections (including those identifying as autistic) who express greater social desire.

Across all three mechanisms of interest, the relationship between the mechanism and sadness scores did not seem to differ across cohorts. This suggests that existing interventions that target these concerns (negative repetitive thinking, social satisfaction, and depressive attributional style) in the general population should be tested within autistic populations. Finding this overlap in clinical targets is an important step towards increasing mental health care access for autistic adults. Many clinicians express hesitancy
to work with autistic clients, due to low confidence in their competency, and this contributes to autistic adults’ difficulties in accessing mental health care (Maddox et al., 2020). Therefore, future efforts should consider focusing on how to best make minor adaptations to these known approaches, testing for efficacy in the autism community, and as indicated, increasing clinician confidence in using them with autistic adults.

**Future Directions**

Due to the current sample size, we have limited ourselves to testing only planned hypotheses at this stage. However, we look forward to continued waves of data collection and further analyses. Before moving to a greater focus on translating the current research to intervention and prevention work, we hope to replicate this study with a larger sample. This will assist in assessing both the practical and statistical significance of hypothesized predictors. It will also allow us to evaluate the role of anxiety in predicting sadness, as well as other exploratory analyses. Future research would also benefit from ecological momentary assessment, to provide more nuanced temporal data on predictive relationships.

Additionally, next stages of this work will incorporate a greater focus on trauma. Research from the general population has suggested that sexual trauma is predictive of long-lasting increased risk of many psychiatric and physical health concerns (Graham et al., 2021; Rothman et al., 2021; Waigandt et al., 1990) and that the risk of sexual trauma may be highest in the first semester of college for some student groups (e.g., women; Kimble et al., 2008). This suggests that trauma may be a particularly important consideration when predicting and intervening on mental health concerns in first-year students, but it is currently understudied within autistic populations. With future waves of
data collection, we intend to evaluate the prevalence of sexual trauma in autistic, first-semester students, as well as its relation to depression and anxiety symptoms, with negative repetitive thinking and social satisfaction as potential moderators of this relationship.

**Conclusion**

Similarly to prior literature, the present research underscores a key mental health disparity: autistic college students are more likely to experience depression and anxiety symptoms than their non-autistic peers throughout the semester. Our current evidence suggests that this may be due in part to autistic students’ comparatively higher levels of negative repetitive thinking, social dissatisfaction, and depressive attributional style. The present research did not find evidence for greater stagnation in our autistic-identifying group compared to non-autistic comparisons, but the positive relationship between negative repetitive thinking and sadness at individual timepoints was observed throughout the semester and across the sample as a whole. Additionally, autistic participants did endorse higher negative repetitive thinking in baseline and endpoint measures, as well as higher brooding throughout the semester. This study advances our understanding of the experience of autistic students transitioning to college and the risk factors for depression and anxiety in autistic adults more broadly. Mental health is a crucial priority of the autistic community, and the current findings represent another step towards a greater focus on lifespan mental health in autism research.
References


Appendix A

Description of Measures

Measures with a “**” are administered during the baseline survey battery, and measures with a “^^” are administered during the endpoint survey battery

- **Baseline History Form**: This was created within our lab to collect demographics and diagnostic, substance use, and treatment history. It includes a series of fill-in and multiple-choice questions, some of which are optional.
- **Endpoint History Form**: This form, also created within our lab, will be used to follow up with participants about their medical and treatment history, as well as ask questions about their living situation, satisfaction with academic accommodations, substance use, and lifestyle throughout the semester.
- **Social Responsiveness Scale, 2nd edition (SRS-2)**: The SRS-2 is a 65-item self-report scale measuring the presence and severity of social impairment as it relates to autism spectrum disorder. The SRS-2 generates a total score as well as scores for each of its five subscales: social awareness, social cognition, social communication, social motivation, and restricted interests and repetitive behavior. The SRS-2 includes clinical ranges of concern for use as an autism screening instrument. Items are rated on a 4-point Likert scale (1=Not true, 4=Almost always true). Example items include “I am much more uncomfortable in social situations than when I am by myself” and “I feel self-confident when interacting with others” (Constantino & Gruber, 2012).
- **Adult Repetitive Behaviors and Interests Questionnaire (ARBI-Q)**: The ARBI-Q is a 24-item self-report questionnaire focused on repetitive behaviors across domains including rigidity/sameness, circumscribed interests, and sensory-motor. This measure was created with our collaborator at Vanderbilt, Zachary Williams. The subscale scores are totaled to arrive at an overall score. Items are rated on a 5-point Likert scale (0=Very untrue of me to 5=Very true of me).
- **Interests Scale (IS)**: The IS is a self-report checklist measuring severity of circumscribed interests associated with autism. For this project, we are using 2 IS items that correspond to frequency of that interest. (Bodfish, 2003).
- **Repetitive Thinking (RepT) survey battery - short form** – The original, extended version of the RepT survey battery includes a few items taken from each of 15 validated instruments and 1 additional novel set of
questions, all of which measure concepts associated with repetitive thinking, including rumination, circumscribed interests, anticipatory worry, obsessive thoughts, posttraumatic processing, etc. Items were selected prior to this IRB application on the basis of best performance in a sample of 589 participants crowdsourced via Amazon MTurk and approximately 800 adults with autism from the SPARK national autism registry. Based on these data, an 8-item short form of this item pool was selected in order to reduce the time burden on participants. All items are rated on a 5-point Likert scale (1=Almost never to 5=Almost always). The 8 items are taken from the following measures:

- Perseverative Thinking Questionnaire (PTQ) (Ehring et al., 2011)
- Rumination and Reflection Questionnaire Negative Events (RRQ-NE) (Trapnell & Campbell, 1999)
- Measure of Mental Anticipatory Processes (MMAP) (Feldman & Hayes, 2005)
- Three-Item Penn State Worry Questionnaire (PSWQ)* – This 3-item measure asks participants about causes of and reactions to worry. Items are rated on a 5-point Likert scale (1=Strongly disagree, 5=Strongly agree) (Meyer et al., 1990; Berle et al., 2011). The PSWQ has been used with autistic adults in research both inside and outside of our lab previously (Top et al., 2019).
- Depressive Attributions Questionnaire (DAQ)* – This 16-item measure asks participants to reflect on how they react to good or bad events in their life, assessing when and whether they attribute bad events to themselves or to their environment. Items are rated on a 5-point Likert scale (1=Almost never, 5=Almost always). Example items include “when bad things happen to me, I think my life will never get better” and “when something good happens, I think it will not last long” (Kleim, Gonzalo, & Ehlers, 2011).
- NIH Toolbox Friendship measure – This 8-item measure asks participants about the relationships they have with the people they encounter on a day to day basis, in an effort to figure out how much friendship or social support a participant receives. Items are rated on a 5-point Likert scale (1=Never, 5=Always). Example items include “I get invited to go out and do things with other people” and “I feel close to my friends” (Cyranowski et al., 2013).
- Perceived Stress Scale (PSS)* – This 10-item measure asks participants about their thoughts and feelings in order to collect data about their self-reported levels of stress. Items are rated on a 5-point Likert scale.
(0=Never, 4=Very often). Example items include “In the last month, how often have you been upset because of something that happened unexpectedly?” and “In the last month, how often have you felt that you were on top of things?” (Cohen et al., 1994). The PSS has been used with autistic adults in research both inside and outside of our lab previously (Hirvikoski & Blomqvist, 2015).

- **Beck Depression Inventory (BDI-II)** – This 21-item measure is one of the most widely used measures of depressive symptoms. For each item, participants are presented a novel set of four answer choices of which they must choose the statement that applies to them the most. Items are titled by their general topic (such as “Sadness” and “Self-dislike”) and include four statements to choose from (for example, under “Sadness” participants choose an answer ranging from 0=I do not feel sad to 3=I am so sad or unhappy I can’t stand it (Beck et al., 1996). This measure has been validated for use with autistic adults (Williams et al., 2020).

- **General Anxiety Disorder (GAD-7)** – This 7-item measure is used to examine for the presence of common Generalized Anxiety Disorder symptoms within the last two weeks. Items are rated on a 4-point Likert scale (0=Not at all sure, 3=Nearly every day). All items follow the general statement “Over the last 2 weeks, how often have you been bothered by the following problems?” and include, for example “Feeling nervous, anxious, or on edge” and “Being so restless that it's hard to sit still” (Spitzer et al., 2006). The GAD-7 been used with autistic adults both inside and outside of our lab previously (Okuda et al., 2017).

- **Anticipatory and Consummatory Interpersonal Pleasure Scale (ACIPS)** – This 17-item measure examines the extent to which one experiences pleasure within a variety of social situations. Items are rated on a 6-point Likert scale (1=Very false for me, 6=Very true for me). Example items include “I look forward to seeing people when I’m on my way to a party or get-together” and “I don’t look forward to family get-togethers or gatherings” (Gooding & Pflum, 2014). The ACIPS has been used with autistic adults both inside and outside of our lab previously (Novacek et al., 2016).

- **Brief Fear of Negative Evaluation (BFNE)** – The 8-item version of this measures examines how much someone fears being evaluated unfavorably within a social setting. Items are rated on a 5-point Likert scale (1=Not at all characteristic of me to 5=Extremely characteristic of me). Example items include “I worry about what other people will think of me even when I know it doesn't make any difference” and “Other people's opinions of me do not bother me”. (Leary, 1983; Rodebaugh et al, 2004).
The BFNE is commonly used as a brief measure of social anxiety and has been validated for use with autistic adults (Boulton & Guastella, 2021).

- **Mini Social Phobia Inventory (Mini-SPIN)**\(^\text{a}\) - This 3-item measure is a brief screener for social anxiety (Connor et al., 2001). Participants rate their agreement with items related to fear of embarrassment and avoidance of attention on a Likert Scale (0=Not at all, 5=Extremely). This measure has been used previously, both inside and outside of our lab, with autistic adults (Nah et al., 2018).

- **Autistic Burnout Scale**\(^\text{a}\) - The endpoint survey includes exploratory questions on autistic burnout, developed by our research team based on Raymaker et al., 2020. These items are rated on a Likert scale (1=Strongly disagree, 6=Strongly agree) and represent the domains of fatigue, loss of skills, reduced sensory tolerance, and reduced social tolerance.

- **"2m2x" bi-weekly survey** – This 11-item measure will be administered twice a week for 12 weeks total. Developed by our lab, this measure prompts participants to provide information about their current mood and anxiety, thinking patterns, attribution style, and social situation. Most items are rated on a 5-point Likert scale (1=Almost never, 5=Almost always). Example items include “In the last few days, how often have you been feeling down, sad, or empty?” and “In the last few days, how often have you been brooding, or thinking repetitively, about problems or negative experiences?”
## Appendix B

### Supplemental Table

Demographics and Baseline Comparisons of Participants at Each University

<table>
<thead>
<tr>
<th>Mean (SD)</th>
<th>Rowan University</th>
<th>Stony Brook University</th>
<th>Montclair State University</th>
<th>College of Staten Island</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=44</td>
<td>n=23</td>
<td>n=29</td>
<td>n=7</td>
</tr>
<tr>
<td>Age in Years</td>
<td>21.21(6.30)</td>
<td>18.68(0.86)</td>
<td>18.74(0.74)</td>
<td>20.96(3.99)</td>
</tr>
<tr>
<td></td>
<td>18.0 – 43.1</td>
<td>18.0-21.5</td>
<td>18.0-22.0</td>
<td>18.1-27.0</td>
</tr>
<tr>
<td>% Autistic (by self-identified groups)</td>
<td>25%</td>
<td>39%</td>
<td>38%</td>
<td>29%</td>
</tr>
<tr>
<td>Gender (% F/Nonbinary or Other)</td>
<td>43/16%</td>
<td>47/4%</td>
<td>52/14%</td>
<td>29/14%</td>
</tr>
<tr>
<td>Non-white</td>
<td>39%</td>
<td>52%</td>
<td>35%</td>
<td>29%</td>
</tr>
<tr>
<td>Least Educated Parent (% HS or Less)</td>
<td>34%</td>
<td>35%</td>
<td>38%</td>
<td>43%</td>
</tr>
<tr>
<td>BDI-II</td>
<td>10.93(10.22)</td>
<td>10.05(7.59)</td>
<td>15.14(11.18)</td>
<td>11.43(8.26)</td>
</tr>
<tr>
<td></td>
<td>0-37</td>
<td>0-29</td>
<td>0-38</td>
<td>1-23</td>
</tr>
<tr>
<td>GAD7</td>
<td>5.85(5.05)</td>
<td>4.73(4.52)</td>
<td>7.57(6.02)</td>
<td>4.86(4.63)</td>
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<td>0-16</td>
<td>0-19</td>
<td>0-12</td>
</tr>
<tr>
<td>RepT</td>
<td>24.35(7.23)</td>
<td>22.27(7.98)</td>
<td>26.04(7.97)</td>
<td>20.83(8.11)</td>
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<td>8-36</td>
<td>8-37</td>
<td>8-39</td>
<td>8-28</td>
</tr>
<tr>
<td>ACIPS</td>
<td>83.40(10.11)</td>
<td>81.50(13.29)</td>
<td>84.25(12.24)</td>
<td>68.17(17.88)</td>
</tr>
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<td>62-102</td>
<td>45-96</td>
<td>63-100</td>
<td>52-102</td>
</tr>
<tr>
<td>NIH Friendship</td>
<td>28.98(7.89)</td>
<td>28.55(7.17)</td>
<td>28.25(7.04)</td>
<td>24.33(6.35)</td>
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<td></td>
<td>14-40</td>
<td>11-40</td>
<td>8-40</td>
<td>14-32</td>
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<tr>
<td>DAQ</td>
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<td>23.14(10.88)</td>
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<td>24.80(6.76)</td>
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<td>1-51</td>
<td>1-48</td>
<td>4-52</td>
<td>18-34</td>
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</table>

*Note. BDI-II = Beck Depression Inventory, 2nd edition; GAD7 = Generalized Anxiety Disorder Scale; RepT = Repetitive Thinking; ACIPS = Anticipatory and Consummatory Interpersonal Pleasure Scale; NIH Friendship = National Institute of Health Toolbox Friendship Scale; DAQ = Depressive Attributions Questionnaire*