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Abstract

Over the last few years, the number of students struggling with symptoms of anxiety increased. While there is plenty of literature on the underlying causes of anxiety, the effect and interplay of so-called resilience factors on these underlying causes has become an increasingly relevant topic recently. Studies have suggested that resilience is a key component in student's well-being and that it can act as a protective factor against mental disorders such as GAD. Most studies have investigated GAD at a construct level, in contrast to a symptom-level analysis. This exploratory, cross-sectional study explores the latter by performing a network analysis, investigating the relationship between resilience factors (RFs), (e.g., optimism, self-esteem, self-efficacy, seeking social support, positive reappraisal, acceptance, self-reported resilience), and GAD symptoms in a broad student population sample (N = 444). Our non-clinical data originates from the WARN-D study, a project that tracks the mental health of higher education students in The Netherlands. A network of seven resilience factors and eight GAD nodes emerged. Excessive worrying held a central position in the network. Optimism was strongly negatively associated with feeling afraid, and moderately negatively associated with worrying excessively, and functional impairment. Self-reported resilience was strongly negatively associated with worrying excessively, and functional impairment. Because of possible power issues, we only selected seven empirically supported resilience factors. Whilst most of the WARN-d population sample identified as female (85%), we did not take gender in account. Future studies could take external RFs in account, as well as gender differences. Since this study is a cross-sectional study, future longitudinal research is needed to further invest our findings.

Keywords: Generalized Anxiety Disorder (GAD), Resilience, Network Analysis

Towards an Understanding of Resilience and Symptoms of Generalized Anxiety Disorder (GAD) in Students: A Network Analysis

Even though student life is sometimes referred to as the best period of one's life, research shows that many students regard it as a stressful time with plenty of challenges (Dopmeijer, 2021). Transitioning into a new life period (e.g., emerging adulthood) when starting higher education brings many new experiences and difficulties (Dopmeijer, 2021). This new phase is one of the known peak moments in life where mental illnesses begin to emerge (Harrer et al., 2018). Mental health plays a big role in the academic success of students (Harrer et al., 2018). *Resilience* has been named one of the most important factors in student well-being (Brewer et al., 2019), and is defined as the ability to bounce back from adversity (Southwick et al., 2004). Because of its importance in student well-being, resilience in students has become a topic of interest in research (Brewer et al., 2019).

Generalized Anxiety Disorder

Anxiety disorders are one of the most common mental health disorders among students (Bamber & Morpeth, 2018). This study will focus on *Generalized Anxiety Disorder* (GAD). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines GAD as excessive worrying lasting at least six months, accompanied by at least three of the following symptoms: restlessness, irritability, difficulty concentrating, muscle tension, sleep disturbance, and tiring easily (American Psychiatric Association, 2013). Around 2-3 % of 18 to 24-year-old students in The Netherlands is diagnosed with GAD (Nederlands Jeugdinstituut, 2019). The lifetime prevalence of GAD is between 3-5 % (Gerlach & Gloster, 2020). The exact cause of GAD is unknown, but the development of its symptoms is most likely the result of complex interactions between biological and environmental factors (Newman et al., 2016). Developmental risk factors

include, but are not limited to, family background, life experiences, and childhood trauma (Newman et al., 2016). Both cognitive-behavioral therapy and/or psychopharmacological interventions are empirically supported treatments (Gerlach & Gloster, 2020). However, a meta-analysis regarding the theoretical foundations of GAD urged an improved understanding of the mechanisms of the factors underlying GAD, to improve treatment outcomes (Bystritsky et al., 2013).

Resilience

Research has shown that resilience functions as a protective factor against the development of mental health disorders such as GAD (Ang et al., 2019). However, the concept of resilience has been defined variously and ambiguously by scholars, with a meta-analysis finding 112 different definitions (Brewer et al., 2019). This negatively influences our understanding of resilience, since the concept has not been studied in a reliable manner (Hu et al., 2015). In this study, resilience is defined as the ability to bounce back from adversity, this definition is in accordance with renowned scholars such as Southwick et al. (2004).

Resilience Factors (RFs)

Most contemporary interpretations of resilience consider it a multifaceted, dynamic concept associated with different and variable factors (Kalisch et al., 2019). Resilience can be seen as the result of a combination of protective factors and risk factors, e.g., factors that increase and decrease resilience (Rutter, 2016). Various papers show the following empirically supported RFs: optimism, self-efficacy, self-esteem, social support, positive reappraisal, acceptance, self-esteem, financial support, and support from institutions (Lee et al., 2013; Brewer et al., 2019; Chen et al., 2015).

Resilience factors can vary throughout one's lifetime and are thought to be influenced by interactions with the environment, such as family and friends, institutions, and society (Southwick et al., 2005). For example, RFs may be present within high school, but may decrease with the transition to both emerging adulthood and higher education. Scholars Connor & Davidson (2003) state that resilience could be an essential target in the treatment of GAD. Recently, different universities are exploring enhancing resilience in students in various programs (Ang et al., 2021). Researchers encourage studying which factors contribute to resilience (Brewer et al., 2019).

Network Analysis

Network analysis is a newly developed method that allows for an exploration of the interplay of psychological symptoms (Fried et al., 2016). Instead of subscribing to the notion that a single cause is at the core of the manifestation of a psychological disorder and its categorized symptoms, the network analysis adopts the view that mental disorders can be understood as a system whereby symptoms interact with one another (Kalisch et al., 2019). The network analysis provides a visual network that can indicate where, and to what degree, there may be an interaction between symptoms within a given psychological disorder. For example, GAD symptom Worrying too much (GAD_3) may lead to Feeling afraid, as if something terrible might happen (GAD_7), which may lead to Becoming easily annoyed (GAD_6), which might lead back to an increase in Worrying too much (GAD_3) (Gerlach & Gloster, 2008). This study's aim is to create a better understanding of how symptoms of GAD are associated with empirically supported resilience factors by answering the following research question: How do resilience factors (RFs) relate to specific symptoms of Generalized Anxiety Disorder from a network analysis perspective in students participating in the WARN-D project? The results of

this study may be of value in future, longitudinal, clinical research aimed at understanding how resilience factors interact with symptoms of GAD, for possible interventions and treatment targets.

Method

Research Design

We investigated our research question using the baseline data collected in the WARN-D project. The WARN-D project is a research project funded by the European Research Council (ERC). The aim is to provide an understanding of early warning signs for depression in students from Dutch higher education facilities (Fried, 2022). The design of the study was cross-sectional. In the baseline data, all participants were prompted to fill out an online questionnaire relating to a variety of topics, including but not limited to stress, life events, resilience, mental health, and overall well-being. The data from the relevant questions towards the research question were included.

Participants

The WARN-D dataset contains data from questionnaires by a total of 444 students pursuing MBO/HBO/WO degrees in the Netherlands. Age ranges from 18 to 53, with the mean age of M= 22.67 with SD=4.00. 85% of included students identifies as female. The data consist of 50% Dutch students, 38% non-Dutch students, and 10% of the students with more than one nationality. Of the student population, 46% were pursuing a WO Bachelor's degree or equivalent, 39% a University / WO Master's degree or equivalent, 9% MBO, 4% was pursuing either a HBO bachelor, 1% a HBO master’s degree, and 1% was pursuing a doctoral degree.

Procedure

The data collection for WARN-D was approved by the Leiden University Psychology Ethics Committee on 06-09-2021 (Approval ID 2021-09-06-E.I.Fried-V2-3406). Approval by the Medical Ethics Review Committee is not applicable based on the nature of the study.

The participants were recruited via social media, posters, e-mail, and word-of-mouth. They first answered a few surveys to check whether the study was a good fit for them. Inclusion criteria were: 1) minimal 18 years old, 2) studying at a Dutch education facility (MBO, HBO, WO), 3) speaking fluent Dutch or English, 4) owning a smartphone, 5) having a European bank account. Exclusion criteria were current 1) schizophrenia, psychosis, or thought disorder, 2) major depressive disorder, 3) (hypo)mania / bipolar disorder, 4) primary substance use disorder, and 5) moderate or severe suicidal ideation. For exclusion criteria 1 through 4, first participants currently waiting for and those in treatment from a licensed psychologist/psychiatrist were excluded. After that, validated self-report screeners were employed to exclude participants who met exclusion criteria 1 through 5. Finally, participants were excluded if they were distressed by seeing the daily calories burned estimate, which is provided by the smartwatch that participants wear in a later phase of the WARN-D project. The participants answered the baseline questionnaire via an online questionnaire. The participants were reimbursed up to 90€, depending on how many questionnaires were completed during the two-year study period.

Measures

The baseline survey of the WARN-D study consisted of validated and reliable questionnaires. However, these were sometimes adapted to fit the goal of the study. Any adaptions were noted, and the adapted questionnaires are reported in Appendix C. We only

describe the measures of interest to this thesis here; The entire baseline questionnaire battery can be found elsewhere.

Resilience Factors (RFs)

As mentioned above, there are various factors associated with resilience (Kalisch et al., 2019). To avoid power issues whilst running the analysis, we chose RFs based on the empirical support they have received. These were optimism (Fried et al.; Kalisch et al., 2019), self-esteem (Fried et al., 2018), self-efficacy (Wang et al., 2015), social support (Johnson et al., 2014; Lunanski et al., 2021), self-reported resilience (Hu et al., 2015; Wang et al., 2021), positive reappraisal (Hoorelbeke et al., 2019; Hong et al, 2018.; Min et al., 2003), and acceptance (Hong et al., 2018).

Optimism. We assessed optimism using an adaptation of the Revised Life Orientation Test (LOT-R; Herzberg, 2006), from which four filler items were left out in the WARN-D questionnaire. The LOT-R measures how optimistic people feel about the future (Herzberg, 2006). Participants answered six questions about their optimism (e.g., "I'm always optimistic about my future") on a five-point Likert scale (1 = *Strongly disagree,* 5 = *Strongly agree*). The LOT-R has good validity, and Cronbach's alpha in previous studies ranged from α= 0.68 to 0.71, respectively (Herzberg, 2006). In our dataset, Cronbach's alpha was α = 0.82. Items 2, 4, 5 were reverse coded, in line with Herzberg, 2006. The sum score was calculated with lower levels of optimism represented by lower sum scores and vice versa, ranging from 6 to 30.

Positive Reappraisal. We assessed positive reappraisal using a subscale of the Cognitive Emotion Regulation Questionnaire (CERQ-SF, Garnefski & Kraaij., 2007). Positive reappraisal was defined as reshaping an experience in a positive manner (Garnefski & Kraaij., 2007). Participants answered two questions on their cognitive coping strategies regarding positive

reappraisal: (e.g., “I think I can learn something from the situation”) on a five-point Likert scale *(*1= *Almost never,* 5 = *Almost always*). The sum score was calculated with lower levels of positive reappraisal represented by lower sum scores, ranging from 2 to 10. In our dataset, the Pearson correlation was r (444) = .63, p <.001

Acceptance. We assessed acceptance using a subscale of the Cognitive Emotion Regulation Questionnaire (CERQ-SF, Garnefski & Kraaij., 2007). Acceptance was defined as coming to terms with the event that happened (Garnefski & Kraaij., 2007). Participants answered two questions on their cognitive coping strategies regarding acceptance: (e.g., “I think I have to accept what happened”) on a five-point Likert scale *(*1= *Almost never,* 5 = *Almost always*). The sum score was calculated with lower levels of acceptance represented by lower sum scores ranging from 2 to 10. In our dataset, the Pearson correlation was r (444) = .68, p <.001

Social Support Seeking. We assessed seeking social support using the Behavioral Emotion Regulation Questionnaire (BERQ, Kraaij & Garnefski., 2019). Seeking social support was defined as sharing feelings and asking for the help of others to successfully cope with a difficult experience (Kraaij & Garnefski., 2019). Participants answered four questions on their behavioral emotion regulation strategies regarding seeking social support: (e.g., “I look for someone to comfort me”) on a five-point Likert scale *(*1= *Almost never,* 5 = *Almost always*). The sum score was calculated with lower levels of seeking social support represented by lower sum scores and vice versa ranging from 4 to 20. In our dataset, Cronbach’s Alpha was $\alpha = .76$.

Resilience. We assessed self-evaluated resilience using the Brief Resilience Scale (BRS, Smith et al., 2008). The BRS defines resilience as the ability to bounce back from adversity (Chimortz et al., 2018). Participants answered six questions about their ability to recover from adversity (e.g., “I tend to bounce back quickly after hard times”) on a five-point Likert scale (1 =

strongly disagree, 5 = *Strongly agree*). The BRS has good validity and Cronbach's Alpha was α =0.87 (Smith et al., 2008). In line with Smith et al. (2008), items 2, 4, and 6 were reverse scored. The sum score was calculated with lower levels of resilience represented by lower sum scores and vice versa, ranging from 6 to 30. In our dataset, Cronbach's Alpha was α =.86.

Self-Efficacy. We assessed self-efficacy with the General Self-Efficacy scale (GSE, Scholtz et al., 2002). Participants answered ten questions about their beliefs in their ability to solve problems and how they generally feel and think (e.g., "I can always manage to solve my problems if I try hard enough") on a four-point Likert scale (1= *Not at all true*, 4= *Exactly true)* (Scholtz et al., 2002). The GSE has good validity, and Cronbach Alphas were α =0.75 and α =0.91, respectively (Scholtz et al., 2002). The sum score was calculated with lower levels of self-efficacy represented by lower sum scores and vice versa, ranging from 10 to 40. In our data set, Cronbach's Alpha was α =.84.

Self-Esteem. We assessed self-esteem with the Rosenberg Self-Esteem scale (RSE, Rosenberg, 1979). Self-esteem is defined as one's perceived sense of self-worth (Schmitt & Allik, 2005). Participants answered ten questions about their global self-worth (e.g., "On the whole, I am satisfied with myself") on a four-point Likert scale (1 = *Strongly disagree*, 4 = *Strongly agree).* The RSE has good validity, and Cronbach's Alpha was α =.89 (Huang & Dong, 2012). In our data set, Cronbach's Alpha was α =.90. In line with Huang & Dong (2012), items 2,5,6, 8, and 9 were reverse coded. The sum score was calculated with lower levels of self-esteem represented by lower sum scores and vice versa, ranging from 10 to 40.

Generalized Anxiety Disorder Symptoms. We assessed the presence of symptoms of GAD with the Generalized Anxiety Disorder Scale-7 (GAD-7, Rutter et al., 2016). GAD is defined as excessive worrying about various aspects of life, for a minimum of six months

(American Psychiatric Association, 2013). Participants answered seven questions asking how often they experienced different problems in the last two weeks (e.g., "feeling nervous, anxious or on edge") on a four-point Likert scale (0= *Not at all*, 3 = *Nearly every day*). They answered one question on impairment based on these symptoms (e.g., "how difficult have they made it for you to do your work, take care of things at home, or get along with other people") on a four-point Likert scale (0 = *Not difficult at all*, 3 = *Extremely difficult*). The range of the scale is 0 to 24. The GAD-7 has good validity, and Cronbach's alphas were $\alpha = 0.85$ and $\alpha = 0.89$, respectively (Löwe, et al., 2008). In our data set, Cronbach's Alpha was $\alpha = .84$.

Statistical Analysis

The data were analyzed using the statistical software JASP, version 0.16 (JASP Team, 2021). Pearson correlations were calculated to examine the possible topological overlap of the RF variables. Prior to running the network analysis, missing data were inspected. The GAD-7 scale had numerous missing values on GAD_8. When participants filled in zero to questions 1 to 7 (e.g., no presence of GAD symptoms), the missing values in GAD_8 (e.g., functional impairment due to these symptoms) were set to zero. The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) has several cut-off points for Generalized Anxiety Disorder (GAD): mild (5), moderate (10), and severe anxiety (15) (American Psychiatric Association, 2013). Whilst we examine the individual items of GAD, the sum score of GAD was calculated to develop a better understanding of how clinical our sample is. We standardized our variables prior to the analysis because of the varying ranges of the variables.

The statistical analysis consisted of estimating and analyzing the network structure and assessing the accuracy of the network parameters (Hevey, 2018). The network was estimated using a partial correlation network, aka a Gaussian Graphical model. This type of network, used

for continuous data, consists of nodes representing the variables and edges that present the strength of the associations between the nodes (Burger et al., 2020). In this study, the nodes represent the item scores of GAD-7, and the sum scores of the RFS: self-reported resilience, self-efficacy, self-esteem, seeking social support, positive reappraisal, acceptance, and optimism. We chose a pairwise removal for the missing data. We used the regularization method EBICglasso, to limit the possibility of spurious relationships (Hevey, 2018). The correlation method was set to the Cochrane-Orcutt (COR) estimator. The tuning parameter gamma was set to 0.5, following Foygel & Drton, (2010). The centrality indices (e.g., betweenness, closeness, and strength) were calculated using the centrality plot. The centrality measures per variable were calculated using the centrality table option. To assess the stability of centrality indices, the case bootstrapping was performed via the bootnet package in JASP with 1,000 bootstrap samples. The accuracy of the edge weight estimates was assessed using non-parametric bootstrapping with 1,000 bootstrap samples.

Table 1

Descriptive Statistics and Pearson's Correlations for Resilience Factors

	N	Mean	SD	Min.	Max.	Acceptance	Optimism	Reappraisal	Seeking support	Self-efficacy	Self-rep. resilience	Self-esteem
Acceptance	445	6.67	2.02	2	10							
Optimism	445	16.69	4.32	6	30	.18**						
Reappraisal	445	6.35	2.13	2	10	.42**	.29**					
Seeking support	445	6.08	2.15	4	20	.06	.26**	.16**				
Self-efficacy	444	29.73	4.37	10	40	.29**	.53**	.44*	.21**			
Self-rep resilience	445	15.37	4.45	6	30	.32**	.42**	.31*	.0009	.54**		
Self-esteem	444	19.71	6.73	10	40	-.02	-0.07	-0.02	.06	-.04	.03	
GAD S.	444	6	4.6									

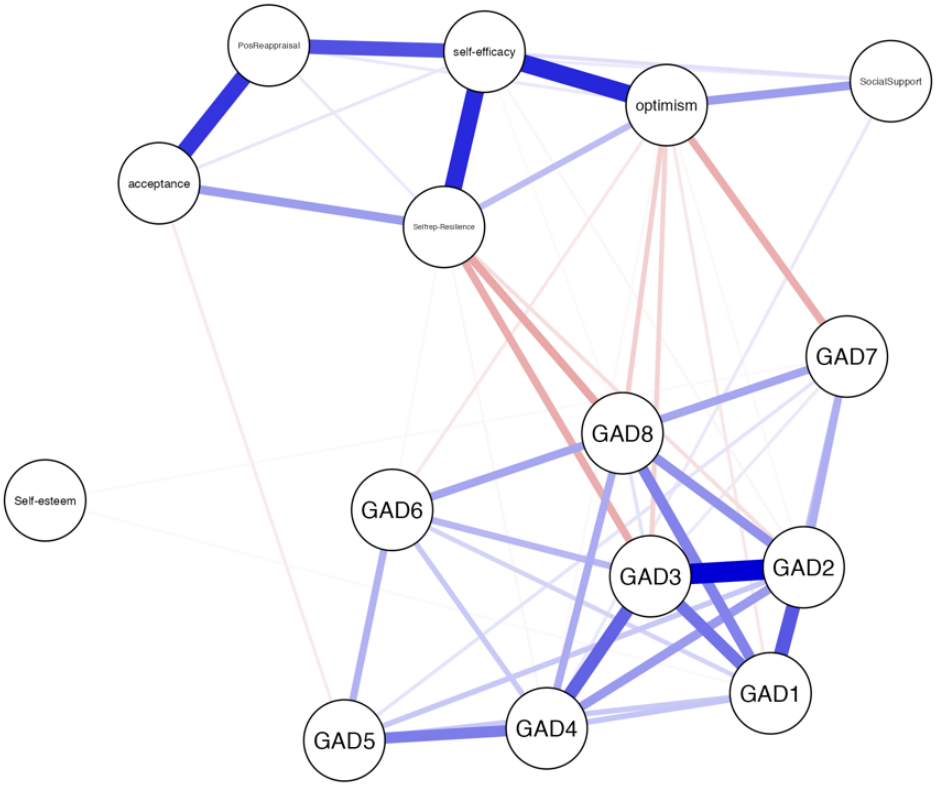
Note. Min = minimum, Max = maximum, and refers to the theoretical range of sum scores. GAD S. = GAD sum-score. *p<.05, **p<.0.

The analysis was run with an overall sample size of 444. 9 missing data were removed pairwise. The descriptive statistics and Pearson correlations are shown in Table 1. The resilience variables were mildly correlated, with the highest correlation being between self-reported resilience and self-esteem (i.e., 0.54). As we did not find correlations that were problematic (a high correlation indicates topological overlap), we continued our analysis. In our analysis, the mean of the GAD sum score was 6 (±4,6).

Figure 1 displays the network of the resilience factors and the GAD symptoms. The edges represent the connections between the nodes, ranging from -3.16 (self-esteem) to 1.78 (GAD_3). The edge weights quantities can be found in Appendix Table A.1. The network displays two clusters with positive associations (e.g., blue-colored nodes connecting strongly with each other in a constellation), one with the GAD symptoms (especially GAD_2 and GAD_3), and one with the RFs (especially optimism, self-efficacy, self-reported resilience, positive reappraisal, and acceptance). Based on the edge weights, there are strong negative associations between self-reported resilience and worrying too much (GAD_3), as well as self-reported resilience and functional impairment (GAD_8). There is a strong negative association between optimism and feeling afraid (GAD_7). There is a negative association between optimism, worrying too much (GAD_3) and functional impairment (GAD_8). Seeking social support has a moderate association with optimism. Notably, self-esteem seems to be isolated from the network.

Figure 1

Partial Correlation Network of GAD symptoms and Resilience Factors

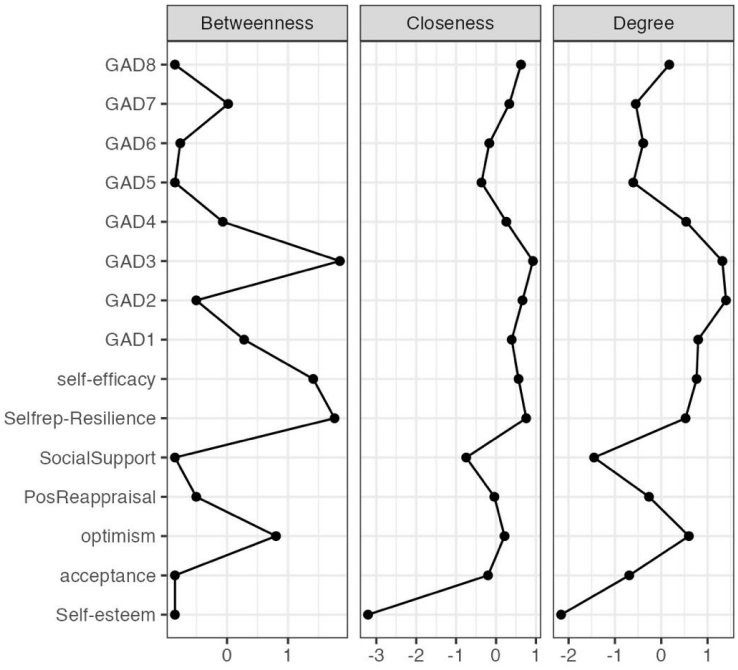


Note. The width of the edges represents the strength of the associations. Blue edges are positive associations, red edges are negative associations. No minimum or maximum cut-off scores were used. Legend: GAD_1 = Feeling nervous, anxious, or on edge, GAD_2= Not being able to stop or control worrying, GAD_3= Worrying too much about different things, GAD_4 = Trouble relaxing, GAD_5= Being so restless that it is hard to sit still, GAD_6= Becoming easily annoyed or irritable, GAD_7 = Feeling afraid, as if something awful might happen. GAD_8 = If you checked any problems, how difficult have they made it for you to do your work, take care of things at home, or get along with other people.

As shown in Figure 2, the variables differ quite in their centrality indices. GAD_3 and self-reported resilience have the highest betweenness and closeness values. GAD_1, GAD_2, GAD_3, and self-efficacy have the highest strength.

Figure 2

Centrality Plot of RFs and GAD symptoms



Note. Betweenness is calculated to analyze how many times the nodes in the network act as a bridge in the shortest pathway of other nodes (Bringmann et al., 2019). Closeness calculates the shortest pathways between nodes, to analyze how fluently information can be spread between the nodes (Bringmann et al., 2019). Degree (i.e., strength) indicates how well a node is directly connected and/or interacts with other nodes (Bringmann et al., 2019). The centrality indices are standardized z-scores.

The edge stability measures in Figure 3 describe variability across different bootstrapping samples, with the grey areas representing confidence intervals (Hevey, 2018). As displayed in

Figure 2, many edges are set to zero. The confidence intervals around zero are relatively small, which indicates that the bootstraps have much overlap with our sample. This means our network is relatively stable.

Figure 3

Accuracy of the edge weight stability

Note. Bootstrapped confidence intervals for the network of resilience and GAD symptoms. The grey areas represent the bootstrapped Confidence Intervals (CI's). The red line represents sample values. The labels of the Y-axis have been removed to improve readability.

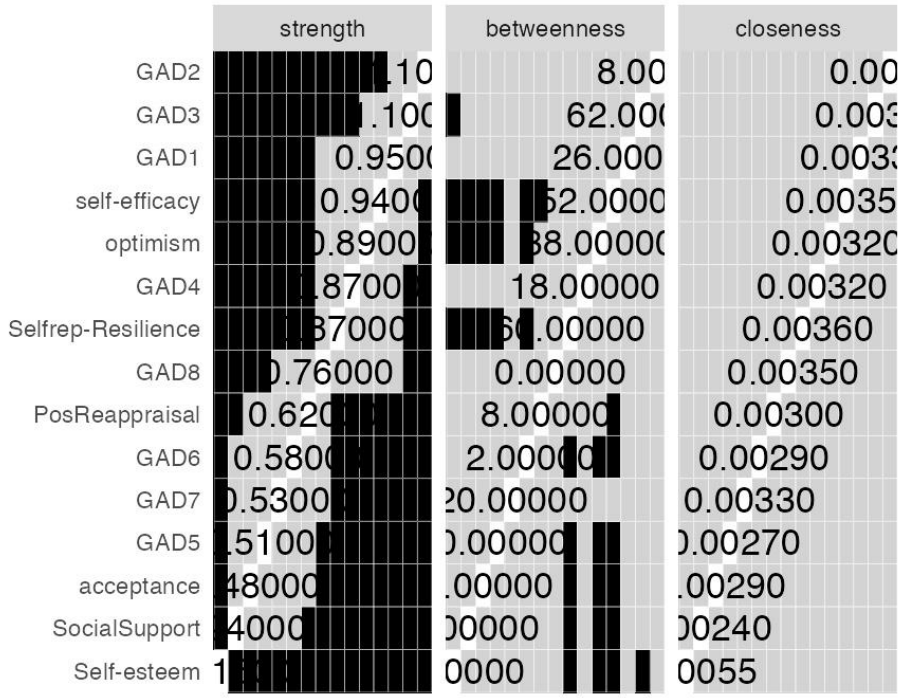
A case bootstrap was performed to investigate the stability of betweenness, closeness, and degree (see Appendix Figure 1 for a visualization and Appendix B for a description). Where closeness and degree remain stable, betweenness drops. This means we should interpret the

results from betweenness with care.

As shown in Figure 4, there are no significant differences between nodes in closeness and only a few in betweenness. In terms of strength, there are significant differences between nodes. GAD_2 is the largest node in terms of strength (1.40, as shown in Appendix Table 2) and differs significantly from all other variables, except GAD_3. GAD_3 is the second largest node (1.32), and differs significantly from all other variables, except for GAD_2 and self-efficacy. Self-efficacy, optimism, and self-reported resilience differ significantly from GAD_2, GAD_5, GAD_6, and GAD_7. Self-efficacy has the largest strength of the RFs (i.e., 0.76).

Figure 4

Bootstrapped differences test



Note. Bootstrapped differences test of the centrality indices between GAD symptoms and RFs. Black tiles represent nodes that differ significantly, and grey tiles represent non-significance. The labels of the X-as have been removed to improve readability.

Discussion

Due to the increasing rates of students struggling with symptoms of anxiety, it is relevant to explore the underlying causes and the ways in which certain resilience factors interact with anxiety symptoms. This exploratory, cross-sectional study aimed to analyze the relationships between GAD symptoms and resilience factors. In our non-clinical broad student population sample, we found that self-reported resilience was negatively associated with Worrying too much (GAD_3) and Functional impairment (GAD_8). Optimism was strongly negatively associated with Feeling afraid (GAD_7). Optimism was moderately associated with Worrying too much (GAD_3) and Functional impairment (GAD_8). These findings are in line with previous research that found that GAD is associated with reduced optimism and is negatively associated with self-reported resilience (Blair et al., 2017). Contrary to consensus in findings reported in the literature, not all resilience variables were associated with GAD symptoms. This is the case in self-esteem, which was unexpectedly displayed as an isolated node in our network, and only had marginal correlations with the other variables in the Pearson correlations. These results dispute the current beliefs that resilience is a predictor of self-esteem and has an empirical relation to GAD (Hagen et al., 2021). Furthermore, seeking social support connected with a mere two RFs (optimism, self-efficacy) and none of the GAD symptoms in our analysis. Recent studies have also found mixed results in the connections between seeking social support and anxiety in young adults (Velez et al., 2015). Velez et al. (2015) have suggested that these mixed

results could be due to the confounder rumination. Further investigation would be of value to provide more clarity on this matter.

Not being able to stop worrying (GAD_2), Worrying too much (GAD_3) and the RFs self-efficacy, optimism, and self-reported resilience were the most central in our analysis. Due to this central position the aforementioned nodes are directly connected to many other nodes (i.e., strength). An explanation for the high centrality of Not being able to stop worrying (GAD_2) and Worrying too much (GAD_3) could be the very strong positive edge between these two symptoms. Since strength is based on the absolute sum of the edge weights, this edge could affect the strength value. Additionally, not being able to stop worrying (GAD_2) and Worrying too much (GAD_3) have the shortest pathways in bridging other symptoms, meaning they can fluently spread information between the nodes (i.e., closeness). In our analysis, nodes acting as a bridge in the shortest pathway of other nodes (i.e., betweenness) were not stable.

Strengths and limitations

To our knowledge, this is the first study to deconstruct GAD to a symptom level in relation to resilience factors, using network analysis. The large sample size of students in this study is also a strength, as the larger the sample, the more stable and precise the network can be estimated (Hevey, 2018). A few limitations should be noted. First, our study is of cross-sectional design, which allows for correlations, but not for causal relationships. Second, because of potential power issues, we included a maximum of seven variables that have empirical support as resilience factors, thereby possibly disregarding significant variables as there are many variables that are related to resilience. Finally, due to the differences in gender distribution in the student population of our dataset (e.g., 85% of participants identify as female), the results might not be representative of the entire student population, especially since GAD is more common in women

(McLean et al., 2011). The findings of this study reflect the experiences of students in a broad, non-clinical setting. We suggest future studies involve populations with more severe (i.e., clinical) GAD symptoms to help elucidate whether significant differences between GAD symptoms and resilience factors exist in more clinical populations. Additionally, future research could include external constructs like financial resources and self-reported support of institutions such as governments as mentioned in the introduction, which might also interact with GAD symptoms (Brewer et al., 2019). Furthermore, future research could take possible gender differences into account by splitting the network analysis into groups based on gender identity. And lastly, longitudinal research is necessary to identify further relationships between our main findings.

Conclusion

We found a strong negative association between self-reported resilience, worrying too much and functional impairment. Optimism is strongly negatively associated with feeling afraid and is moderately associated with worrying too much and functional impairment. Given that student life can be a hectic time, with the prevalence of anxiety rapidly increasing, improving our understanding of how GAD symptoms interact with resilience factors is fundamental.

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Appendix

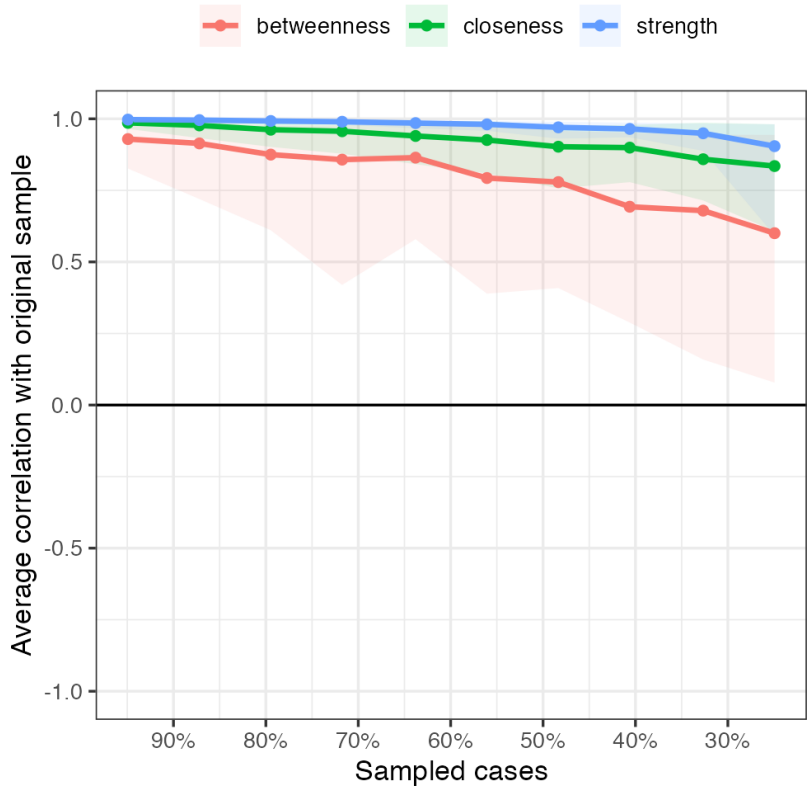
Table A.1.

Centrality measures per variable

Variable	Betweenness	Closeness	Strength
Self-esteem	-0.85	-3.21	-2.16
acceptance	-0.85	-0.20	-0.69
optimism	0.80	0.21	0.60
PosReappraisal	-0.51	-0.04	-0.26
SocialSupport	-0.85	-0.75	-1.45
Selfrep-Resilience	1.76	0.76	0.52
self-efficacy	1.41	0.56	0.76
GAD1	0.28	0.39	0.80
GAD2	-0.51	0.66	1.40
GAD3	1.85	0.92	1.32
GAD4	-0.07	0.26	0.54
GAD5	-0.85	-0.36	-0.60
GAD6	-0.77	-0.17	-0.39
GAD7	0.02	0.33	-0.55
GAD8	-0.85	0.63	0.17

Figure A.1

Stability analysis of the centrality indices



Note. *Average correlations between centrality indices of networks from the original sample and sampled networks. Lines represent the means.*

Appendix B.

Case-bootstrap Method Information.

The case-bootstrap method continuously drops a percentage of the sample, then the centrality indices are calculated again to see if the results remain stable. In our study, we found that when 50% of the original sample had been dropped, all the centrality indices decreased more rapidly, while betweenness dropped the most. This pattern suggests that closeness and strength remain

quite stable when the population drops to 30%, but betweenness is not as reliable. This means that the results from betweenness should be interpreted with caution.

Appendix C.

Adapted Validated Questionnaires from the WARN-D Study.

Revised Life Orientation Test (LOT-R).

Please use the scale below to describe your agreement or disagreement with the following statements about you.

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
In uncertain times, I usually expect the best. (LOT_1)	○	○	○	○	○
If something can go wrong for me, it will. (LOT_2)	○	○	○	○	○
I'm always optimistic about my future. (LOT_3)	○	○	○	○	○
I hardly ever expect things to go my way. (LOT_4)	○	○	○	○	○
I rarely count on good	○	○	○	○	○

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
things happening to me. (LOT_5)					
Overall, I expect more good things to happen to me than bad. (LOT_6)	○	○	○	○	○

Brief Resilience Scale (BRS).

Please use the scale below to describe your agreement or disagreement with the following statements about you.

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
I tend to bounce back quickly after hard times. (BRS_1)	○	○	○	○	○
I have a hard time making it through stressful events. (BRS_2)	○	○	○	○	○
It does not take me long to recover from a stressful event. (BRS_3)	○	○	○	○	○

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
It is hard for me to snap back when something bad happens. (BRS_4)	○	○	○	○	○
I usually come through difficult times with little trouble (BRS_5)	○	○	○	○	○
I tend to take a long time to get over set-backs in my life. (BRS_6)	○	○	○	○	○

General Self-Efficacy scale (GSE).

Below are ten statements about how you generally act and think. For each statement, please choose the answer than suits you best.

	Not at all true (1)	Hardly true (2)	Moderately true (3)	Exactly true (4)
I can always manage to solve difficult problems if I try hard enough. (GSE_1)	○	○	○	○
If someone opposes me, I can find the means and ways to get what I want. (GSE_2)	○	○	○	○
It is easy for me to stick to my aims and accomplish	○	○	○	○

my goals. (GSE_3)				
I am confident that I could deal efficiently with unexpected news. (GSE_4)	○	○	○	○
Thanks to my resourcefulness, I know how to handle unforeseen situations. (GSE_5)	○	○	○	○
I can solve most problems if I invest the necessary effort. (GSE_6)	○	○	○	○
I can remain calm when facing difficulties because I can rely on my coping abilities. (GSE_7)	○	○	○	○
When I am confronted with a problem, I can usually find several solutions. (GSE_8)	○	○	○	○
If I am in trouble, I can usually think of a solution. (GSE_9)	○	○	○	○
I can usually handle whatever comes my way. (GSE_10)	○	○	○	○

Rosenberg Self-Esteem (RSE).

Below is a list of statements dealing with your general feelings about yourself. Please indicate how strongly you agree or disagree with each statement.

	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)
On the whole, I am satisfied with myself. (RSE_1)	○	○	○	○
At times I think I am no good at all. (RSE_2)	○	○	○	○
I feel that I have a number of good qualities. (RSE_3)	○	○	○	○
I am able to do things as well as most other people. (RSE_4)	○	○	○	○
I feel I do not have much to be proud of. (RSE_5)	○	○	○	○
I certainly feel useless at times. (RSE_6)	○	○	○	○
I feel that I'm a person of worth. (RSE_7)	○	○	○	○
I wish I could have more respect for myself. (RSE_8)	○	○	○	○
All in all, I am inclined to think that I am a failure. (RSE_9)	○	○	○	○
I take a positive attitude toward	○	○	○	○

myself. (RSE_10)	

Behavioral Emotion Regulation Questionnaire (BERQ), sub-scale Seeking social support.

Everyone gets confronted with negative or unpleasant events now and then and everyone responds to them in their own way. What do you generally do when you experience negative or unpleasant events? Read the sentences below and indicate how often they apply to you.

	(Almost) never (1)	Sometimes (2)	Regularly (3)	Often (4)	(Almost) always (5)
I look for someone to comfort me. (BERQ_4)	○	○	○	○	○
I ask someone for advice. (BERQ_9)	○	○	○	○	○
I share my feelings with someone. (BERQ_14)	○	○	○	○	○
I look for someone who can support me. (BERQ_19)	○	○	○	○	○

Cognitive Emotion Regulation Questionnaire (CERQ-SF) sub-scale acceptance.

Everyone gets confronted with negative or unpleasant events now and then and everyone responds to them in their own way. What do you generally think when you experience negative or unpleasant events? Read the sentences below and indicate how often they apply to you.

	(Almost) never (1)	Sometimes (2)	Regularly (3)	Often (4)	(Almost) always (5)
I think that I have to accept that this has happened. (CERQ_1)	○	○	○	○	○
I think that I have to accept the situation. (CERQ_5)	○	○	○	○	○

Cognitive Emotion Regulation Questionnaire (CERQ-SF) subscale positive reappraisal

Everyone gets confronted with negative or unpleasant events now and then and everyone responds to them in their own way. What do you generally think when you experience negative or unpleasant events? Read the sentences below and indicate how often they apply to you.

	(Almost) never (1)	Sometimes (2)	Regularly (3)	Often (4)	(Almost) always (5)

I think I can learn something from the situation. (CERQ_3)	○	○	○	○	○
I think that I can become a stronger person as a result of what has happened. (CERQ_8)	○	○	○	○	○

Generalized Anxiety Disorder Scale-7 (GAD-7).

Over the last two weeks, how often have you been bothered by the following problems?

	Not at all (0)	Several days (1)	More than half the days (2)	Nearly every day (3)
Feeling nervous, anxious, or on edge (GAD_1)	○	○	○	○
Not being able to stop or control worrying (GAD_2)	○	○	○	○
Worrying too much about different things (GAD_3)	○	○	○	○
Trouble relaxing (GAD_4)	○	○	○	○
Being so restless that it is hard to sit still (GAD_5)	○	○	○	○
Becoming easily annoyed or	○	○	○	○

irritable (GAD_6)				
Feeling afraid, as if something awful might happen (GAD_7)	○	○	○	○

GAD_8 If you checked any problems, how difficult have they made it for you to do your work, take care of things at home, or get along with other people?

- ○ Not difficult at all (0)
- ○ Somewhat difficult (1)
- ○ Very difficult (2)
- ○ Extremely difficult (3)