Journal of Affective Disorders 255 (2019) 60–68

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Research paper

Symptom network connectivity in adolescents with comorbid major depressive disorder and social phobia

Alejandro de la Torre-Luque[a], Cecilia A Essau[b,*]

[a] Centre for Biomedical Research in Mental Health (CIBERSAM). Universidad Autónoma de Madrid, Spain
[b] Department of Psychology, University of Roehampton, Whitelands College, Holybourne Avenue, London SW15 4JD, UK

ARTICLE INFO

Keywords:
Comorbidity
Major depressive disorder
Social phobia
Symptom network analysis
Adolescent

ABSTRACT

Purpose: Major depressive disorder (MDD) and social phobia (SP) are both common and highly co-occurring psychiatric disorders. This study used symptom network analysis approach to examine comorbidity structure and the complex symptom dynamics which may play a role in the co-occurrence of MDD and SP.

Method: Data comes from the National Comorbidity Survey – Adolescent Supplement, a nationally representative survey of adolescents ages 13 to 18 years. This study examined data of adolescents with a lifetime diagnosis of MDD (n = 597), SP (n = 708), and adolescents with comorbid MDD and SP (n = 189). Networks were estimated by means of 26 symptoms from both disorders.

Results: All MDD and SP symptoms were involved in the network of both pure disorders (MDD; SP) and comorbid condition (MDD + SP). Network structure was different between the pure disorders (p = 0.014), but not when comparing each of these disorders that have comorbid condition. Depressive symptoms of poor self-esteem and suicidal symptoms were central (i.e., showed a higher influence) in the symptom network for the pure disorders and for the comorbid condition. Other key symptoms in the comorbid condition network were two depressive symptoms: feelings of worthlessness and anhedonia. SP and MDD networks showed two common key SP symptoms: feeling uncomfortable when meeting new people and feeling uncomfortable talking to people do not know well.

Conclusion: The study of symptom dynamics will provide useful targets for preventing the development of comorbid disorders as well as new lines of intervention to deal with key symptoms of psychiatric disorders.

1. Introduction

The comorbidity between major depressive disorder (MDD) and anxiety disorders is a rule rather than an exception (Kessler et al., 2012; Merikangas et al., 2010). Of all the anxiety disorders, social phobia (SP) is one of the disorders that most frequently comorbid with MDD, and that these two disorders have also consistently been reported as among the most common psychiatric disorders during adolescence (Beesdo et al., 2007; Essau et al., 1999, 2000; Kessler et al., 2005; Ohayon and Schatzberg, 2010). Among adolescents with both disorders, SP precedes MDD in approximately 70% of the cases. Furthermore, among those with SP during adolescence, the risk for depression at adulthood is approximately 2-fold compared to those without SP (Beesdo et al., 2007). The comorbidity of SP and MDD tends to be associated with greater psychosocial impairment, and greater risk of relapse compared to when either disorder occurs alone (Essau et al., 2014; Ruscio et al., 2008). Therefore, understanding the underlying structure of comorbidity between these disorders could have important implications for their assessment and treatment.

Despite the common comorbidity between SP and MDD, the meaning of this comorbidity remains unclear (Langer and Rodebaugh, 2013). Symptoms overlap between SP and MDD has been suggested as an explanation for their frequent comorbidity (Cramer et al., 2010). A novel method to clarify the role of symptoms overlap in the constellation of comorbid disorder is the network approach. This approach focuses on individual symptoms and the associations between those symptoms (Borsboom and Cramer, 2013), as well as on the way in which these symptoms dynamically interact with one another over time (Schmittmann et al., 2013; van Bork et al., 2018). As such, the network approach helps to identify the unique role of each individual symptoms and may provide important information about the structure of comorbidity (Cramer et al., 2010). Symptoms are represented as nodes and the associations between these symptoms are represented as edges. Symptoms that bridge the relation between two

* Corresponding author.
E-mail address: c.essau@roehampton.ac.uk (C.A. Essau).

https://doi.org/10.1016/j.jad.2019.05.015
Received 8 February 2019; Received in revised form 5 May 2019; Accepted 7 May 2019
Available online 09 May 2019

disorders (i.e., bridge symptom) can be conceptualised as a stepping-stone in a pathway from one disorder to another, and that the presence of this symptom tends to increase the probability that an individual will develop a secondary disorder (Borsboom, 2008). Symptoms of multiple diagnoses can be combined into one network structure, which enable the patterns in which these symptoms co-occur to be examined (Cramer et al., 2010). Despite the advantages of a network approach, only a handful of studies have thus far examined the network structure of psychiatric disorders.

Beard et al. (2016) used network analysis to examine the relationships between and among MDD and anxiety (i.e., generalised anxiety disorder; GAD) symptoms using data of psychiatric adult patients (M = 35.00 years, SD = 13.80). Results indicated that anxiety and depressive symptoms were more connected within-disorder than between-disorders. The symptoms of "sad mood" and "too much worry" were the most central symptom in the network (i.e., having great influence within the network), and the least central symptom was suicidal ideation. MDD's motor symptom and GAD's restlessness symptom were the most strongly connected items across these two disorders. More recently, van Loo et al. (2018) examined symptom networks among women with recurrent MDD (M = 44.40 years, SD = 8.90), who were then classified into subgroups based on their genetic risk for MDD (i.e., family history, polygenic risk score, early age at onset) and severe adversity (i.e., childhood sexual abuse, stressful life events). Their results showed similar associations between depressive symptoms across the different subgroups of genetic and environmental risk. Specifically, depressive symptoms of decreased appetite and weight loss or hopelessness and suicidal ideation, were strongly connected.

Langer et al. (2019) recently used network approach to examine symptoms which may play a role in the co-occurrence of SP and MDD in a group of adult women (aged 18–59 years); these women met criteria for SP, MDD, both disorders, or had no lifetime history of mental illness. The overall shape of the network shows a cluster of depression (including symptoms of depressed mood, worthless, and irritability) and social anxiety (including symptoms of fear and avoidance). The social fear node and the depressed mood node appeared at opposite ends of the network, suggesting that the connection between these two hallmark symptoms of SP and MDD, could only take place through other variables. Worthlessness was found to be an important bridge symptom given its position in the centre of the network and the strength of its relationship with other nodes. Two major limitations of Langer et al.'s study (2019) were its reliance on a very low sample size to conduct network analysis (i.e., approximately 30 participants in each group) and the inclusion of only women participants. These limitations may hinder generalisation of findings.

Heeren et al. (2018) utilized network approach to characterize the associations between the core symptoms of SP (i.e., fear and avoidance of social situations) and depressive symptoms among adults with a primary SP (age range from 18 to 67 years old). Not all nodes were found to be equally important in the comorbidity between fear and avoidance of specific situations with comorbid depression. Fear and avoidance of meeting strangers, avoidance of going to party, and fear of speaking up at a meeting and of being the centre of attention were collectively the most influential SP nodes. Nodes which consisted of fear and avoidance of specific situations failed to cluster with those denoting comorbid depression symptoms; however, there were several bridge symptoms that connected SP and depression. Depression nodes that consisted of suicidal ideation, loss of interest, and loss of pleasure had the strongest association with SP symptoms. SP nodes that consisted of avoidance of participating in small groups, avoidance of going to a party, and fear of working had the strongest association with depressive symptoms. Unfortunately, this study did not consider samples with pure diagnoses (e.g., SP without comorbid disorders). Thus, the extent to which symptoms of comorbid disorders may play a significant role in the network's structure is unknown.

While informative, almost all the above studies are based on adult samples and thus it is unclear whether the findings could be generalised to adolescents. Adolescence constitutes a sensitive period for the development of internalising disorders, especially MDD and SP (Essau et al., 2014). In other words, this period may be a window of vulnerability in which some (vulnerability) factors may have a decisive influence on brain plasticity towards the emergence or exacerbation of these syndromes (Andersen, 2003; Andersen and Teicher, 2008; Fuhrmann et al., 2015; Leussis and Andersen, 2008). For that reason, a focus on adolescence is critical to understanding the developmental pathways of psychopathology development. Almost all studies that used the network approach to examining the comorbidity between MDD and SP have important methodological shortcomings that undermine the validity of their conclusions (e.g., small sample size, focus on female gender, lack of control of comorbid conditions).

Little is known about the complex nature and interactions of symptoms or sets of symptoms in MDD and SP among adolescents. To fill up this gap, the present study aimed to examine symptom network connectivity of MDD, SP, and comorbidity between MDD and SP in a group of large sample of community adolescents using a symptom network approach. Additionally, it aimed to investigate the key symptoms in the symptom network structure, with a special interest in identifying central symptoms across pure disorders (MDD, SP) and comorbid conditions (comorbid MDD and SP).

2. Methods

2.1. Sample

All analyses used data from the National Comorbidity Survey – Adolescent Supplement (NCS-A; Kessler et al., 2009a) which is a nationally representative survey of 10,123 adolescents in the United States of America (51.07% girls, mean age = 15.18, SD = 1.51) ages 13 to 18 years. Details of the NCS-A study design, sampling, and measures have been reported in several publications (Kessler et al., 2009a, b; Merikangas et al., 2009).

The present study specifically examined data of adolescents with a lifetime diagnosis of MDD (n = 597; 63.82% girls; mean age = 15.53, sd = 1.47), SP (n = 708; 53.38% girls; mean age = 15.25, sd = 1.50), and adolescents with both MDD and SP (n = 189; 58.20% girls; mean age = 15.52, sd = 1.51). Participants in each of these groups did not meet the criteria for any other internalising disorders (ID).

All the participants provided a written consent to participate into the study. The study was approved by the institutional review boards at the University of Michigan and Harvard University.

2.2. Measures

The face-to-face interview with the adolescents was conducted using the World Health Organization Composite International Diagnostic Instrument, version 3.0 (WMH CIDI 3.0) (Kessler and Ustun, 2004). The WMH CIDI 3.0 is a fully-structured diagnostic interview which was modified to simplify language and to use examples that are more of relevance to adolescents (detailed description on these modifications has been provided in Merikangas et al., 2009). The major classes of DSM-IV disorders included in the WMH CIDI are mood disorders, anxiety disorders, behaviour disorders, eating disorders, and substance use disorders. Concordance of WMH CIDI and DSM-IV diagnoses was endorsed in Kessler et al. (2009b). The present study focuses on symptoms of major depressive disorder and social phobia (Table 1).

2.3. Data analysis

The main sociodemographic characteristics of each group of adolescents (MDD, SP, MDD + SP) were examined by means of descriptive statistics. These sociodemographic characteristics were compared across these three groups using Student's t tests and χ^2-based tests, as

Table 1
Symptoms of depressive and social phobia as measured in the WMH CIDI.

Domain	Label	Item/question
MDD	D_p	Small appetite most days
	D_ch	Nothing could cheer you most days
	D_cn	More trouble concentrating most days
	D_dTH	Would be better if dead
	D_dt	Often thought of death
	D_ds	Discouraged about things in life most days
	D_n	Low energy and tired w/out work most days
	D_st	Felt not as good as others most days
	D_f	Lost interest in things you used to have fun
	D_g	Felt guilty most days
	D_h	Felt hopeless about future most days
	D_r	Felt irritable/grouchy/moody most days
	D_slf	Lost self confidence
	D_slp	Trouble sleeping most nights
	D_slw	Talk/move more slowly than usual most days
	D_sTH	Slow or mixed up thoughts most days
	D_sc	Thought about suicide
SP	S_th	Shy/afraid/uncomfortable talking to authority
	S_b	Shy/afraid/uncomfortable using public bathroom
	S_d	Shy/afraid/uncomfortable in dating situation
	S_D	Shy/afraid/uncomfortable disagree with people you do not know well
	S_et	Shy/afraid/uncomfortable write/eat/drink while other watches
	S_m	Shy/afraid/uncomfortable being centre of attention/ embarrassing situation
	S_r	Shy/afraid/uncomfortable entering room when others are present
	S_nc	Shy/afraid/uncomfortable meeting new people
	S_nk	Shy/afraid/uncomfortable talking to people you do not know well

Note. MDD = Major depressive disorder. SP = Social phobia.
WMH CIDI = World Health Organization Composite International Diagnostic Instrument, version 3.0.

well as the Cohen's *d* and Cramer's *V* as effect size estimates.

Participants with high rate of missing values (i.e., more than five items without response each module) were ruled out. Missing data were estimated by means of multiple imputation procedures (Sterne et al., 2009). Method to estimate missing data was weighted predictive mean matching. We set a cut-off of 10 iterations to obtain convergence for the solution comprising the imputed values.

Symptom network analysis (SNA) approach (Borsboom, 2017) was used to address the aims of the present study. This approach enables the examination of the dynamic relationships between symptoms that underlie a mental disorder. SNA provides a graphical summary of relationships between symptoms, which are represented as nodes. Edge between nodes reflects the conditional dependence relation between them (i.e., association between two symptoms after controlling for all other associations among the symptoms in the network). By implementing the Fruchterman and Reingold's algorithm, the nodes with stronger correlations are placed near the centre of the network. Network was weighted and regularised (under regularised logistic regression framework) by shrinking small connections in the network, which are set to be exactly zero. Network estimation relied on nested Lasso regressions, by considering penalisation (based on a gamma hyperparameter, $\gamma = 0.25$) on observation dependent basis, with model selection based on the extended Bayesian information criterion (EBIC).

To examine the similarity of the structure of network across groups, analyses based on network comparison test were conducted (van Borkulo, 2018; van Borkulo et al., 2016) at three levels: network structure (i.e., whether the structure of both networks is invariant between groups), global strength (i.e., invariant overall connectivity of symptoms across between groups) and edge strength (i.e., whether each association between symptoms is invariant across groups, using a Bonferroni–Holm correction to prevent from multiple testing bias). Edge strength invariance was tested when the network structure showed no invariant between groups. Pairwise network comparisons (MDD network vs. SP network; MDD network vs. MDD + SP network; and SP network vs. MDD + SP network) were carried out, correcting the *p* level ($0.05/3 = 0.017$) to prevent from multiple comparison testing.

To examine the important role of each item within the symptom networks, centrality analysis was conducted. Centrality is conceptualised as the sum of the absolute values of all the non-zero associations within the network. A central symptom has more and stronger connections to other items than a peripheral symptom. According to the symptom network approach, highly central nodes are those of greatest importance in the network and the highest relevance to the disorder (McNally, 2016). Three centrality measures were calculated in this study: strength (i.e., sum of the edge weights connected to a node), betweenness (i.e., number of times that node lies on the shortest path between two other nodes), and expected influence (i.e., a strength centrality measure taking into account both positive and negative edges).

Network robustness and accuracy were tested by difference tests of edge-weights from the observed-data network and those estimating under non-parametric bootstrapping (Costenbader and Valente, 2003). The centrality stability coefficient (considering strength and betweenness) was used to determine the maximum proportion of cases that can be dropped to retain same centrality values. This coefficient should not be below 0.25 and is preferably to be above 0.50 (Epskamp et al., 2018).

All the analyses were conducted using R Core Software (R Core Team, 2017), packages mice, qgraph, bootnet and NetworkComparisonTest.

3. Results

Ten participants were excluded from the analyses due to the high rate of missing data (over 75% of missing data), resulting in 1484 participants who were used in all the analyses of the present study. Of these participants, 589 met the diagnosis of a lifetime SP (36.16% boys; overall age = 15.53 years, *sd* = 1.48), 706 met the diagnosis of a lifetime MDD (46.74% boys; overall age = 15.25 years, *sd* = 1.51), and 189 participants had comorbid MDD + SP (41.80% boys; overall age = 15.52 years, *sd* = 1.51). Table 2 displays the sociodemographic characteristics of adolescents with MDD, SP, and comorbid MDD + SP. The groups differed in age, sex, race, family income, urbanicity and externalising disorder comorbidity. Adolescents in the MDD group comprised more girls and were mostly Caucasian white. Adolescents in the SP group were younger, a high proportion of them were from a black ethnicity; and a lower proportion of these adolescents (in comparison to those from the other study groups) showed a comorbid externalising disorder. Adolescents in the comorbid MDD + SP lived mostly in urban area and a high proportion of them were Hispanic.

3.1. Network estimation and centrality

It estimated 14,389 missing values, 34.61% of the total data. Distribution of data with imputed values showed the same data distribution as the original data (see the Supplementary material, Fig. SF1).

The estimated networks for the study groups are depicted in Fig. 1. All the symptoms of MDD and SP were present in the network constellations of the three groups. Network structure was similar when comparing the comorbid disorder network with those of the pure diagnoses network. However, network structure was different when comparing the MDD and SP networks (maximum norm of the all connection strength matrix = 0.94, $p = 0.014$). Global strength was not significantly different between groups in all comparisons. The association between suicidal thought and loss of self-confidence was significantly different when comparing the MDD network ($r = 0.45$) and SP network ($r = 0.10$). The other correlations did not significantly

Table 2
Sociodemographic characteristics of the adolescents in the major depression, social phobia, and comorbid disorders (major depression + social phobia) groups.

Variable	MDD	SP	MDD + SP	χ^2 (df)	*V*
N	589	706	189		
Age				12.56 (4)*	0.06
Early (13–14 years)	28.18	35.55	31.22		
Mid (15–16 years)	40.58	39.94	36.51		
Late (17–18 years)	31.24	24.51	32.28		
Sex				14.76 (2)***	0.10
Boy	36.16	46.74	41.80		
Girl	63.84	53.26	58.20		
Race				18.22 (6)**	0.08
White	57.56	54.96	53.97		
Hispanic	21.05	17.14	27.51		
Black	14.94	19.69	11.64		
Other	6.450	8.22	6.88		
Parents' education				11.01 (6)	0.06
< High school	14.94	18.56	18.52		
High school graduate	29.54	33.43	28.04		
Some college	23.09	20.11	17.99		
College graduate	32.43	27.90	35.45		
Household income†				16.24 (6)*	0.07
Low	15.96	16.29	22.22		
Low-average	21.56	21.39	12.70		
High-average	26.15	29.89	34.92		
High	36.33	32.43	30.16		
Urbanicity				10.04 (4)*	0.06
Census major metropolitan area	44.31	42.64	54.50		
Other urbanised county	32.94	36.40	28.04		
Rural county	22.75	20.96	17.46		
Biological parents living with adolescent				6.04 (4)	0.04
No parents	12.05	8.78	12.70		
One parents	38.54	39.52	42.33		
Both parents	49.41	51.70	44.97		
Comorbid externalising disorders‡ (% yes)	50.76	37.53	56.08	33.15 (2)	0.15

Note. χ^2 tests for between-category differences and related effect size estimates (Cramer's *V*) are presented.
df = degrees of freedom.
MDD = Major depression group; SP = Social phobia group; MDD + SP = group with comorbid depression and social phobia.
† Levels based on poverty line.
‡ Externalising disorders comorbidity included a lifetime diagnosis of any of these disorders: attention deficit and/or hyperactivity disorder, alcohol abuse or dependence, drug abuse or dependence, intermittent explosive disorder, conduct disorder, and/or oppositional defiant disorder.
* $p < 0.05$;
** $p < 0.01$;
*** $p < 0.001$.

differ between these networks.

Fig. 2 shows the centrality measures for the three network constellations. Three depressive symptoms showed higher values in centrality measures across the three groups: death ideation, suicidal ideation, and loss of self-confidence. SP network and MDD network showed two common central symptoms, both of which were derived from the SP criteria: feeling uncomfortable when meeting new people and feeling uncomfortable talking to people you do not know well. Finally, the comorbid disorder network showed other depressive symptoms with high centrality values (Fig. 2), namely, anhedonia and felt not as good as others most days.

Bootstrapped test revealed no differences across the edge weights in the three groups, as the bootstrapped confidence interval of the node strength included zero (Fig. 3), thus, providing evidence on the network robustness for the estimated networks. Stability of centrality measures dropped significantly, but less steeply when considering strength. Specifically, stability correlation with the original centrality was low for the depression network (*r* for betweenness = 0.05; *r* for strength = 0.28) and social phobia network (*r* for betweenness = 0.12; *r* for strength = 0.36), and very low for the comorbid disorder network (*r* for betweenness = 0.00; *r* for strength = 0.05).

4. Discussion

MDD and SP are among the most common and frequently comorbid psychiatric disorders in adolescence (Avenevoli et al., 2015; Ohayon and Schatzberg, 2010). This study aimed to shed light on the way in which symptoms dynamically interact with one another in comorbid conditions in adolescence. Concretely, we examined the relationships between symptoms of the comorbid MDD and SP. To achieve this goal, symptom network analysis was conducted to examine a group of adolescents with comorbid MDD and SP, and two groups of adolescents with pure disorders (i.e., one group with MDD and another group with SP without any comorbid internalising disorders). Another aim was to investigate the role of MDD and SP symptoms within the network of relationships between symptoms.

Our findings revealed that all the symptoms were of relevance in the symptom constellation of the comorbid condition, as well as in both the pure disorder conditions. This result provides some evidence that the co-occurring internalising symptoms have an overall propensity to express psychological distress inwards (Carragher et al., 2016; Caspi et al., 2015; Krueger et al., 1998). While it is not the focus of the present study, common underpinnings factors (e.g., dysregulation of emotional-processing cortical structures, some temperamental factors influencing both disorders) and shared genetic bases may be responsible for the development and maintenance of internalising symptoms and disorders (Burghy et al., 2012; Hettema, 2008; Sportel et al., 2011). However, our results also provide some evidence on boundaries between the studied disorders, highlighting the distinctiveness of SP and MDD as different internalising disorders. As shown by the network invariance test, the symptom network structure of both disorders differed significantly.

Additionally, we examined the role of MDD and SP symptoms within the constellation of relationships between symptoms. Surprisingly, some depressive symptoms were found to be highly relevant in the symptom network for the pure disorders (MDD, SP) as well as for the comorbid conditions (MDD + SP). In other words, these symptoms were bridge symptoms across conditions (i.e., with a critical role on disorder maintenance across conditions; McNally, 2016). Specifically, poor self-esteem (i.e., loss of self-confidence) and suicidal symptoms (i.e., death ideation and suicidal ideation) were key in the networks of all the three groups (MDD, SP, MDD + SP) as they showed high levels in centrality measures.

Our findings provide further support to previous findings that negative self-views and feelings of low self-confidence act as a risk factor for the development of both MDD and anxiety disorders in childhood and adolescence (Sowislo and Orth, 2013). Likewise, SP is associated with dysfunctional social relationships as a result of low self-esteem (Fung and Alden, 2016; Meeus, 2016). Furthermore, according to some authors the high comorbidity between MDD and SP may be mediated by low self-esteem (De Jong et al., 2012; Vaananen et al., 2014). Our findings are in line with these results because self-confidence was identified to be a central symptom for MDD and SP, and that it has a great influence on the rest of symptom relationships. Langera et al. (2019) suggested that the relationship between self-confidence and mood instability were critical in the maintenance of internalising disorder due to a contagion effect on the rest of relationships between symptoms.

On the other hand, our study revealed that suicidal symptoms importantly contributed to the symptom constellation across groups

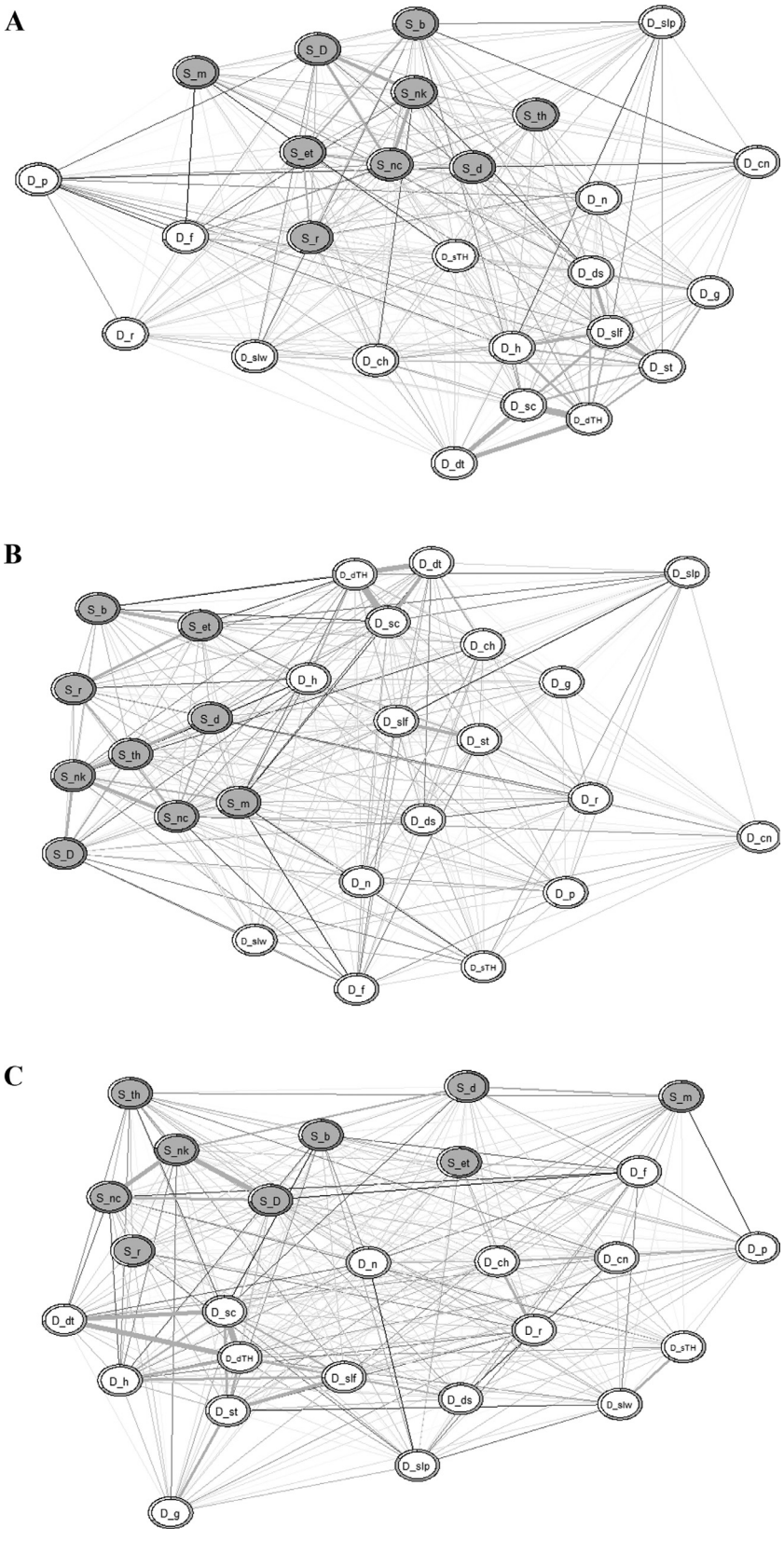

Fig. 1. Estimated symptom constellations for the study groups. *Note.* Box A = Major depression network. Box B = Social phobia network. Box C = Comorbid disorder network. Edges represent connections between symptoms (positive partial correlations in grey or negative correlations in black). The thicker the edge, the stronger the connection. Nodes in grey depict social phobia symptoms. Nodes in white depict major depression symptoms. The colouring of the white circle around each node represents the explained variance by its neighbours. **Symptoms:** D_p = Small appetite most days. D_ch = Nothing could cheer you most days. D_cn = More trouble concentrating most days. D_dTH = Would be better if dead. D_dt = Often thought of death. D_ds = Discouraged about things in life most days. D_n = Low energy and tired w/ out work most days. D_st = Felt not as good as others most days. D_f = Lost interest in things you used to have fun. D_g = Felt guilty most days. D_h = Felt hopeless about future most days. D_r = Felt irritable/grouchy/moody most days. D_slf = Lost self-confidence. D_slp = Trouble sleeping most nights. D_slw = Talk/move more slowly than usual most days. D_sTH = Slow or mixed up thoughts most days. D_sc = Thought about suicide. S_th = Shy/afraid/uncomfortable talking to authority. S_b = Shy/afraid/uncomfortable using public bathroom. S_d = Shy/afraid/uncomfortable in dating situation. S_D = Shy/afraid/uncomfortable disagree with people you do not know well. S_et = Shy/afraid/uncomfortable write/eat/drink while other watches. S_m = Shy/afraid/uncomfortable being centre of attention/embarrassing situation. S_r = Shy/afraid/uncomfortable entering room when others are present. S_nc = Shy/afraid/uncomfortable meeting new people. S_nk = Shy/afraid/uncomfortable talking to people you do not know well.

(depression, social phobia and comorbid disorders). This finding showed that these symptoms have a critical influence on the relationship between symptoms for the three groups. Suicidal behaviour and ideation have been associated with depressive disorder (Gili et al., 2019). Moreover, previous studies have consistently shown poor prognosis and treatment response among patients with depression who showed suicidal ideation (Asarnow et al., 2011; Vitiello et al., 2011). Suicidal symptoms have furthermore been found across a wide range of psychiatric disorders, including social phobia networks and other comorbid conditions (Armour et al., 2017; Boschloo et al., 2015;

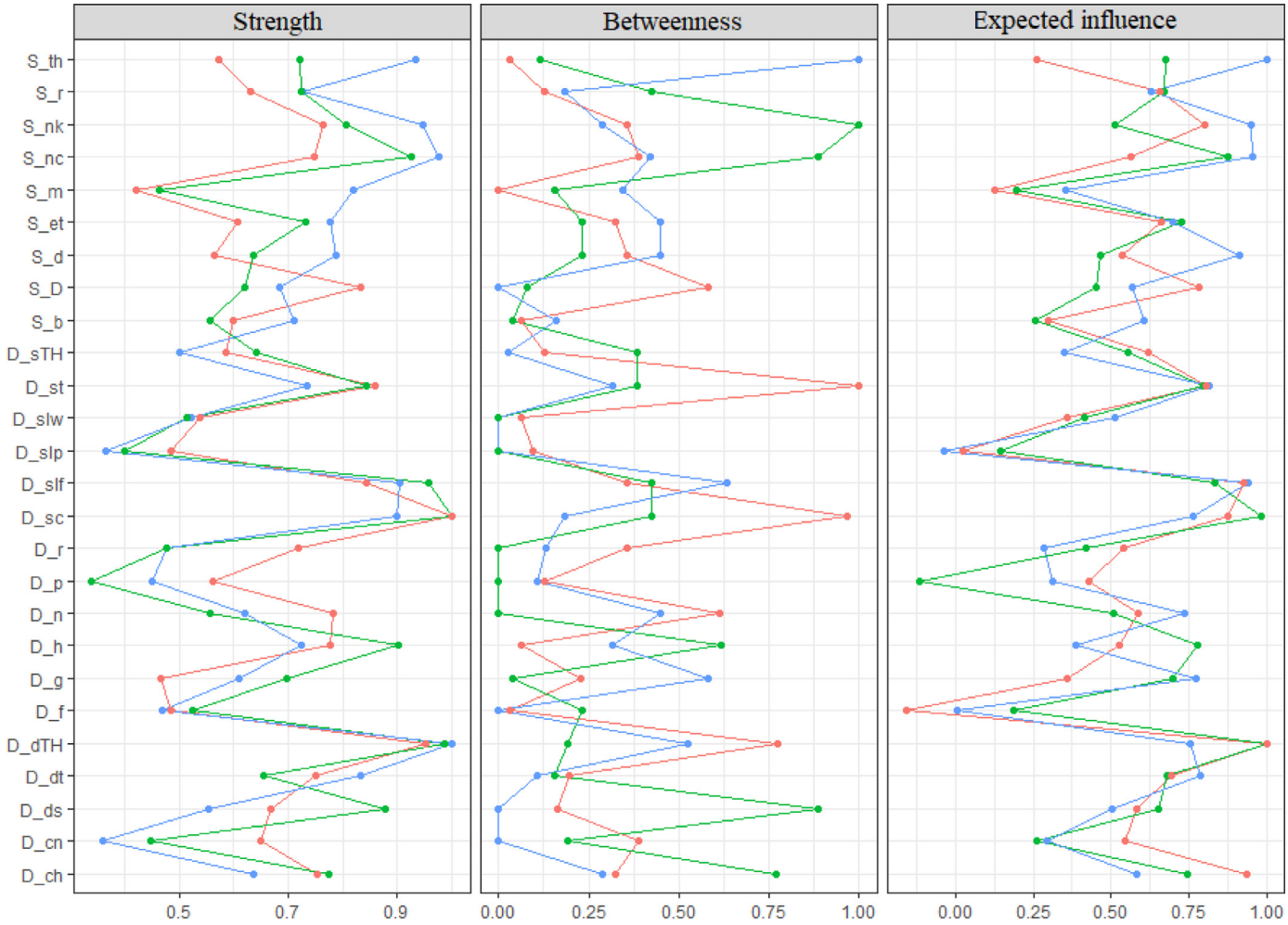

Fig. 2. Centrality measures across study groups. *Note.* Green line = Major depression network. Blue line = Social phobia network. Red line = Comorbid disorder network. Measures are displayed on a relative scale from 0 (lowest) to 1 (highest). **Symptoms:** D_p = Small appetite most days. D_ch = Nothing could cheer you most days. D_cn = More trouble concentrating most days. D_dTH = Would be better if dead. D_dt = Often thought of death. D_ds = Discouraged about things in life most days. D_n = Low energy and tired w/out work most days. D_st = Felt not as good as others most days. D_f = Lost interest in things you used to have fun. D_g = Felt guilty most days. D_h = Felt hopeless about future most days. D_r = Felt irritable/grouchy/moody most days. D_slf = Lost self-confidence. D_slp = Trouble sleeping most nights. D_slw = Talk/move more slowly than usual most days. D_sTH = Slow or mixed up thoughts most days. D_sc = Thought about suicide. S_th = Shy/afraid/uncomfortable talking to authority. S_b = Shy/afraid/uncomfortable using public bathroom. S_d = Shy/afraid/uncomfortable in dating situation. S_D = Shy/afraid/uncomfortable disagree with people you do not know well. S_et = Shy/afraid/uncomfortable write/eat/drink while other watches. S_m = Shy/afraid/uncomfortable being centre of attention/embarrassing situation. S_r = Shy/afraid/uncomfortable entering room when others are present. S_nc = Shy/afraid/uncomfortable meeting new people. S_nk = Shy/afraid/uncomfortable talking to people you do not know well. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Bringmann et al., 2015). Heeren et al. (2018) found that suicidal ideation was an influential symptom in the network of symptoms of adults with SP and comorbid MDD. Some authors propose that suicidal symptoms are highly related to problems with emotion regulation, particularly in social situations (Arditte et al., 2016; Harris et al., 2018). Additionally, suicide deserves special attention because it is one of the leading causes of unnatural death in adolescents (Gili et al., 2019; World Health Organization, 2014). Furthermore, suicidal ideation and suicide-related symptoms are strong predictors of committing suicide (Rodriguez-Cintas et al., 2018; Skinner and McFaull, 2012). For that reason, prevention/early intervention programmes are needed to tackle suicidal ideation and suicidal symptoms due to their devastating health consequences (i.e., survival risk) and their impact on the chronicity of the disorders.

Other symptoms of importance in the comorbid condition network were related to two depressive symptoms: feelings of worthlessness and anhedonia. We suggest that these symptoms were bridge symptoms that highly contribute to the maintenance of a comorbid MDD + SP condition (Cramer et al., 2010). The feelings of worthlessness symptom is related to low self-esteem and involves self-view being affected (Orchard et al., 2018; Ybrandt, 2008). Anhedonia in comorbid depression and social phobia conditions may be related to social situation avoidance; studies have shown that frequent social avoidance could lead to severe SP which in turn often lead to the development of MDD (Cummings et al., 2014; Wardenaar et al., 2012).

To sum up, this study provides some evidence on how symptoms of MDD, SP and comorbid conditions interact with one another forming a dynamic network of relationships. Symptom network structure was similar when comparing the symptom constellations of the comorbid condition with either pure MDD or SP. Self-esteem (self-confidence) and suicidal symptoms were identified as central across networks of the study groups (having a great influence on the relationships between symptoms), probably because of problems with emotion regulation that are associated with these disorders. Moreover, anhedonia and feelings of worthlessness were critical in the comorbid MDD + SP condition, being identified as bridge symptoms.

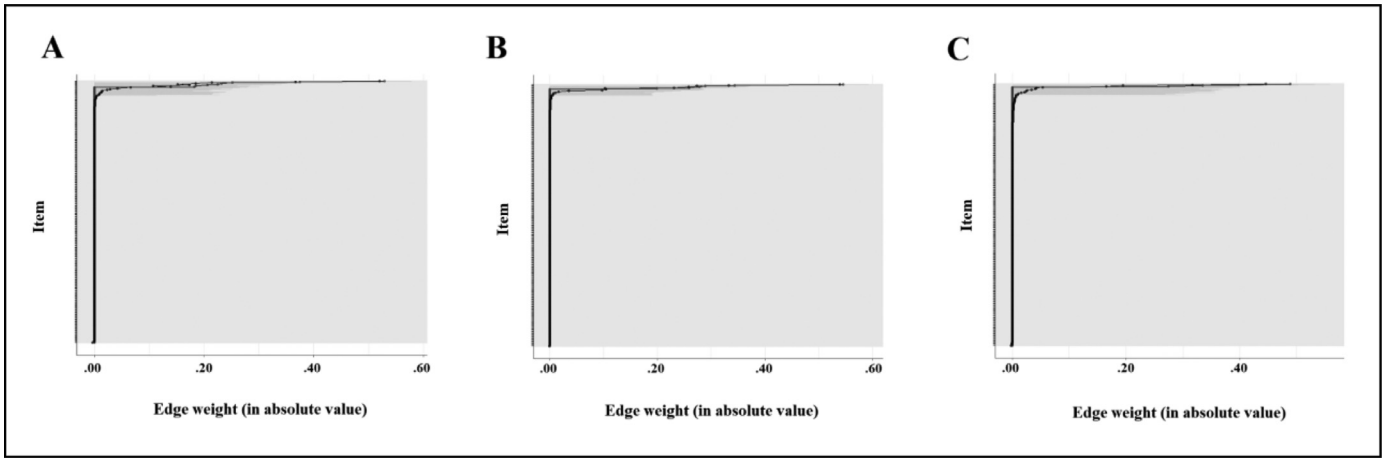

Fig. 3. Bootstrapped confidence intervals of estimated edge-weights for the estimated networks. *Note.* Box A = Major depression network. Box B = Social phobia network. Box C = Comorbid disorder network. The solid line represents the sample values and the shaded area the bootstrapped 95% confidence interval. All the items are displayed, ordered from the edge with the highest edge-weight to the edge with the lowest edge-weight.

A major strength of this study is that it used a network analysis technique which could provide detailed information on the complex relations between DSM-IV symptoms of MDD and SP in a large number of adolescents who met the diagnoses of MDD and SP. Furthermore, "comorbidity controls" (i.e., participants did not have a diagnosis of other internalising disorder) were included in the study.

When interpreting our findings, the limitations of the present study should be considered. First, the information about psychiatric symptoms was based on cross-sectional assessment. Thus, it is not possible to draw conclusions about the temporal relationship between symptoms. Further research should address this issue by conducting longitudinal studies. Second, externalising disorder symptoms were not taken into account. Furthermore, other comorbid conditions (e.g., eating disorders), apart from comorbidity with internalising disorders, should have been controlled. However, our approach relied on robust frameworks considering internalising and externalising disorders having characteristic profiles and distinct symptoms (Krueger et al., 1998). Moreover, alternative strategies to deal with the confounding effect of comorbid conditions (e.g., sensitivity analysis removing participants with comorbid externalising disorders) resulted in very low sample size (some groups with $n < 100$) and biased, resulting in unreliable solutions. Thus, future research should address the additive effect of externalising and other syndromes within internalising symptom constellations. Another limitation of our study is that it did not consider adolescents with subclinical syndromes or adolescents with different disorder conditions according to symptom/disability severity. We focused on full-blown disorders regardless of severity to identify patterns of symptom relationships that feature pure disorders and encourage the development of comorbid conditions. However, future studies should include individuals falling in different points (stages) over the continuum of these internalising disorders from early-stage conditions (subclinical disorders) to severe conditions (chronic, unremitted conditions), and longitudinal approaches to study symptom-network transitions across stages. Also, robustness indicators of centrality measures stated that our results should be considered cautiously, even though network robustness estimates supported some evidence on network structure conclusions were valid and highly accurate. These limitations notwithstanding, this study was the first to have examined the associations between MDD and SP symptoms among adolescents with MDD, SP, and comorbid MDD + SP using the dynamic symptom network approach. Finally, further research should focus on other comorbidities across internalising disorders to delimitate particularities on symptom dynamics and disentangle common potential pathways of comorbidity development.

This study has some valuable implications for clinical assessment and the search for effective intervention tools in adolescence. First, a wide and exhaustive assessment of internalising symptoms should be conducted to accurately identify patterns of comorbidity in adolescence and symptom-related factors that perpetuate a disorder. Second, when developing an intervention programme, it is important to focus on either central symptoms of both SP and MDD, or bridge symptoms to prevent the emergence of comorbid conditions.

Conflict of interest

Dr Alejandro de la Torre-Luque and Professor Cecilia A Essau report no conflict of interest to report in relation to the research presented in this manuscript.

Authors' contribution

Dr Alejandro de la Torre-Luque undertook the statistical analysis and interpretation.

Cecilia A Essau wrote the manuscript. Both authors contributed to and have approved the final manuscript.

Acknowledgement

The authors thank the staff of the Inter-university Consortium for Political and Social Research (ICPSR) of the Institute for Social Research at the University of Michigan for access to the National Comorbidity Survey-Adolescent Supplement (NCS-A) database.

Funding

The National Comorbidity Survey Replication Adolescent Supplement (NCS-A) was funded by: United States Department of Health and Human Services, National Institutes of Health, National Institute of Mental Health (U01-MH60220); United States Department of Health and Human Services, National Institutes of Health, National Institute of Drug Abuse (R01-DA12058-05); United States Department of Health and Human Services, Substance Abuse and Mental Health Services Administration; Robert Wood Johnson Foundation (Grant 044780); John W. Alden Trust. The NCS-A was carried out in conjunction with the World Health Organization World Mental Health Survey Initiative.

The views and opinions expressed in this article are those of the authors and should not be construed to represent the views of any of the sponsoring organizations, agencies, or US Government.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2019.05.015.

Reference

Andersen, S.L., 2003. Trajectories of brain development: point of vulnerability or window of opportunity? Neurosci. Biobehav. Rev. 27, 3–18. https://doi.org/10.1016/S0149-7634(03)00005-8.

Andersen, S.L., Teicher, M.H., 2008. Stress, sensitive periods and maturational events in adolescent depression. Trends Neurosci. 31, 183–191. https://doi.org/10.1016/j.tins.2008.01.004.

Arditte, K.A., Morabito, D.M., Shaw, A.M., Timpano, K.R., 2016. Interpersonal risk for suicide in social anxiety: the roles of shame and depression. Psychiatry Res. 239, 139–144. https://doi.org/10.1016/j.psychres.2016.03.017.

Armour, C., Fried, E.I., Deserno, M.K., Tsai, J., Pietrzak, R.H., 2017. A network analysis of DSM-5 posttraumatic stress disorder symptoms and correlates in U.S. military veterans. J. Anxiety Disord. 45, 49–59. https://doi.org/10.1016/j.janxdis.2016.11.008.

Asarnow, J.R., Porta, G., Spirito, A., Emslie, G., Clarke, G., Wagner, K.D., ... Brent, D.A., 2011. Suicide attempts and nonsuicidal self-injury in the treatment of resistant depression in adolescents: findings from the TORDIA study. J. Am. Acad. Child Adolesc. Psychiatry 50, 772–781. https://doi.org/10.1016/j.jaac.2011.04.003.

Avenevoli, S., Swendsen, J., He, J.P., Burstein, M., Merikangas, K.R., et al., 2015. Major depression in the national comorbidity survey–adolescent supplement: prevalence, correlates, and treatment. J. Am. Acad. Child Adolesc. Psychiatry 54, 37–44.e2. https://doi.org/10.1016/j.jaac.2014.10.010.

Beard, C., Millner, A.J., Forgeard, M.J.C., Fried, E.I., Hsu, K.J., Treadway, M.T., Leonard, C.V., Kertz, S.J., Björgvinsson, T., 2016. Network analysis of depression and anxiety symptom relationships in a psychiatric sample. Psychol. Med. 46, 3359–3369. https://doi.org/10.1017/S0033291716002300.

Beesdo, K., Bittner, A., Pine, D.S., Stein, M.B., Hofler, M., Lieb, R., Wittchen, H.U., 2007. Incidence of social anxiety disorder and the consistent risk for secondary depression in the first three decades of life. Arch. Gen. Psychiatry 64, 903–912. https://doi.org/10.1001/archpsyc.64.8.903.

Borsboom, D., 2008. Psychometric perspectives on diagnostic systems. J. Clin. Psychol. 64, 1089–1108.

Borsboom, D., 2017. A network theory of mental disorders. World Psychiatry 16, 5–13. https://doi.org/10.1002/wps.20375.

Borsboom, D., Cramer, A.O., 2013. Network analysis: an integrative approach to the structure of psychopathology. Annu. Rev. Clin. Psychol. 9, 91–121. https://doi.org/10.1146/annurev-clinpsy-050212-185608.

Boschloo, L., Van Borkulo, C.D., Rhemtulla, M., Keyes, K.M., Borsboom, D., Schoevers, R.A., 2015. The network structure of symptoms of the diagnostic and statistical manual of mental disorders. PLoS ONE 10, e0137621. https://doi.org/10.1371/journal.pone.0137621.

Bringmann, L.F., Lemmens, L.H.J.M., Huibers, M.J.H., Borsboom, D., Tuerlinckx, F., 2015. Revealing the dynamic network structure of the Beck depression inventory-II. Psychol. Med. 45, 747–757. https://doi.org/10.1017/S0033291714001809.

Burghy, C.A., Stodola, D.E., Ruttle, P.L., Molloy, E.K., Armstrong, J.M., Oler, J.A., ... Birn, R.M., 2012. Developmental pathways to amygdala-prefrontal function and internalizing symptoms in adolescence. Nat. Neurosci. 15, 1736–1741. https://doi.org/10.1038/nn.3257.

Carragher, N., Teesson, M., Sunderland, M., Newton, N.C., Krueger, R.F., Conrod, P.J., ... Slade, T., 2016. The structure of adolescent psychopathology: a symptom-level analysis. Psychol. Med. 46, 981–994. https://doi.org/10.1017/S0033291715002470.

Caspi, A., Houts, R.M., Belsky, D.W., Goldman-mellor, S.J., 2015. The p factor : one general psychopathology factor in the structure of psychiatric disorders? Clin. Psychol. Sci. 2, 119–137. https://doi.org/10.1177/2167702613497473.The.

Costenbader, E., Valente, T.W., 2003. The stability of centrality measures when networks are sampled. Soc. Netw. 25, 283–307. https://doi.org/10.1016/S0378-8733(03)00012-1.

Cramer, A.O.J., Waldorp, L.J., Van Der Maas, H.L.J., Borsboom, D., 2010. Comorbidity : a network perspective. Behav. Brain Sci. 33, 137–193. https://doi.org/10.1017/S0140525X09991567.

Cummings, C.M., Caporino, N.E., Kendall, P.C., 2014. Comorbidity of anxiety and depression in children and adolescents: 20 years after. Psychol. Bull. 140, 816–845. https://doi.org/10.1037/a0034733.

De Jong, P.J., Sportel, B.E., De Hullu, E., Nauta, M.H., 2012. Co-occurrence of social anxiety and depression symptoms in adolescence: differential links with implicit and explicit self-esteem? Psychol. Med. 42, 475–484. https://doi.org/10.1017/S0033291711001358.

Epskamp, S., Borsboom, D., Fried, E.I., 2018. Estimating psychological networks and their accuracy: a tutorial paper. *Behav*. Res. Methods 50, 195–212. https://doi.org/10.3758/s13428-017-0862-1.

Essau, C.A., Conradt, J., Petermann, F., 1999. Frequency and comorbidity of social phobia and social fears in adolescents. Behav. Res. Ther. 37, 831–843.

Essau, C.A., Conradt, J., Petermann, F., 2000. Frequency, comorbidity, and psychosocial impairment of anxiety disorders in German adolescents. J. Anxiety Disord. 14, 263–279.

Essau, C.A., Lewinsohn, P.M., Olaya, B., Seeley, J.R., 2014. Anxiety disorders in adolescents and psychosocial outcomes at age 30. J. Affect. Disord. 163, 125–132. https://doi.org/10.1016/j.jad.2013.12.033.

Fuhrmann, D., Knoll, L.J., Blakemore, S.J., 2015. Adolescence as a sensitive period of brain development. Trends Cognit. Sci. 19, 558–566. https://doi.org/10.1016/j.tics.2015.07.008.

Fung, K., Alden, L.E., 2016. Emotion once hurt, twice shy: social pain contributes to social anxiety. Emotion 17, 231–239. https://doi.org/10.1037/emo0000223.

Gili, M., Castellví, P., Vives, M., de la Torre-Luque, A., Almenara, J., Blasco, M.J., ... Roca, M., 2019. Mental disorders as risk factors for suicidal behavior in young people: a meta-analysis and systematic review of longitudinal studies. J. Affect. Disord. 245, 152–162. https://doi.org/10.1016/j.jad.2018.10.115.

Harris, L., Chelminski, I., Dalrymple, K., Morgan, T., Zimmerman, M., 2018. Suicide attempts and emotion regulation in psychiatric outpatients. J. Affect. Disord. 232. https://doi.org/10.1016/j.jad.2018.02.054.

Heeren, A., Jones, P.J., McNally, R.J., 2018. Mapping network connectivity among symptoms of social anxiety and comorbid depression in people with social anxiety disorder. J. Affect. Disord. 228, 75–82. https://doi.org/10.1016/j.jad.2017.12.003.

Hettema, J.M., 2008. What is the genetic relationship between anxiety and depression? Am. J. Med. Genet. C Semin. Med. Genet. 148, 140–146. https://doi.org/10.1002/ajmg.c.30171.

Kessler, R.C., Avenevoli, S., Mclaughlin, K.A., Green, J.G., Lakoma, M.D., Petukhova, M., ... Merikangas, K.R., 2012. Lifetime co-morbidity of DSM-IV disorders in the US National Comorbidity Survey Replication Adolescent Supplement (NCS-A). Psychol. Med. 42, 1997–2010. https://doi.org/10.1017/S0033291712000025.

Kessler, R.C., Berglund, P., Demler, O., Jin, R., Merikangas, K.R., Walters, E.E., 2005. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch. Gen. Psychiatry 62, 593–602.

Kessler, R.C., Avenevoli, S., Costello, E.J., Green, J.G., Gruber, M.J., Heeringa, S., et al., 2009a. The National Comorbidity Survey Adolescent Supplement (NCS- A): II. Overview and design. J. Am. Acad. Child Adolesc. Psychiatry 48, 280–385. https://doi.org/10.1097/CHI.0b013e3181999705.

Kessler, R.C., Avenevoli, S., Green, J.G., ... Merikangas, K.R., 2009b. The National Comorbidity Survey Adolescent Supplement (NCS- A): III. Concordance of DSM-IV/CIDI diagnoses with clinical reassessments. J. Am. Acad. Child Adolesc. Psychiatry 48, 386–399. https://doi.org/10.1097/CHI.0b013e31819a1cbc.

Kessler, R.C., Ustun, T.B., 2004. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). Int. J. Methods Psychiatr. Res. 13, 93–121.

Krueger, R.F., Caspi, A., Moffitt, T.E., Silva, P.A., 1998. The structure and stability of common mental disorders (DSM - III-R): a longitudinal-epidemiological study. J. Abnorm. Psychol. 107, 216–227. https://doi.org/10.1037/0021-843X.107.2.216.

Langer, J.K., Rodebaugh, T.L., 2013. Social anxiety and gaze avoidance: averting gaze but not anxiety. Cognit. Ther. Res. 37, 1110–1120. https://doi.org/10.1007/s10608-013-9546-z.

Langera, J.K., Tongea, N.A., Piccirilloa, M., Rodebaugha, T.L., Thompsona, R.J., Gotlibb, I.H., 2019. Symptoms of social anxiety disorder and major depressive disorder: a network perspective. J. Affect. Disord. 243, 531–538. https://doi.org/10.1016/j.jad.2018.09.078.

Leussis, M.P., Andersen, S.L., 2008. Is adolescence a sensitive period for depression? Behavioral and neuroanatomical findings from a social stress model. Synapse 62, 22–30. https://doi.org/10.1002/syn.20462.

McNally, R.J., 2016. Can network analysis transform psychopathology? Behav. Res. Ther. 86, 95–104. https://doi.org/10.1016/j.brat.2016.06.006.

Meeus, W., 2016. Adolescent psychosocial development: a review of longitudinal models and research. Dev. Psychol. 52, 1969–1993. https://doi.org/10.1037/dev0000243.

Merikangas, K.R., Avenevoli, S., Costello, E.J., Koretz, D., Kessler, R.C., 2009. National Comorbidity Survey Replication Adolescent Supplement (NCS-A): I. Background and measures. J. Am. Acad. Child Adolesc. Psychiatry 48, 367–379. https://doi.org/10.1097/CHI.0b013e31819996f1.

Merikangas, K.R., He, J.P., Burstein, M., Swendsen, J., Avenevoli, S., Case, B., ... Olfson, M., et al., 2010. Lifetime prevalence of mental disorders in U.S. adolescents: results from the National Comorbidity Survey Replication– Adolescent Supplement (NCS-A). J. Am. Acad. Child Adolesc. Psychiatry 49, 980–989. https://doi.org/10.1016/j.jaac.2010.05.017.

Ohayon, M.M., Schatzberg, A.F., 2010. Social phobia and depression: prevalence and comorbidity. J. Psychosom. Res. 68, 235–243. https://doi.org/10.1016/j.jpsychores.2009.07.018.

Orchard, F., Pass, L., Reynolds, S., 2018. 'I Am Worthless and Kind'; the specificity of positive and negative self-evaluation in adolescent depression. Br. J. Clin. Psychol. https://doi.org/10.1111/bjc.12215.

R Core Team, 2017. R: a language and environment for statistical computing. R Foundation for Statistical Computing. Retrieved from. https://www.r-project.org/.

Rodríguez-Cintas, L., Daigre, C., Braquehais, M.D., Palma-Alvarez, R.F., Grau-López, L., Ros-Cucurull, E., Rodríguez-Martos, L., Abad, A.C., Roncero, C., 2018. Factors associated with lifetime suicidal ideation and suicide attempts in outpatients with substance use disorders. Psychiatry Res. 262, 440–445. https://doi.org/10.1016/j.psychres.2017.09.021.

Ruscio, A.M., Brown, T.A., Chiu, W.T., Sareen, J., Stein, M.B., Kessler, R.C., 2008. Social fears and social phobia in the USA: results from the National Comorbidity Survey Replication. Psychol. Med. 38, 15–28. https://doi.org/10.1017/S0033291707001699.

Schmittmann, V.D., Cramer, A.O.J., Waldorp, L.J., Epskamp, S., Kievit, R.A., Borsboom, D., 2013. Deconstructing the construct: a network perspective on psychological phenomena. New Ideas Psychol. 31, 43–53. https://doi.org/10.1016/j.newideapsych.2011.02.007.

Skinner, R., McFaull, S., 2012. Suicide among children and adolescents in Canada: trends and sex differences, 1980–2008. Can. Med. Assoc. J. 184, 1029–1034. https://doi.org/10.1503/cmaj.111867.

Sowislo, J.F., Orth, U., 2013. Does low self-esteem predict depression and anxiety? A

meta-analysis of longitudinal studies. Psychol. Bull. 139, 213–240. https://doi.org/10.1037/a0028931.

Sportel, B.E., Nauta, M.H., de Hullu, E., de Jong, P.J., Hartman, C.A., 2011. Behavioral inhibition and attentional control in adolescents: robust relationships with anxiety and depression. J. Child Fam. Stud. 20, 149–156. https://doi.org/10.1007/s10826-010-9435-y.

Sterne, J.A.C., White, I.R., Carlin, J.B., Spratt, M., Royston, P., Kenward, M.G., ... Carpenter, J.R., 2009. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. BMJ 338, 157–160. https://doi.org/10.1136/bmj.b2393.

Vaananen, J.M., Isomaa, R., Kaltiala-Heino, R., Frojd, S., Helminen, M., Marttunen, M., 2014. Decrease in self-esteem mediates the association between symptoms of social phobia and depression in middle adolescence in a sex-specific manner: a 2-year follow-up of a prospective population cohort study. BMC Psychiatry 14, 79. https://doi.org/10.1186/1471-244X-14-79.

van Bork, R., et al., 2018. Network models for clinical psychology. In: Wagenmakers, E.J. (Ed.), Stevens' Handbook of Experimental Psychology and Cognitive Neuroscience. Learning and Memory. Volume 5 - Methodology. John Wiley & Sons, Ltd, Malden, MA. https://doi.org/10.1002/9781119170174.epcn518.

van Borkulo, C.D., 2018. A tutorial on R package NetworkComparisonTest (NCT). Symptom Network Models in Depression Research: from Methodological Exploration to Clinical Application. Thesis dissertation. University of Groningen, Groningen. https://www.researchgate.net/publication/317493228_A_tutorial_on_R_package_NetworkComparisonTest_NCT.

van Borkulo, C.D., Boschloo, L., Kossakowski, J.J., Tio, P., Schoevers, R.A., Borsboom, D., Waldorp, L.J., 2016. Comparing network structures on three aspects: A permutation test. https://doi.org/10.13140/RG.2.2.29455.38569. Working paper.

van Loo, H.M., Van Borkulo, C.D., Peterson, R.E., Fried, E.I., Aggen, S.H., Borsboom, D., Kendler, K.S., 2018. Robust symptom networks in recurrent major depression across different levels of genetic and environmental risk. J. Affect. Disord. 227, 313–322. https://doi.org/10.1016/j.jad.2017.10.038.

Vitiello, B., Emslie, G., Clarke, G., Ph, D., Wagner, K.D., Asarnow, J.R., ... Brent, D., 2011. Long-term outcome of adolescent depression initially resistant to SSRI treatment. J. Clin. Psychiatry 72, 388–396. https://doi.org/10.4088/JCP.09m05885blu.Long-Term.

Wardenaar, K.J., Giltay, E.J., Van Veen, T., Zitman, F.G., Penninx, B.W.J.H., 2012. Symptom dimensions as predictors of the two-year course of depressive and anxiety disorders. J. Affect. Disord. 136, 1198–1203. https://doi.org/10.1016/j.jad.2011.11.037.

World Health Organization, 2014. Preventing Suicide: A Global Imperative. World Health Organization, Geneva.

Ybrandt, H., 2008. The relation between self-concept and social functioning in adolescence. J. Adolesc. 31, 1–16. https://doi.org/10.1016/j.adolescence.2007.03.004.