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Research paper

Examining the boundaries between ICD-11 PTSD/CPTSD and depression and anxiety symptoms: A network analysis perspective

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A B S T R A C T

Background: Two newly identified sibling disorders – ICD-11 PTSD and CPTSD – have been well validated in the last few years. Although these trauma-related disorders are suggested to be neatly separated from depression and anxiety, no study has used a network analysis to examine those definitions' construct validity when they also interplay with symptoms of depression and anxiety. Additionally, no research has focused upon the specific boundaries between these four disorders' symptoms, the bridges between them, and the ways they influence each other among clinical populations.
Methods: A sample of 234 men drawn randomly from a national sample of 1,600 Jewish men receiving treatment for domestic violence in Israel completed the ICD-11 International Trauma Questionnaire (ITQ) and Brief Symptom Inventory (BSI).
Results: The ICD-11 CPTSD, depression and anxiety clustering network results revealed, within the EGA, a four-cluster solution in which PTSD and CPTSD symptoms are differentiated from two other distinct clusters of anxiety and depression symptoms. Feelings of worthlessness and avoiding internal reminders of the experience were the most central symptoms.
Limitations: Due to the use of a cross-sectional design, causal interpretation of the network correlation between symptoms should be made cautiously.
Conclusions: These findings strengthen the approach that ICD-11 PTSD and CPTSD have a distinct construct; however, they also reflect a strong positive connection to anxiety and depression symptoms and no clear boundaries between disorders. Specifically, dysphoria/avoidance-related symptoms act as a bridge between the disorders, which may be important targets for specific assessments and related interventions.

1. Introduction

The International Classification of Diseases 11th Version (ICD-11) recently accepted for inclusion two sibling trauma-based disorders. Based on WHO Working Group recommendations, symptoms common to and that potentially characterize other diagnoses were removed from the final definitions of the new clinical disorders (Brewin et al., 2017; Shevlin et al., 2018). In other words, non-specific symptoms that also typify other disorders – that is, symptoms that characterize depression and anxiety disorders – were eliminated (Maercker et al., 2013). During the development of these definitions, the new formulation was supported by several factor structure analyses (Gilbar et al., 2018; Brewin et al., 2017; Hyland et al., 2017; Karatzias et al., 2017). The diagnosis of posttraumatic stress disorder (PTSD) focuses on three core elements: re-experiencing (RE), avoidance (AV), and sense of threat (TH). The ICD-11 complex post-traumatic stress disorder (CPTSD) includes, in addition to the PTSD symptoms, three areas of disturbances in self-organization (DSO): affective dysregulation (AD), negative self-concept (NSC), and disturbances in relationships (DR) (Brewin et al., 2017; Cloitre et al., 2018; Shevlin et al., 2018).The finalized factor structure of the conclusive ICD-11 PTSD and CPTSD definitions has been validated through measurement of the symptoms of these disorders in national surveys (e.g., Ben-Ezra et al., 2018; Cloitre et al., 2018; Frost et al., 2019; Karatzias et al., 2019; Knefel et al., 2019; McElroy et al., 2019), and, to a more limited extent, on clinical samples (Hyland et al., 2018). However, no published study has used a network analysis approach to investigate more carefully the structure of the final version of these diagnoses' selected symptoms with the symptoms of the potentially highly comorbid disorders depression and anxiety (Brewin, 2019; Hyland et al., 2018; Karatzias et al., 2019). Specifically, we suggested examination of the possible interaction between the disorders' symptoms and their influence on each other (Borsboom and Cramer, 2013) as they do not neatly separate due to both the prevalence of specific symptoms/dimensions and to the same shared risk factor (i.e., trauma exposure) (Elklit et al., 2014). Findings to date, reflect some associations between ICD-11 disorders and depression and anxiety symptoms. For example, Hyland et al. (2016) showed anxiety was more strongly associated with PTSD than with CPTSD, whereas higher levels of dysthymia were more strongly associated with CPTSD than PTSD symptoms. Another study likewise indicated that the ICD-11 PTSD structure was the stronger predictor of Generalized Anxiety Disorder (GAD) symptoms than DSO, and that compared to PTSD, DSO also significantly predicted depression symptoms (Hyland et al., 2017). CPTSD diagnosis was distinguished from a PTSD diagnosis by higher

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levels of depression (Hyland et al., 2018). Recently, a study among trauma exposure participants found that those with CPTSD were more likely to endorse symptoms reflecting Major Depressive Disorder (MDD) and GAD (Karatzias et al., 2019). These studies indicate that these disorders may have strong inter-connections and raise the question of whether clear boundaries or distinct symptoms exist between disorders. It has been suggested that the connections between PTSD, depression, and anxiety disorders do not constitute indistinguishable constructs (Grant et al., 2008). Rather, the shared classification symptoms that characterize these and other diagnoses (i.e. the same conceptual types of stress), may reflect the shared risk factor of exposure to trauma. First among the shared dimensions of PTSD and depression are dysphoric-related symptoms (Afzali et al., 2017); second, the shared dimension of PTSD disorders and anxiety are fear responses such an alarm response to present or imminent danger that is real or perceived, with related hyperarousal and fear-specific avoidance symptoms (Zoellner et al., 2014). As the ICD-11 CPTSD disorder includes PTSD symptoms, anxiety and depression symptoms may have strong connections with the CPTSD disorder as well. Recent studies tested PTSD and CPTSD clusters with clusters of symptoms of depression and anxiety; such studies found that clusters of CPTSD compared to those of PTSD scored highest on depression and anxiety (Elklit et al., 2014; Frost et al., 2019), or with a mixed cluster of anxiety/depression (Murphy et al., 2016). In addition, three clusters of PTSD were more strongly correlated to anxiety than to depression symptoms (Hansen et al., 2015). In another study that identified different clusters of PTSD, DSO and CPTSD, it was found that more participants from the PTSD cluster endorsed depression symptoms than the other clusters and more participants from the CPTSD cluster endorsed anxiety symptoms than the other clusters (Perkonigg et al., 2016). These studies mainly examined the co-occurrence within the disorders level only; thus, the results do not provide clear answers regarding the nature of these specific shared symptoms or dimensions (i.e. symptoms that shared the same type of distress); they do not explain whether sharing creates bridges between the disorders or negates the possibility of clear boundaries between them.

Moving from the construct level to the symptom level, it has been argued that high co-occurrence rates between PTSD, depression, and anxiety are due to their specific shared symptoms (Elhai et al., 2011), and that this also applies to the sibling disorder, CPTSD (Zoellner et al., 2014). In the PTSD ICD-11 there are substantial similar symptoms between symptom AD2 “Feel numb or emotionally shut down.” and symptom BSI1 of depression, described as: “Feeling no interest in things.” PTSD may be viewed as an anxiety disorder (Friedman et al., 2011); as such it shares symptoms such as the ICD-11 symptom SOT2: "Feeling jumpy or easily startled” and symptom BSI10 of anxiety, described as ‘‘Feeling so restless you couldn't sit still.” In addition, symptoms that describe irritable feelings, such as, in the PTSD sense of threat cluster, the symptom SOT1: "Being 'super−alert', watchful or on guard," is close to the anxiety symptom, BSI2: "Feeling of easily annoyed or irritated." Additionally, one symptom of depression was used also in DSO symptoms (i.e. CPTSD symptoms) to describe negative self-concept BSI7: "Feelings of worthless" (Cloitre et al., 2013). Although the WHO working group has worked to reduce shared symptoms of other comorbid disorders (Maercker et al., 2013), the question of whether there are distinct “communities” or clusters of PTSD/CPTSD depression and anxiety disorders symptoms and how these similar symptoms may connect to each other and affect the disorders boundaries is yet to be answered. Thus, in view of the possibly high connections between these disorders at both the construct and symptomatology levels and in order to understand the lack of neat separations and the interplay between them (Borsboom and Cramer, 2013), a new method has been suggested. The network analysis approach studies the topic of comorbidity as it relates to symptoms of various disorders. The network analysis approach proposes that disorders result from the direct causal interplay between symptoms, and not from the presence of a latent, underlying disease entity (Kendler et al., 2011). It is thought that network analysis might also allow us to identify the symptoms that create the bridge and the boundaries between sibling and comorbid disorders, via an examination of co-occurrence by direct relationships between symptoms of two or more distinct disorders (Cramer et al., 2010). This method was used in the exploration of the validity of the last version of ICD-11 PTSD and CPTSD clusters (Knefel et al., 2019; McElroy et al., 2019) and with other psychological problems such as shame and anger (Glück et al., 2017), and their possible shared symptoms with other disorders, such as borderline disorder (Knefel et al., 2016). Network analysis has already been used to study the perceived causal relation between anxiety, posttraumatic stress, and depression symptoms by the DSM-4 (Frewen et al., 2013), between PTSD and depression (Afzali et al., 2017) and between depression and anxiety (McElroy et al., 2018). However, no study focused on the construct validity of the last version of ICD-11 PTSD and CPTSD clusters and at the same time on their potentially co-occurring disorders, depression and anxiety; to do so may enable identification of the connections by which symptoms create the bridge and the boundaries between these disorders.

1.1. The current study

The purpose of the present study was to use network analysis to validate the final version of the new ICD-11 definitions of PTSD and CPTSD as having symptom clusters distinct from one another and from the symptoms of depression and anxiety, among a clinical population. In addition, based on the possible influence between these disorder symptoms, we wished to discover "bridge symptoms,” meaning those specific symptoms that act as a central connection between one disorder and another via the use of a network analysis approach (Cramer et al., 2010). Therefore, we aimed toward several additional goals. First, we aimed to investigate whether groups of symptoms can be observed that include symptoms from different disorders and to explore the cluster symptoms of PTSD and CPTSD and their possible shared common symptoms of the disorders separate from depression and anxiety. We sought to accomplish this by estimating graphical LASSO networks through a clustering procedure (i.e., the extent to which nodes tend to form a connected group; Borsboom and Cramer, 2013). Second, we aimed to identify the central symptoms in this network by inspecting network node centrality measures for bridge symptoms. The study questions were examined among male intimate partner violence (IPV) perpetrators, a population of individuals who generally have had greater exposure to traumatic events than do other men in the community (Delsol and Margolin, 2004; Maguire et al., 2015). The rationale for conducting the study among this population was that greater trauma exposure has been suggested as a risk factor for PTSD, CPTSD, anxiety, and depression (Renner and Whitney, 2012), which, as expected, were found at higher rates in this population than in community samples (Delsol and Margolin, 2004; Hoyt et al., 2012).

2. Methods

2.1. Participants and procedures

This study was conducted in collaboration with Israel's Ministry of Social Welfare and Social Services, and ethical approval was received from both Bar-Ilan University's institutional review board (IRB) and the Welfare Ministry's research department. Data collection took place from February-August 2016. Despite concerns raised in the literature regarding this population's cooperation with research studies, there was a response rate of approximately 70% in the current study. Participants were 234 randomly-drawn males from the Jewish population in Israel who received treatment at 30 domestic violence prevention centers. They comprise about 9% of the total number of 1600 Jewish males who were treated at 66 centers during the same time period (Hasherut Lerevahat Haprat VeHamishpaha, 2016). The majority of

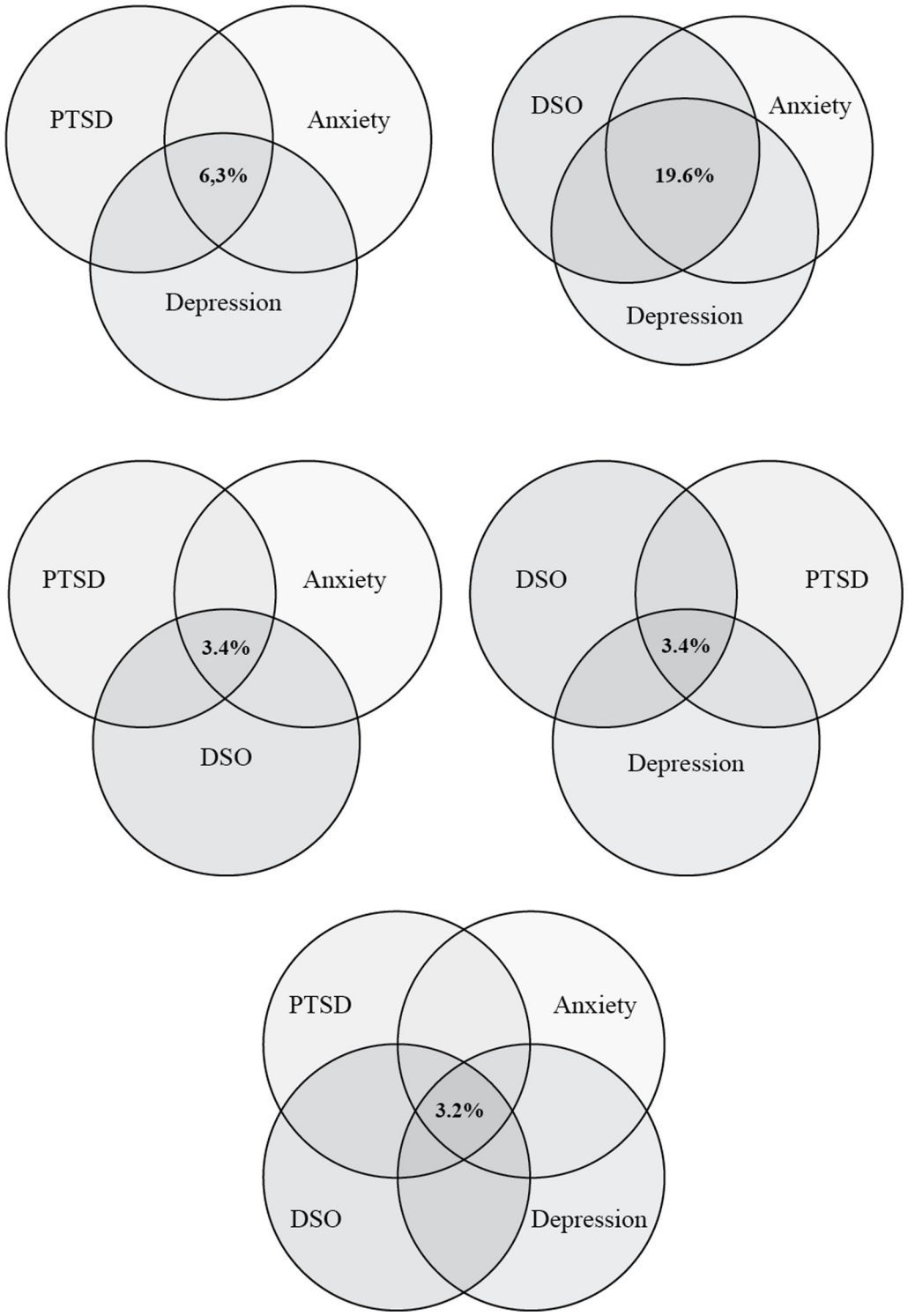
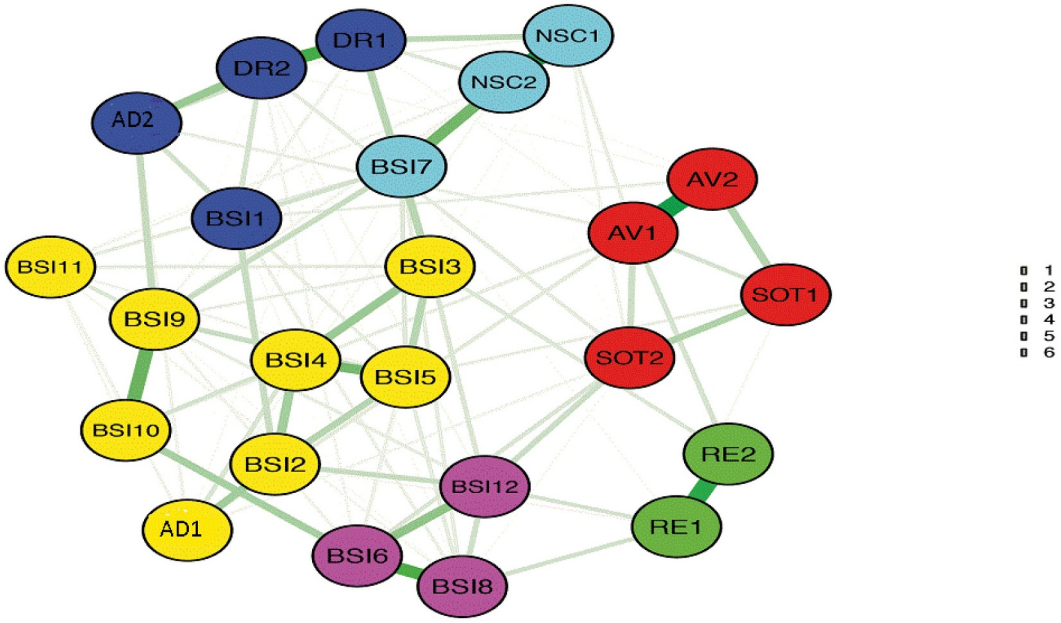


Fig. 1. Comorbidity rates between more than one study disorders' construct.

respondents (88%) sought help after a legal or social service intervention. The length of time in intervention ranged from two weeks to three years. There were no significant differences between participants' time in therapy and the study examined disorders criteria (i.e. PTSD, DSO, depression and anxiety). The socio-demographic variables revealed that more than half (56%) were in a relationship, 37.6% were separated, and 6.4% were single. The mean age of the study participants was 42.11 (SD = 9.13), and the range was between 21 and 62 years of age. The average length of education was 12.8 years (SD = 2.58; range = 8–21). In addition, 14.7% were unemployed, 9% had part-time jobs, and 76% had full-time jobs.

2.2. Measures

CPTSD and PTSD: International Trauma Questionnaire (ITQ) (Cloitre et al., 2018). The ITQ is a 12-item self-report measure – the last



Re−experiencing
RE1: Having upsetting dreams
RE2: Having powerful images or memories
Avoidance
AV1: Avoiding internal reminders of the experience
AV2: Avoiding external reminders of the experience
Sense of a threat
SOT1: Being "super−alert", watchful or on guard
SOT2: Feeling jumpy or easily startled
Affect dysregulation
AD1: When I am upset, it takes me a long time to calm down
AD2: I feel numb or emotionally shut down
Negative self−concept
NSC1: I feel like a failure
NSC2: I feel worthless
Disturbances in relationship
DR1: I feel distant or cut off from people
DR2: I find it hard to stay emotionally close to people
depression
BSI1: Feeling no interest in things
BSI3: Feeling lonely
BSI5: Feeling blue
BSI7: Feeling worthless
BSI9: Feeling hopeless about the future
BSI11: Thoughts of ending your life
anxiety
BSI2: Feeling of easily annoyed or irritated
BSI4: Feeling tense
BSI6: Suddenly scared for no reason
BSI8: Spells of terror or panic
BSI10: Feeling so restless you couldn't sit still
BSI12: Feeling fearful

Fig. 2. Network containing the 12 ICD-11 symptoms of PTSD/CPTSD, along with 12 symptoms of depression and anxiety. Green lines represent positive associations, and the thickness and brightness of an edge indicate the association strength. Colors representing the 6 clusters solutions resulting from the EGA.(For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

version of which was recently validated – for screening ICD-11 PTSD and CPTSD symptomatology (Cloitre et al., 2018). Six items represent the three clusters of PTSD: re-experiencing, avoidance, and sense of threat (Re, Av, Th). There are two Re items, two Av items, and two Th items. Symptom endorsement is scored on a Likert-type scale, indicating how bothersome a symptom has been over the past month with scores ranging from 0 (*not at all*) to 4 (*extremely*). Six items represent the three DSO clusters: affective dysregulation, negative self-concept, and disturbances in relationships (AD 2 items; NSC 2 items; DR 2 items), where endorsement of items indicates how typical the problem is to the individual, with scores ranging from 0 (*not at all*) to 4 (*extremely*). A diagnosis of PTSD requires the endorsement of one of two symptoms from each of the three PTSD symptom clusters, plus endorsement of functional impairment associated with these symptoms. A diagnosis of

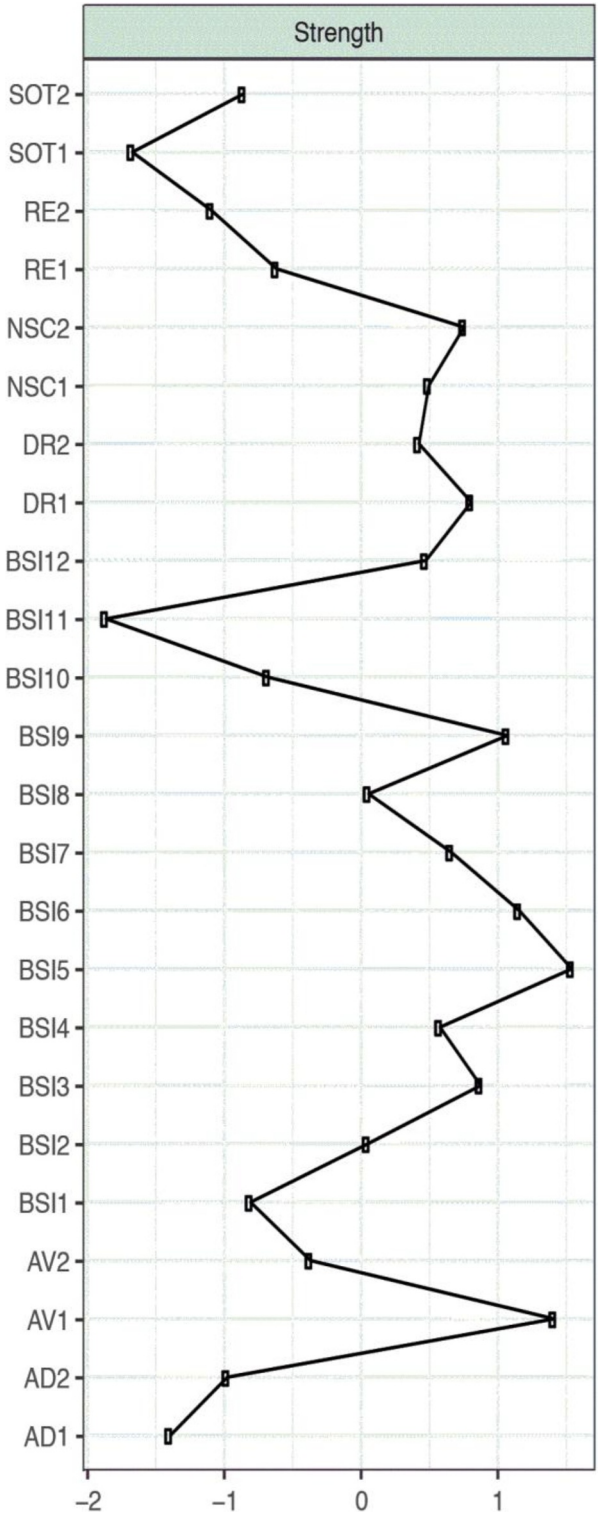


Fig. 3. Centrality plot of the scale-level network. Strength refers to the sum of weights that are connected to the focal node. For definitions of abbreviations, see Fig. 1.

CPTSD requires that the PTSD criteria are satisfied, and the endorsement of one of two symptoms from each of the three DSO symptom clusters, plus endorsement of functional impairment associated with these symptoms. Endorsement of a symptom is a score ≥ 2. Cronbach's alpha reliability estimates for the PTSD indicators in the current sample were acceptable for the PTSD cluster = 0.75, and for the DSO indicators and for DSO = 0.91. In this study, this measure was translated into Hebrew according to the WHO criteria, which include reverse-translation. Additionally, this version of the measurement was validated in previous research (Author, 2018; Ben-Ezra et al., 2018).

Depression and Anxiety: Brief Symptom Inventory (BSI) (Derogatis and Melisaratos, 1983). Participants' depression and anxiety levels were measured using the appropriate subscales of the Brief Symptoms Inventory (BSI) which include six items examining depression symptoms and six items for anxiety symptoms. The BSI has been recommended as a self -report instrument designed to evaluate the "psychological symptoms statous ... " in time limited setting (Dergogatis & Melisaratos, 1983, p. 596). It may also reflect the clinical diagnosis according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-4) or International Classification of Diseases (ICD-10) (Steel et al., 2011). The BSI has shown good convergence with a similar measure of anxiety and depression and was validated by construct validity (Derogatis and Melisaratos, 1983). Participants were asked to rank the degree to which they experienced each depression and anxiety symptom during the previous month on a scale ranging from 1 (*not at all*) to 4 (*very much*). We used the Hebrew translation (Gilbar and Ben-Zur, 2002) of the BSI. Cronbach's alpha for depression was 0.83 and for anxiety was 0.83. The cut-off points for clinically significant symptoms for depression and anxiety are, according to the test manual, for all scales at the T-score of the normative population sample of $T \geq 0.83$ (Schulte-van Maaren et al., 2012).

2.3. Statistical analysis

We developed six measures of comorbidity, which represent the intersection between 1) depression and anxiety; 2) depression and PTSD; 3) depression and DSO; 4) anxiety and PTSD; 5) anxiety and DSO; and, 6) PTSD and DSO. If both disorders' criteria appeared, we coded the case as one, whereas if one or none appeared we coded the case as zero.

Network estimation. The symptom network was estimated for all Complex PTSD (CPTSD) symptoms (i.e., PTSD and DSO symptoms), and for depression and anxiety symptoms, using the R-package qgraph (Epskamp et al., 2012). Nodes in the network represent symptoms, and edges between the nodes represent the corresponding association between the symptoms. The network presented here is weighted (the edges differ in size) and undirected because the data are cross-sectional. It is likely that many connections in the data are spurious and do not represent associations that are present in the population, because they are based on indirect associations. A Polychoric correlation was used in this analysis. We thus used the graphical least absolute shrinkage and selection operator (the graphical LASSO; implemented in qgraph) to shrink small edges. This approach avoids the multiple testing problems. The graphical LASSO method directly estimates the inverse of the covariance matrix (Friedman et al., 2008) and shrinks many parameters to zero (conditional independence) by estimating a penalized maximum likelihood solution based on the Extended Bayesian Information Criterion (EBIC) (Foygel and Drton, 2010). Using graphical LASSO, it is possible to estimate a sparse network that is very close to the real network and recovers the causal skeleton of the network (van Borkulo et al., 2014; van Borkulo et al., 2015). It should be noted that using the graphical LASSO will always result in a sparse network, regardless of the density of the real network (Epskamp et al., 2016). However, we assume that a psychopathological network is by nature sparse, because only some symptoms directly interact with other symptoms, and not every symptom with every other. Edges in a graphical LASSO network can be interpreted as a partial correlation between two nodes, controlling for all other variables in the network. The graphical solution of the network structure is based on the Fruchterman-Reingold algorithm, such that nodes with stronger connections are more central, and nodes with weaker connections are more peripheral (Epskamp et al., 2012). The density of the network (i.e., the number of nonzero edges of symptoms within and between disorders in relation to the number of

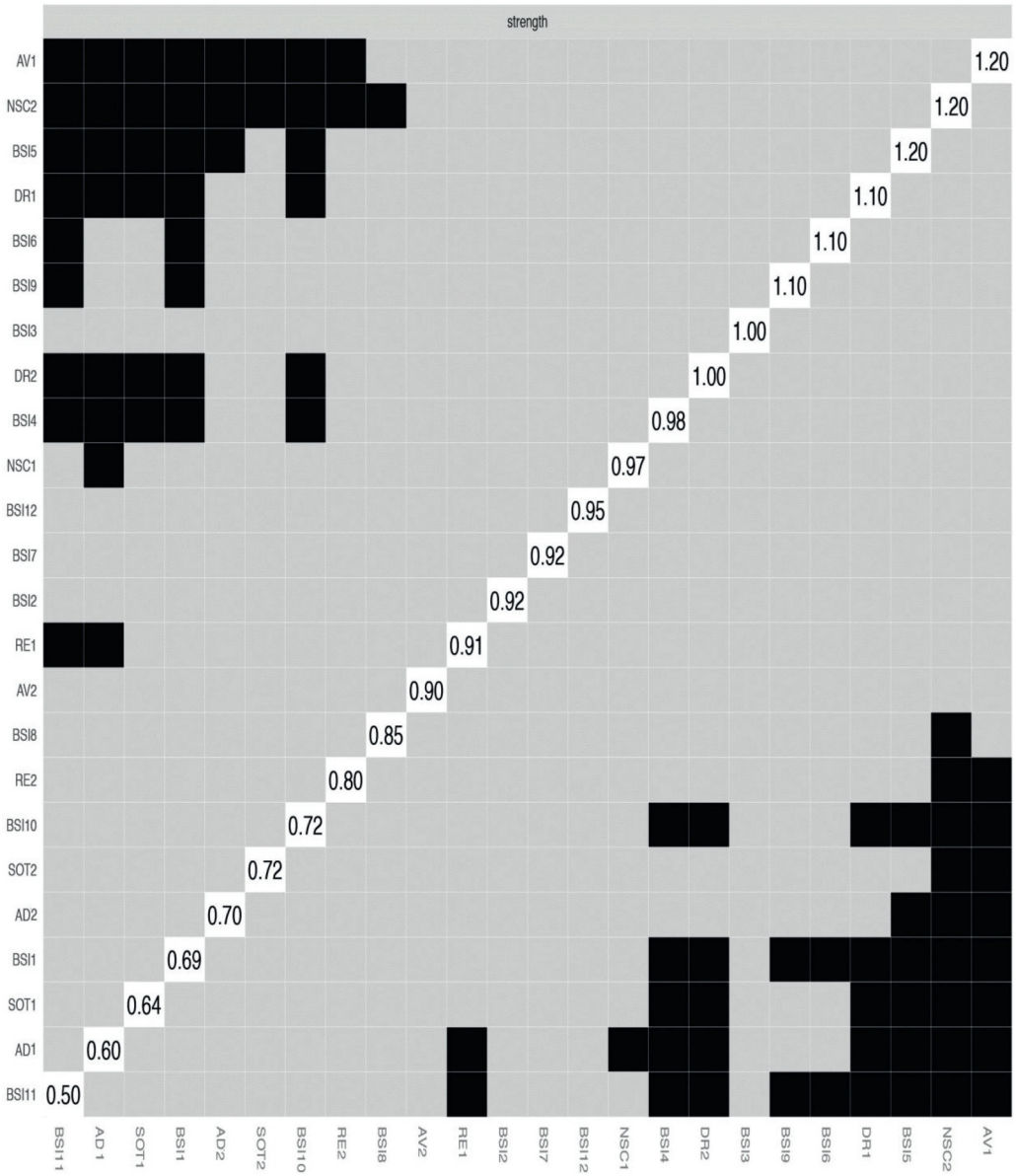


Fig. 4. Centrality test. Standardized centrality values are shown in the diagonal, gray boxes indicate no significant differences centrality estimates, and black boxes represent significant differences centrality estimates.
Panel A: Bootstrapped confidence intervals (CIs) of the edge weights in the 24-item PTSD/CPTSD/depression/anxiety network. The red line indicates the edge weight values and the gray area the 95% CIs. **Panel B:** Subsetting bootstrap for the 24-item PTSD/CPTSD/depression/anxiety network that shows the average correlations between centrality indices of the original network constructed on the full data with networks estimated on samples with fewer participants.(For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

possible connections) was used to assess the extent of the connectedness within and between PTSD, Complex PTSD, depression, and anxiety. We next aimed to discover sub-groups of symptoms (modules or communities in the network literature) that emerged from the network. We used the Walktrap algorithm to calculate modularity as it is implemented in the Exploratory Graph Analysis (EGA) R-package (Golino and Epskamp, 2017).

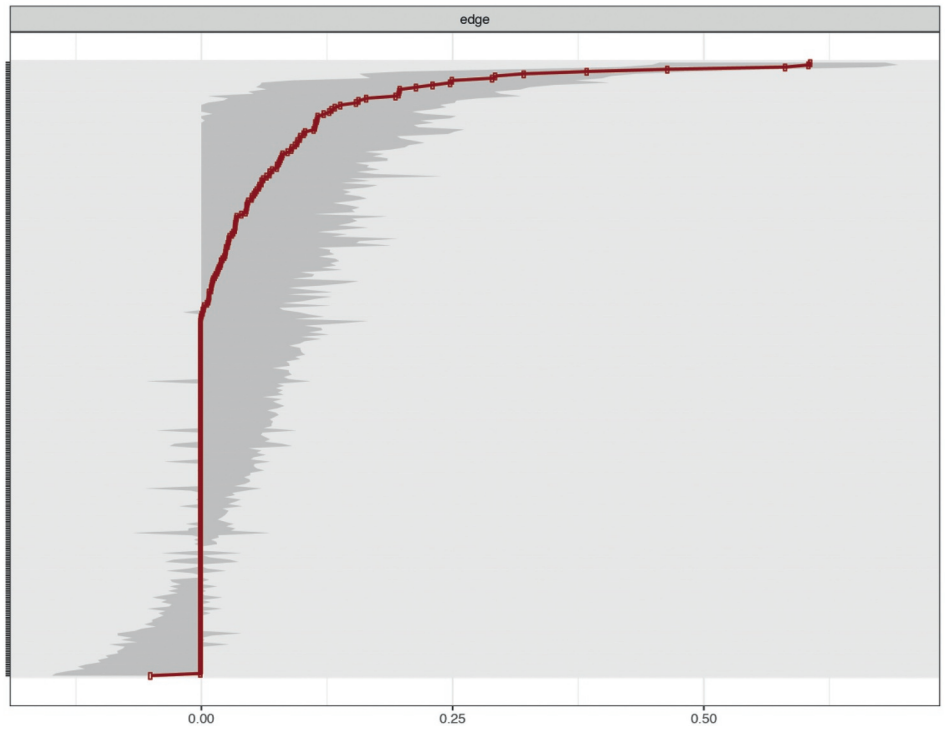
2.4. Centrality analysis

We then assessed the centrality of the nodes using node centrality measures (Boccalettia et al., 2006) in order to estimate each symptom's importance in the network (Opsahl et al., 2010). Centrality indicates the connectivity of symptoms in the network and thus provides information regarding the relevance and clinical significance of symptoms. We used one main reliable measure of node centrality. The *strength* of a specific node is defined as the sum of the weights of all the edges attached to this node. A node with high strength is strongly and directly interconnected with other nodes.

2.5. Network stability

The concept of network stability estimation was only recently introduced (Epskamp et al., 2018). We thus followed the procedure conducted by Fried et al. (2018) and examined the stability of the individual networks. We used the R-package bootnet (Epskamp et al., 2016) and bootstrapped 95% confidence intervals around the edge weights, estimated the correlation-stability coefficient for centrality metrics (ranging from 0 to 1; values above 0.25 imply moderate stability and above 0.50 imply strong stability; Epskamp et al., 2018), and computed the edge-weights difference test and the centrality difference test for each network.

Panel A:



Panel B:

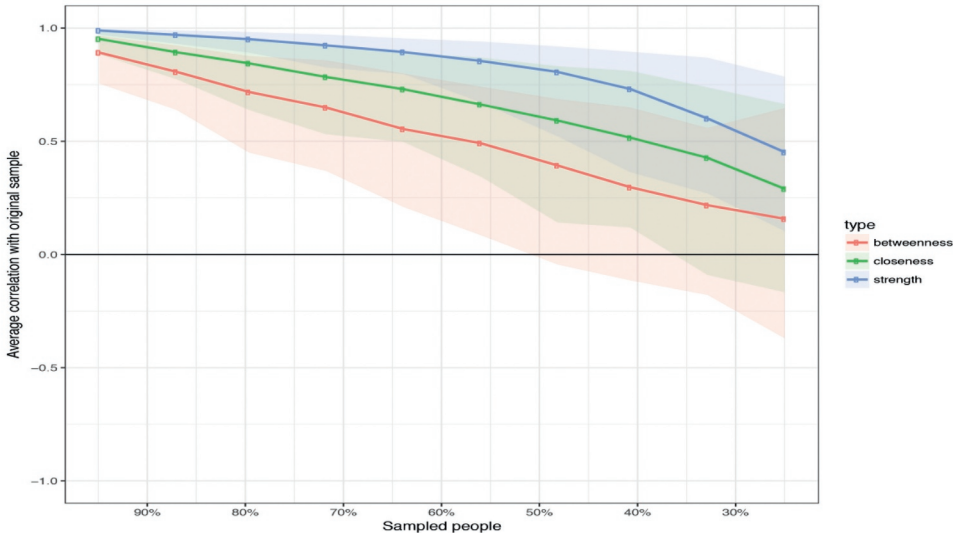


Fig. 4. (*continued*)

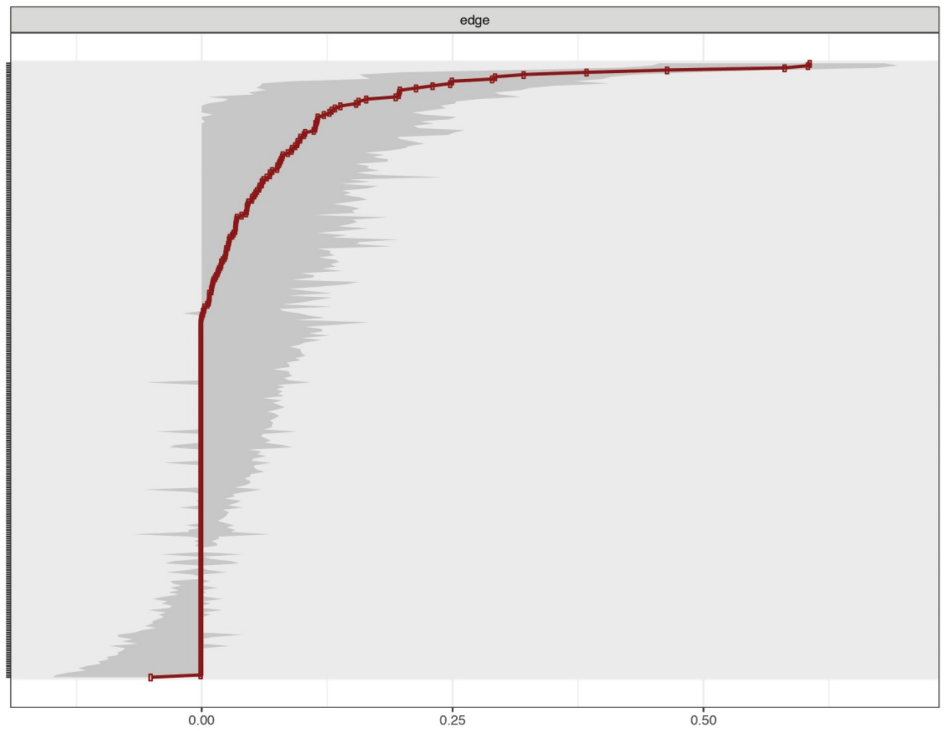
2.6. Missing data

The data covered 216 participants (18 participants were preliminarily excluded due to no data for the network models) who reported all three disorder symptoms. For all participants, data were complete, except for eleven items of which the rate of missing values varied from less than one percent up to 3.7 percent. Little's test for random missing patterns revealed missing completely at random (MCAR, $\chi 2(134) = 150.75$, $p = .153$). Missing values were imputed in one repeat due to the low rates of missingness (Enders, 2010). Specifically, the three CPTSD clusters showed rates of missing values below one percent except worthless that had 1.9 percent missing values.

3. Results

The PTSD diagnostic criteria were met by 19 respondents (8.2%), DSO criteria were met by 59 respondents (26%) and the CPTSD diagnostic criteria were met by 8 respondents (3.4%). Furthermore, based on the recommended cut-off scores for the depression and anxiety, respectively, 127 participants (56.1%) had probable clinically significant symptoms of depression and 126 (57.3%) had probable clinically significant symptoms of anxiety. The co-occurrent of participants with PTSD and depression was 16 participants (7%), with PTSD and anxiety was 14 participants (6.3%). The co- occurrent of participants with DSO and depression was 52 participants (23%), with DSO and anxiety was

Panel A:



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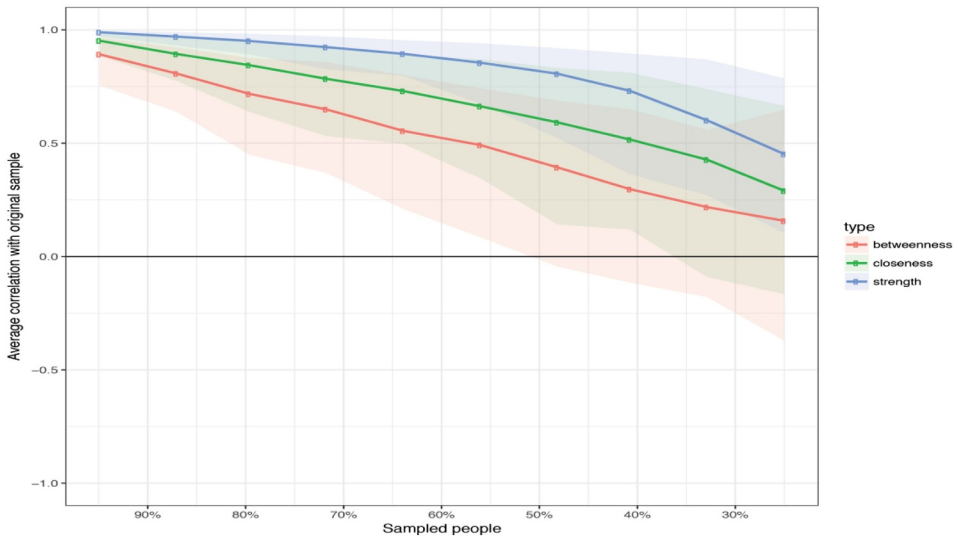

Fig. 5. Bootstrapped significance (α = 0.05) between edges. Each row and column indicate an edge. Black boxes represent significant differences and gray boxes represent non-significant differences. The color in the diagonal corresponds with the edge colors in the original network figures.(For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

48 participants (21.1%). The co- occurrent of participants with anxiety and depression was 102 participants (45.1%). The comorbidity rates of more than one construct (e.g. the number of people with depression, anxiety, and DSO) are presented in Fig. 1.

3.1. Network analysis of CPTSD, depression, and anxiety

In the network of the Complex PTSD (CPTSD) and depression and anxiety symptoms, 116 of 276 possible edges were nonzero (42%). The density (number of nonzero edges in relation to all possible edges) varied within and between disorders: within PTSD 0.73, within DSO 0.80, within depression 0.87, within anxiety 0.60. The density between PTSD and DSO was 0.36; between PTSD and depression was 0.17; between DSO and depression was 0.42; between PTSD and anxiety 0.22; and between DSO and anxiety 0.17 (Fig. 2). The EGA revealed a six-cluster solution. The first cluster comprised re-experiencing symptoms, the second, avoidance and sense of threat symptoms, the third, negative self-concept symptoms, the fourth, disturbances in relationships with affect dysregulation symptoms – deactivation, the fifth, depression with affect dysregulation symptoms - hyper-activation, and the sixth, anxiety

symptoms. All six groups of symptoms are connected by zero correlation between at least one symptom from one group to another symptom from other group. Almost all of the depression symptoms (5 out of 6) were clustered together with two symptoms of anxiety – BSI10 ("Feeling so restless you couldn't sit still") and BSI2 ("Feelings of being easily annoyed or irritated") and with one deactivation symptom – AD2 ("When I am upset, it takes me a long time to calm down"). The remaining three anxiety symptoms were strongly connected to each other.

3.2. Centrality analysis and stability

The centrality symptoms are presented in terms of the strength measure in Fig. 3. NSC2 - "Feelings of worthlessness" and AV1 -"Avoiding internal reminders of the experience" were the most central symptoms in terms of *strength*, indicating that these symptoms had strong direct connections to other neighboring symptoms and thus affected them strongly. The stability of the centrality measures is reported in the supplementary materials (see Fig. 4). In order to assess the stability of the network and thus the validity of the findings, we calculated the stability of the centrality measures following Fried et al. (2018). The confidence intervals around the edge weights were moderately large, indicating a moderate accuracy of the network estimation. The correlation stability coefficient for the strength centrality metric was 0.44 which is above the cutoff score of 0.25 (see Epskamp et al., 2018). The bootstrapping procedure supports robustness of the strength centrality measure (based on the correlation stability coefficient) and the graph structure and edge weights (based on the bootstrapped confidence intervals of the edge weights - please see Figs. 4, 5, panel A and panel B).

3.3. EGA clustering

The stability analysis supported the robustness of the results (see supplementary materials). The Walktrap algorithm identified six subgroups (Fig. 2 for a heat map sorted according to the community structure identified by the algorithm) that closely aligned with the diagnostic concepts. Avoidance and sense of threat symptoms were clustered together, and re-experiencing symptoms were clustered together. Two symptoms of negative self-concept were clustered together with the BSI7 symptom and the NSC2 symptom, both of which were labeled "Feelings worthless." All symptoms of disturbances in relationships were clustered with one symptom of affect dysregulation (AD2 - "Feel numb or emotionally shut down") and one symptom of depression (BSI1 - "Feel no interest in things").

4. Discussion

The current study's first purpose was to validate, among a clinical population, the final version of the selected symptoms for the new ICD-11 PTSD and CPTSD definitions by a network analysis approach which includes depression and anxiety symptoms. The results enable an identification of the distinct structure of PTSD and DSO clusters' symptoms, which together define ICD-11 CPTSD, by estimating graphical LASSO networks. Some studies have validated its latest version, which includes 12 items among community samples (Cloitre et al., 2018) and also among a clinical population (Hyland et al., 2018). Furthermore, recently, a network analysis for the structure of ICD-11 PTSD definitions has been validated, among nationally representative samples, on the basis of the final version of the measurement (Karatzias et al., 2019; Knefel et al., 2019; McElroy et al., 2019). However, the current study results provide, for the first time, evidence of the validity of the final version of the ICD-11 PTSD and CPTSD definitions when examining it with other possible co-occurring disorders – anxiety and depression – which may influence each other (Borsboom and Cramer, 2013) and which share the same risk factor (i.e., trauma exposure). In addition, the positive correlations between the study network symptoms' results indicate strong connections between each of the symptoms of the different clusters of PTSD and CPTSD and correspond to the concept of these disorders as sibling disorders (Maercker et al., 2013) whose symptoms influence each other. Since the definitions of PTSD and CPTSD are perceived by some researchers as neatly separated from depression and anxiety, a specific aim of this study was to explore the possibility that one or more symptoms of the PTSD/CPTSD clusters are shared as symptoms of the depression and anxiety symptoms clusters. This exploration was accomplished by estimating graphical LASSO networks and applying a clustering procedure over them. As in other such network analyses recently conducted on ICD-11 CPTSD (Knefel et al., 2019; McElroy et al., 2019), the results in this study showed a weak connection pertaining to one symptom of affect dysregulation (i.e., AD2 - " I feel numb or emotionally shut down"), which seemed to have a closer connection to disturbances in relationships. As such, this affect dysregulation symptom may be closer to disturbances in relationships; however, it still falls under the category of DSO symptoms. These results may align with the idea that affect dysregulation is also the underlying mechanism for disturbances in relationship problems, such as avoiding close relationships. Additionally, affect dysregulation may also affect interpersonal self-schemas (Briere, 2002). Although these results align with a previous study indicating the probability of such a connection (Knefel et al., 2016), they may also stem from the population at the heart of this specific study: that is, individuals who suffer from a high level of disturbances in self-organization, specifically problems in affect dysregulation which have previously been shown to be highly correlated with aggressive and violent behavior (Miles et al., 2016, 2017). Likewise showing weak interplay with the symptoms of the CPTSD clusters was another affect dysregulation symptom of AD1 - "When I am upset, it takes me a long time to calm down." This symptom was closer to depression cluster symptoms, which supports that the mode aspects seen in DSO – specifically affect dysregulation – relate to mood changes such as depression (Dvir et al., 2014). The study results suggest clustering of the BSI7 symptom – a depression symptom – with the negative self-concept symptoms (i.e. NSC1, NSC2) (i.e., DSO cluster). This overlap is caused because BSI7 and NSC2 are the same symptom; the NSC2 symptom category defined as "Feeling worthless" was originally taken from the BSI measurement of CPTSD- the symptom identified as BSI17. Whereas symptoms of depression were connected in the same cluster, only three of the anxiety symptoms appeared in the same cluster, and the other two anxiety symptoms were clustered with depression. This result may be due to the strong correlation between anxiety and depression symptoms in general and within this scale in particular. These results support the ICD-11 WHO Working Group's suggestion to remove shared symptoms from the new definition, specifically for depression and anxiety disorders (Maercker et al., 2013; Shevlin et al., 2018). In addition, based on the possible influence between these disorders' symptoms, we aimed to identify the centrality of symptoms in this network by inspecting network node centrality measures (i.e., strength). The study results reinforce previous studies' findings of how these disorders maybe connected to each other. This likewise supports the concept that PTSD, depression and anxiety are not distinct disorders (Borsboom and Cramer, 2013) and in this study also link to CPTSD symptoms. Based on the network colorations map, as expected, anxiety symptoms were stronger in relation to PTSD symptoms and depression symptoms were stronger in relation to DSO symptoms. In addition, based on the strength test, the central symptoms – meaning those that had strong direct connections to other neighboring symptoms, and thus, affected each other strongly – came from three out of four disorders: PTSD, CPTSD and depression. One symptom was related to two disorders: Feeling worthless (i.e., the disorders CPTSD and depression); and, one symptom – an avoidance symptom – was related to PTSD. These results suggest how the connection between the disorders is based on the depression/avoidance response. This

finding regarding the bridge symptoms, reinforces the idea that the strong connections between ICD-11 PTSD and depression disorder may relate to the dimensional communality between depression and the PTSD dysphoria factors, as comprised of an inability to recall important aspects of trauma (Simms et al., 2002). The possible role of depression symptoms as a central network of PTSD symptoms was also suggested in a study on DSM-5 network analysis which found anhedonia and dysphoria as central symptoms (Benfer et al., 2018), which may also relate to emotion dysregulation (Dvir et al., 2014). An avoidance symptom points to the important role played by anxiety in connecting the disorders to one another, and supports the literature pertaining to the strong connections between PTSD and anxiety disorders (Friedman et al., 2011). However, in this study, anxiety responses served as a bridge between all of these disorders, including CPTSD. This study had several limitations. Due to the use of a cross-sectional design, causal interpretations should be made cautiously. Longitudinal data using structured, clinical interviews are needed in order to better understand the differences between the common symptoms of depression and DSO. Relatedly, future research should consider using multiple methods of assessment to explore which specific depression symptoms overlap with DSO (i.e., disturbances in relationships). The network analysis results may be specific to this sample and its unique cultural context expressing distress following trauma in Israel; it is essential to study the role of CPTSD in the trauma model's explanation of violence among additional cultural groups. Also, social desirability among men mandated for treatment for intimate partner violence (i.e., these men's tendency not to report their distress) and other factors may have deflated associations (Maguire et al., 2015). The study sample were sampled from different points in the therapy process; although this study didn't differentiate between the time dimension in studying disorders' severity, the network structure may change over time in therapy. Further, the current study results may have emerged as a result of this specific population's characteristics; future research should thus investigate the network structure of CPTSD in populations that are diverse in a number of ways, including studying the validity of the network structure of these disorders by comparing between different culturally and socioeconomically samples (For example: Mahoney et al., 2019). Future researchers may endeavor to apply network analysis in larger clinical samples and examine comorbidity at the symptom level across a broader range of psychopathological constructs (Armour et al., 2017).

5. Conclusion and clinical applications

In conclusion, in addition to the validation of the construct validity of ICD-11 PTSD and CPTSD among a unique clinical population, this study demonstrates how the symptoms of these disorders are connected and have a possible co-influence on the symptoms of depression and anxiety. Although a recent study suggested some other types of ICD-11 PTSD symptoms as being the most relevant ones for presenting PTSD, such as negative emotional state, inability to experience positive emotions, and distressing dreams (Mitchell et al., 2017), indeed, the goal of the WHO Working Group's final version of symptoms – to reduce the incidence of shared common symptoms with underlying dimensions of depression and anxiety – was achieved. In addition, these results which give rise to the different groupings in relation to PTSD/CPTSD as distinguished from depression and anxiety symptoms, support the final version of the new ICD-11 PTSD definitions as core symptoms. This allows for more effective assessment and treatment planning, particularly in settings where resources and time are limited (Walton et al., 2017). However, further studies should examine whether the ICD-11 final criteria for PTSD/CPTSD symptoms are less in common with major depression symptoms than are the DSM-5 criteria for these symptoms (Morina et al., 2014; O'Donnell et al., 2014; Stein et al., 2014; Stammel et al., 2015) or whether they are no different than the DSM-5 criteria as stated in the developmental version (Wisco et al., 2017).

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7. Contributor

Dr. Ohad Gilbar developed the study concept, contributed to the study design, data collection and the data analysis. The manuscript is my original work, has not been published previously, and is not under consideration for publication elsewhere. If accepted, it will not be published elsewhere in the same form, in English or any other language, including electronically without the written consent of the copyright-holder.

Declaration of Competing Interest

No conflict declared

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2019.11.060.

References

Afzali, M.H., Sunderland, M., Teesson, M., Carragher, N., Mills, K., Slade, T., 2017. A network approach to the comorbidity between posttraumatic stress disorder and major depressive disorder: the role of overlapping symptoms. J. Effect. Disord. 208, 490–496.

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 US military veterans. J. Anxiety Disord. 45, 49–59 10.1016/ j.janxdis.2016.11.008.

Ben-Ezra, M., Karatzias, T., Hyland, P., Brewin, C.R., Cloitre, M., Bisson, J.I., Shevlin, M., 2018. Posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD) as per ICD-11 proposals: a population study in Israel. Depress. Anxiety 35 (3), 264–274.

Benfer, N., Bardeen, J.R., Cero, I., Kramer, L.B., Whiteman, S.E., Rogers, T.A., Weathers, F.W., 2018. Network models of posttraumatic stress symptoms across trauma types. J. Anxiety Disord. 58, 70–77.

Boccalettia, S., Latorab, V., Moreno, Y., Chavez, M., Hwanga, D.-.U., 2006. Complex networks: structure and dynamics. Phys. Rep. 424, 175–308. https://doi.org/10.1016/j.physrep.2005.10.009.

Borsboom, D., Cramer, A.O., 2013. Network analysis: an integrative approach to the structure of psychopathology. Annu. Rev. Clin. Psychol. 9, 91–121.

Brewin, C.R., 2019. Complex post-traumatic stress disorder: a new diagnosis in ICD-11. BJPsych. Adv. 1–8. https://doi.org/10.1192/bja.2019.48.

Brewin, C.R., Cloitre, M., Hyland, P., Shevlin, M., Maercker, A., Bryant, R.A., ... Reed, G.M., 2017. A review of current evidence regarding the ICD-11 proposals for diagnosing PTSD and complex PTSD. Clin. Psychol. Rev. 58, 1–15. https://doi.org/10.1016/j.cpr.2017.09.001.

Briere, J., 2002. Treating adult survivors of severe childhood. *The APSAC Handbook on Child Maltreatment.* Sage, London, pp. 175–196.

Cloitre, M., Garvert, D.W., Brewin, C.R., Bryant, R.A., Maercker, A., 2013. Evidence for proposed ICD-11 PTSD and complex PTSD: a latent profile analysis. Eur. J. Psychotraumatol. 4. https://doi.org/10.3402/ejpt.v4i0.20706.

Cloitre, M., Shevlin, M., Brewin, C.R., Bisson, J.I., Roberts, N.P., Maercker, A., ... Hyland, P., 2018. The international trauma questionnaire (ITQ): development of a self-report measure of ICD-11 PTSD and complex PTSD. Acta Psychiatr. Scand. https://doi.org/10.1111/acps.12956.

Cramer, A.O.J., Waldorp, L.J., van der Maas, H.L.J., Borsboom, D., 2010. Comorbidity: a network perspective. Behav. Brain Sci. 33, 137–150 10.1017/ S0140525×09991567.

Delsol, C., Margolin, G., 2004. The role of family-of-origin violence in men's marital violence perpetration. Clin. Psychol. Rev. 24 (1), 99–122.

Derogatis, L.R., Melisaratos, N., 1983. The brief symptom inventory: an introductory report. Psychol. Med. 13 (3), 595–605.

Dvir, Y., Ford, J.D., Hill, M., Frazier, J.A., 2014. Childhood maltreatment, emotional dysregulation, and psychiatric comorbidities. Harv. Rev. Psychiatry 22 (3), 149–161.

Elhai, J.D., Contractor, A.A., Palmieri, P.A., Forbes, D., Richardson, J.D., 2011. Exploring the relationship between underlying dimensions of posttraumatic stress disorder and depression in a national, trauma-exposed military sample. J. Affect. Disord. 133 (3),

477–480.
Elklit, A., Hyland, P., Shevlin, M., 2014. Evidence of symptom profiles consistent with posttraumatic stress disorder and complex posttraumatic stress disorder in different trauma samples. Eur. J. Psychotraumatol. 5. https://doi.org/10.3402/ejpt.v5.24221.
Enders, C.K., 2010. Applied missing data analysis. Guilford Press, New York.
Epskamp, S., Borsboom, D., Fried, E.I., 2018. Estimating psychological networks and their accuracy: a tutorial paper. Behav. Res. Methods 50 (1), 195–212.
Epskamp, S., Cramer, A.O.J., Waldorp, L.J., Schmittmann, V.D., Borsboom, D., 2012. Qgraph: network visualizations of relationships in psychometric data. J. Stat. Softw. 48 (4), 1–18.
Epskamp, S., Kruis, J., Marsman, M., 2016a. Estimating psychopathological networks: be careful what you wish for. PLoS ONE 12 (6), e0179891. https://doi.org/10.1371/journal.pone.0179891.
Epskamp, S., Waldorp, L.J., Mõttus, R., & Borsboom, D. (2016b). Discovering psychological dynamics: the Gaussian graphical model in cross-sectional and time-series data. arXiv Preprint arXiv:1609.04156.
Foygel, R., Drton, M., 2010. Extended Bayesian information criteria for Gaussian graphical models. Adv. Neural Inf. Process. Syst. 1, 604–612.
Frewen, P.A., Schmittmann, V.D., Bringmann, L.F., Borsboom, D., 2013. Perceived causal relations between anxiety, posttraumatic stress and depression: extension to moderation, mediation, and network analysis. Eur. J. Psychotraumatol. 4, 20656. https://doi.org/10.3402/ejpt.v4i0.
Fried, E.I., Eidhof, M.B., Palic, S., Costantini, G., Huisman-van Dijk, H.M., Bockting, C.L., Karstoft, K.I., 2018. Replicability and generalizability of posttraumatic stress disorder (PTSD) networks: a cross-cultural multisite study of PTSD symptoms in four trauma patient samples. Clinic. Psychol. Sci. 6 (3), 335–351.
Friedman, J., Hastie, T., Tibshirani, R., 2008. Sparse inverse covariance estimation with the graphical lasso. Biostatistics 9, 432–441. https://doi.org/10.1093/biostatistics/kxm045.
Friedman, M.J., Resick, P.A., Bryant, R.A., Strain, J., Horowitz, M., Spiegel, D., 2011. Classification of trauma and stressor-related disorders in DSM-5. Depress. Anxiety 28 (9), 737–749.
Frost, R., Louison Vang, M., Karatzias, T., Hyland, P., Shevlin, M., 2019. The distribution of psychosis, ICD-11 PTSD and complex PTSD symptoms among a trauma-exposed UK general population sample. Psychosis 1–12.
Gilbar, O., Ben-Zur, H., 2002. Adult Israeli community norms for the brief symptom inventory (BSI). Int. J. Stress Manag. 9 (1), 1–10.
Gilbar, O., Hyland, P., Cloitre, M., Dekel, R., 2018. ICD-11 complex PTSD among Israeli male perpetrators of intimate partner violence: Construct validity and risk factors. J. Anxiety. Disord. 54, 49–56.
Glück, T.M., Knefel, M., Lueger-Schuster, B., 2017. A network analysis of anger, shame, proposed ICD-11 post-traumatic stress disorder, and different types of childhood trauma in foster care settings in a sample of adult survivors. Eur. J. Psychotraumatol. 8, 1372543.
Golino, H.F., Epskamp, S., 2017. Exploratory graph analysis: a new approach for estimating the number of dimensions in psychological research. PLoS ONE 12 (6), e0174035.
Grant, D.M., Beck, J.G., Marques, L., Palyo, S.A., Clapp, J.D., 2008. The structure of distress following trauma: posttraumatic stress disorder, major depressive disorder, and generalized anxiety disorder. J. Abnorm. Psychol. 117 (3), 662–672.
Hansen, M., Hyland, P., Armour, C., Shevlin, M., Elklit, A., 2015. Less is more? Assessing the validity of the ICD-11 model of PTSD across multiple trauma samples. Eur. J. Psychotraumatol. 6 (1), 28766.
Hasherut Lerevahat Haprat VeHamishpaha [The service for the welfare of the individual and the family] (2016). *Sicum peilut venetunim lishnat 2015* [Summery of activities and data of 2015]. Israel: Social Welfare Ministry.
Hoyt, T., Wray, A.M., Wiggins, K.T., Gerstle, M., Maclean, P.C., 2012. Personality profiles of intimate partner violence offenders with and without PTSD. J. Offend. Rehabil. 51 (4), 239–256.
Hyland, P., Shevlin, M., Brewin, C.R., Cloitre, M., Downes, A.J., Jumbe, S., Roberts, N.P., 2017. Validation of post-traumatic stress disorder (PTSD) and complex PTSD using the international trauma questionnaire. Acta Psychiatr. Scand. 136 (3), 313–322.
Hyland, P., Shevlin, M., Elklit, A., Murphy, J., Vallières, F., Garvert, D.W., Cloitre, M., 2016. An assessment of the construct validity of the ICD-11 proposal for complex posttraumatic stress disorder. Psychologic. Trauma Theo. Res. Pract. Policy 9 (1), 1–9.
Hyland, P., Shevlin, M., Fyvie, C., Karatzias, T., 2018. Posttraumatic stress disorder and complex posttraumatic stress disorder in DSM-5 and ICD-11: clinical and behavioral correlates. J. Trauma. Stress. https://doi.org/10.1002/jts.22272.
Karatzias, T., Shevlin, M., Fyvie, C., Hyland, P., Efthymiadou, E., Wilson, D., Cloitre, M., 2017. Evidence of distinct profiles of posttraumatic stress disorder (PTSD) and complex posttraumatic stress disorder (CPTSD) based on the new ICD-11 trauma questionnaire (ICD-TQ). J. Affect. Disord. 207, 181–187.
Karatzias, T., Hyland, P., Bradley, A., Cloitre, M., Roberts, N.P., Bisson, J.I., Shevlin, M., 2019. Risk-factors and comorbidity of ICD-11 PTSD and complex PTSD: findings from a trauma-exposed population based sample of adults in the United Kingdom. Depress. Anxiety. https://doi.org/10.1002/da.22934.
Kendler, K.S., Zachar, P., Craver, C., 2011. What kinds of things are psychiatric disorders. Psychologic. Med. 41, 1143–1150. https://doi.org/10.1017/S0033291710001844.
Knefel, M., Karatzias, T., Ben-Ezra, M., Cloitre, M., Lueger-Schuster, B., Maercker, A., 2019. The replicability of ICD-11 complex post-traumatic stress disorder symptom networks in adults. Br. J. Psychiatry 214 (6), 361–368.
Knefel, M., Tran, U.S., Lueger-Schuster, B., 2016. The association of posttraumatic stress disorder, complex posttraumatic stress disorder, and borderline personality disorder from a network analytical perspective. J. Anxiety Disord. 43, 70–78.
Maercker, A., Brewin, C.R., Bryant, R.A., Cloitre, M., Reed, G.M., Van Ommeren, M., Rousseau, C., 2013. Proposals for mental disorders specifically associated with stress in the international classification of diseases-11. Lancet North Am. Ed. 381 (9878), 1683–1685.
Maguire, E., Macdonald, A., Krill, S., Holowka, D.W., Marx, B.P., Woodward, H., Taft, C.T., 2015. Examining trauma and posttraumatic stress disorder symptoms in court-mandated intimate partner violence perpetrators. Psychologic. Trauma Theo. Res. Pract. Policy 7 (5), 473–478.
Mahoney, A., Karatzias, T., Hutton, P., 2019. A systematic review and meta-analysis of group treatments for adults with symptoms associated with complex post-traumatic stress disorder. J. Affect. Disord. 243, 305–321.
McElroy, E., Fearon, P., Belsky, J., Fonagy, P., Patalay, P., 2018. Networks of depression and anxiety symptoms across development. J. Am. Acad. Child Adoles. Psychiatry 57 (12), 964–973.
McElroy, E., Shevlin, M., Murphy, S., Roberts, B., Makhashvili, N., Javakhishvili, J., Hyland, P., 2019. ICD-11 PTSD and complex PTSD: structural validation using network analysis. World Psychiatry 18 (2), 236.
Miles, S.R., Menefee, D.S., Wanner, J., Teten Tharp, A., Kent, T.A., 2016. The relationship between emotion dysregulation and impulsive aggression in veterans with post-traumatic stress disorder symptoms. J. Interpers. Violence 31 (10), 1795–1816.
Miles, S.R., Sharp, C., Tharp, A.T., Stanford, M.S., Stanley, M., Thompson, K.E., Kent, T.A., 2017. Emotion dysregulation as an underlying mechanism of impulsive aggression: reviewing empirical data to inform treatments for veterans who perpetrate violence. Aggress. Violent Behav. 34, 147–153.
Mitchell, K.S., Wolf, E.J., Bovin, M.J., Lee, L.O., Green, J.D., Rosen, R.C., ... Marx, B.P., 2017. Network models of DSM-5 posttraumatic stress disorder: implications for ICD-11. J. Abnorm. Psychol. 126, 355–366.
Morina, N., van Emmerik, A.A.P., Andrews, B., Brewin, C.R., 2014. Comparison of DSM-IV and proposed ICD-11 formulations of PTSD among civilian survivors of war and war veterans. J. Trauma. Stress 27, 647–654 http://dx.doi.org/10.
Murphy, S., Elklit, A., Dokkedahl, S., Shevlin, M., 2016. Testing the validity of the proposed ICD-11 PTSD and complex PTSD criteria using a sample from Northern Uganda. Eur. J. Psychotraumatol. 7, 1–10. https://doi.org/10.3402/ejpt.v7.32678.
O'Donnell, M.L., Alkemade, N., Nickerson, A., Creamer, M., McFarlane, A.C., Silove, D., Forbes, D., 2014. Impact of the diagnostic changes to post-traumatic stress disorder for DSM-5 and the proposed changes to ICD-11. Br. J. Psychiatry 205, 230–235. https://doi.org/10.1192/bjp.bp.113.135285.
Opsahl, T., Agneessens, F., Skvoretz, J., 2010. Node centrality in weighted networks: generalizing degree and shortest paths. Soc. Netw. 32, 245–251.
Perkonigg, A., Höfler, M., Cloitre, M., Wittchen, H.U., Trautmann, S., Maercker, A., 2016. Evidence for two different ICD-11 posttraumatic stress disorders in a community sample of adolescents and young adults. Eur. Arch. Psychiatry Clin. Neurosci. 266, 317–328.
Renner, L.M., Whitney, S.D., 2012. Risk factors for unidirectional and bidirectional intimate partner violence among young adults. Child Abuse Negl. 36 (1), 40–52.
Schulte-van Maaren, Y.W., Carlier, I.V., Zitman, F.G., van Hemert, A.M., de Waal, M.W., van Noorden, M.S., Giltay, E.J., 2012. Reference values for generic instruments used in routine outcome monitoring: the leiden routine outcome monitoring study. BMC Psychiatry 12 (1), 203.
Shevlin, M., Hyland, P., Roberts, N.P., Bisson, J.I., Brewin, C.R., Cloitre, M., 2018. A psychometric assessment of disturbances in self-organization symptom indicators for ICD-11 complex PTSD using the international trauma questionnaire. Eur. J. Psychotraumatol. 9 (1), 1419749.
Simms, L.J., Watson, D., Doebbelling, B.N., 2002. Confirmatory factor analyses of posttraumatic stress symptoms in deployed and nondeployed veterans of the Gulf War. J. Abnorm. Psychol. 111 (4), 637.
Stammel, N., Abbing, E.M., Heeke, C., Knaevelsrud, C., 2015. Applicability of the ICD- 11 proposal for PTSD: a comparison of prevalence and comorbidity rates with the DSM-IV PTSD classification in two post-conflict samples. Eur. J. Psychotraumatol. 6. https://doi.org/10.3402/ejpt.v6.27070.
Steel, J.L., Dunlavy, A.C., Stillman, J., Pape, H.C., 2011. Measuring depression and PTSD after trauma: common scales and checklists. Injury 42 (3), 288–300.
Stein, D.J., McLaughlin, K.A., Koenen, K.C., Atwoli, L., Friedman, M.J., Hill, E.D., Kessler, R.C., 2014. DSM-5 and ICD-11 definitions of posttraumatic stress disorder: investigating "narrow" and "broad" approaches. Depress. Anxiety 31, 494–505. https://doi.org/10.1002/da.22279.
van Borkulo, C., Boschloo, L., Borsboom, D., Penninx, B.W., Waldorp, L.J., Schoevers, R.A., 2015. Association of symptom network structure with the course of depression. JAMA Psychiatry 72 (12), 1219–1226.
van Borkulo, C.D., Borsboom, D., Epskamp, S., Blanken, T.F., Boschloo, L., Schoevers, R.A., Waldorf, J.L., 2014. A new method for constructing networks from binary data. Sci. Rep. 4, 5918. https://doi.org/10.1038/srep05918.
Walton, J.L., Cuccurullo, L.-A.J., Raines, A.M., Vidaurri, D.N., Allan, N.P., Maieritsch, K.P., Franklin, C.L., 2017. Sometimes less is more: establishing the core symptoms of ptsd. J. Trauma. Stress 30, 254–258 10.1002/ jts.22185.
Wisco, B.E., Marx, B.P., Miller, M.W., Wolf, E.J., Krystal, J.H., Southwick, S.M., Pietrzak, R.H., 2017. A comparison of ICD-11 and DSM criteria for posttraumatic stress disorder in two national samples of US military veterans. J. Affect. Disord. 223, 17–19.
Zoellner, L.A., Pruitt, L.D., Farach, F.J., Jun, J.J., 2014. Understanding heterogeneity in PTSD: fear, dysphoria, and distress. Depress. Anxiety 31, 97–106.