5-5-2020

Resilience and Purpose in life as protective factors against specific Posttraumatic Stress Disorder symptoms

A network analysis study of the individual DSM 5 Posttraumatic Stress Disorder symptoms in combination with Resilience or Purpose in life.

E.M. Esmeijer
S2276062
Master Thesis Clinical Psychology
Supervisor: E. I. Fried
Institute of Psychology
Leiden University
June, 2020

Universiteit Leiden
Institute of Psychology

Content

Abstract

Objective: Since many veterans suffer from posttraumatic stress disorder, there is a need for research on protective factors against its symptoms. Literature provides evidence that resilience and 'purpose in life' may be protective factors. The current study investigates the relation between individual symptoms, resilience and purpose in life, while seeking to determine for which specific PTSD symptoms, resilience and/or purpose in life are protective factors. *Method:* This study used the National Health and Resilience in Veterans Study. Participants filled in the PCL-5, CD-RISC 10 and/or the PIL-SF. To keep the samples as large as possible, the data was used to create four samples. The current study seeks to find answers by: examining the network structures of the twenty individual DSM 5 posttraumatic stress disorder symptoms, in combination with resilience or purpose in life and to test their stability over time. *Results:* There are negative relations between four posttraumatic stress disorder symptoms and resilience and two with purpose in life. Resilience also has a positive relation with one symptom. The relations were weakly connected and a floor effect in the PCL-5 results was found. *Conclusion:* Results indicate that when resilience or purpose in life rises, the related symptoms drop, meaning that resilience and purpose in life could be protective factors for the related symptoms. Resilience is a protective factor against overly negative thoughts and assumptions about oneself or the world, difficulty concentrating, decreased interest in activities and irritability or aggression. Purpose in life protected against difficulty concentrating and decreased interest in activities.

1. Introduction

1.1 PTSD

Posttraumatic stress disorder (PTSD) is a mental disorder with impairing and distressing symptoms that occurs after a traumatic event (Kessler et al., 2014). It mainly involves intrusive and recurrent memories related to the trauma, the avoidance of reminders of the trauma and hyperarousal. It has a lifetime prevalence of between seven to twelve percent worldwide with a high comorbidity rate (Sareen et al., 2007). Full and partial PTSD is common among civilians but also affects a significant number of military personnel (Armour, Fried, Deserno, Tsai & Pietrzak, 2017; Pietrzak, Goldstein, Southwick, & Grant, 2011). A growing number of studies show a consistent relationship between PTSD and an increased risk of suicidal ideations and behaviour (Cougle, Keough, Riccardi, & Sachs-Ericsson, 2009; Ferrada-Noli, Asberg, Ormstad, Lundin, & Sunbdom, 1998; Tarrier & Gregg, 2004). This demonstrates the severity

of PTSD symptoms and the consequent need for solutions which reduce the related suffering. This could be done by determining a range of possible protective or healing factors against the individual symptoms of PTSD, such as resilience.

1.2 Resilience

Resilience research is based on the idea that a lot of people go through distressing life events but still maintain their mental health, whereas others develop mental health problems after experiencing similar distressing life events. Resilience might be a protective factor against stress-related disease (Kalish, Baker, Basten, Boks, Bonanno, Brummelman, … & Kleim, 2017) and is currently seen as a dynamic process altered by experiences and circumstances. It can not simply be described as a characteristic or an insensitivity to stress (Seery, Homan, Silver, 2010; Russo, Murrough, Han, Charney & Nestler, 2012). King et al., (1998) divided resilience into different resilience factors, such as hardiness, functional- and structural support and stressful life events, and identified correlations between the resilience factors and PTSD. This was also the case in the study of Whealin, Stotzer, Nelson, Li, Liu-Tom and Pietrzak (2013) who found a relationship between low resilience scores and a positive PTSD outcome. A classical twin study found a strong within-person correlation between resilience and PTSD of -.59 in monozygotic and dizygotic twins and found that both PTSD and resilience are influenced by genetic and environmental factors (Wolf et al., 2017). The impact of resilience on the individual PTSD symptoms has not yet been sufficiently examined. The research of Aiena, Buchanan, Smith and Schulenberg (2015) found that an important facet of resilience is someone's perceived meaning in life. Teche et al. (2017) showed that the capacity to solve problematic situations and have strong personal values were greater in participants who suffered a traumatic experience but did not develop PTSD, than in participants who experienced the same traumatic event and went on to develop PTSD. The participants' characteristics were only found to differ in one resilience subscale including moral characteristics (a meaning in life representative) and facing problems in an active manner (a resilience characteristic), creating curiosity to not only resilience but also meaning in life. Resilience and meaning in life combined, as well as separately, appeared to indicate fewer PTSD symptoms. Having a sense of meaning (i.e. having an own purpose and belief) in life buffers against the harmful effects of psychological distress and PTSD symptoms (Owens, Steger, Whitsell & Herrera, 2009), indicating that purpose in life might also be a protective or healing factor against PTSD symptoms on its own and indicates a need for further research.

1.3 Purpose in life

A recent study showed that having a purpose in life could be a possible protective factor against suicidal ideation in high-risk military veterans (Straus, Norman, Tripp, Pitts & Pietrzak, 2019). This finding agrees with another study that indicates that having a global meaning in life (i.e. having a purpose, own beliefs, goal and feelings) may be a protective factor against depression and PTSD created by deployment sexual trauma (DST), which denotes sexual assault and/or harassment during the deployment time in the military. The findings advocated using one's global meaning in life as part of an intervention (Gross, Laws, Park, Hoff & Hoffmire, 2019). Positive experiences in youth, such as being praised by one's parents and teachers or feeling successful in events, seems to significantly alter the firmness of one's purpose in life in a positive way. In turn, having a firm purpose in life can decrease the tendency towards anxiety and can lower incidences of psychiatric and somatic symptoms (Ishida & Okada, 2006). Literature shows that the resilience factor 'purpose in life' should be noted, separately from general resilience, since it also seems to have a positive effect on its own. The impact of one's purpose in life on individual PTSD symptoms is not yet satisfactorily examined.

1.4 Present study

Extensive data already exists about the positive effects of being resilient and having a firm purpose in life. Nevertheless, existing literature does not yet explain which specific PTSD symptoms are affected by being resilient or having a strong purpose in life. This could be an interesting question for future treatment of these specific symptoms and may help to discover the requirements for future well-being/health. Based on this, the research question of this study is: For which specific PTSD symptoms is resilience and/or purpose in life a protective factor? Since there is still a lack of knowledge in this area, this is an exploratory study without clear hypotheses. This study will seek to determine which specific PTSD symptoms are connected to resilience or purpose in life by examining whether there are negative relations between the symptoms and the protective factor. The negative relations can be interpreted as follows: being resilient or having a strong purpose in life reduces the related PTSD symptoms. To make sure the results are reliable, the negative relations between resilience or purpose in life and the specific PTSD symptoms need to be steady over time, in order to prove that they are not coincidental. The symptoms connected to resilience in the first moment in time must be consistent with the relations found in the second moment in time. The concept 'purpose in life' and resilience will be tested separately.

2. Method

2.1 Sample

The sample that will be used is the National Health and Resilience in Veterans Study (NHRVS), which is a representative cohort study. It has a sample size of 1,484 United States veterans and was conducted in 2013 with a follow up in 2016. Participants were recruited from a research panel of United States household, owned by GfK Knowledge Networks, Inc., which includes Knowledge Panel®. Knowledge Panel® is a probability-based online survey panel of a national and representative sample of United States adults. Of the 1,602 adults that confirmed their veteran status, 1,484 participated in the NHRVS study at baseline. The follow up assessment three years later contains 713 participants. The participants all filled in an informed consent document before participating in the study. The study was approved by the Human Subject Subcommittee of the VA Connecticut Healthcare System as well as by the VA Office of Research & Development.

2.2 Participants

To maximize the sample size, the following strategy was applied. To analyse the relation between individual PTSD symptoms and resilience, the participants who filled in the Connor-Davidson Resilience Scale-10 and the Posttraumatic Stress Disorder-Checklist version 5 (PCL-5) without missing values were included. For the analysis of the relation between individual PTSD symptoms and the resilience factor 'purpose in life', only the participants who filled in the Purpose in Life Test-Short form and the PCL-5 without missing values were included. This strategy was used for the baseline data as well as for the follow-up data. It creates slightly different samples for each analysis at baseline and in the follow-up. Even though the samples are not identical, they have a high level of similarity, as shown in table 1..

2.3 Assessment

To assess PTSD, the *Posttraumatic Stress Disorder-Checklist version 5* was used. The PCL-5 corresponds with the PTSD symptoms in the DSM-5. The *Diagnostic and Statistical Manual of Mental Disorders* (DSM) is widely used to diagnose PTSD and describes all the individual symptoms. The latest version (DSM-5) includes an updated view of symptoms and definitions as well as a new sub-type (Armour, Fried, Deserno, Tsai & Pietrzak, 2017). This study is based on the principles of the DSM-5. Each of the 20 items can be answered with a score from 0-4. A higher score indicates greater symptom severity. Total scores can range from

0 to 80. The internal consistency is good (α = .96) and the test has a good test-retest reliability (r = .84). The PCL-5 has fine psychometric values and can be effectively used on veterans (Bovin, Marx, Weathers, Gallagher, Rodriguez, Schnurr & Keane, 2006). The participants were asked to fill in the PCL-5 with their self-nominated "worst" stressful experience in mind. They rated how much they suffered from the symptoms asked in the 20 items during the past month. A score of 31 or higher indicates probable PTSD (Stockert, Fried, Armour, Pietrzak, 2018; Bovin et al., 2015). Only participants who have a history of trauma filled in the PCL-5 and were used in this study.

The *Connor-Davidson Resilience Scale-10* (CD-RISC 10) was used to assess resilience. The CD-RISC 10 consists of ten items, each item can be rated on a scale from 0 to 4, where 0 means the item is not true at all and 4 means the item is true nearly all the time. The mean total score in the USA is 32.1 with a standard deviation of 5.8 in the general population (Connor & Davidson, 2003). The mean score of people with PTSD and subjects exposed to severe trauma in the USA is 30.3 with a standard deviation of 6.6 (Pietrzak et al., 2014; Connor & Davidson, 2003). Scores are rated in quartiles of 0-29, 30-32, 33-36, 37-40, where a score in a higher quartile indicates a higher resilience score (Campbell-Sills et al., 2007). Even though the score quartiles are skewed, the CD-RISC 10 has a good internal consistency (α = .85) and is able to capture the core elements of resilience (Campbell-Sills & Stein, 2007).

'Purpose in life' was measured with the *Purpose in Life Test- Short Form* (PIL-SF). The reliability of the PIL-SF is equal to the reliability of the 20 item version (α = .86). The PIL-SF is seen as a valid assessment method and consists of four questions. The questions have a Likert-type 7-point response model where 1 means 'not at all' and 7 means 'a lot'. For each question, the exact meaning of the scale differs (Schulenberg, Schnetzer & Buchanan, 2011). The mean of the questionnaire is 22.67 with a standard deviation of 3.73. Participants total score can rate from 4-28. A higher score indicates a higher feeling of having a purpose in life.

The PCL-5, CD-RISC 10 and the PIL-SF were all administered at baseline and in the follow-up, which was three years later.

2.4 Statistical Analysis

The first two networks will be estimated using the baseline data of the participants. The networks are created out of the PCL-5 and with the CD RISC 10 or the PIL-SF scores, to find out which specific PTSD symptoms have a strong relationship with either resilience, purpose

in life or both. The third and fourth network analyses will be done with the follow-up data. The network set-up will be the same, to see how consistent the found relationships are over time.

We estimate four network structures in JASP, a free open-source software (http://jasp-stats.org/). Network analysis has a core advantage of visualising the data's multivariate dependencies, where in most analysis these would stay hidden. A network contains nodes, in this case these are PTSD symptoms and resilience or purpose in life; and edges, representing the connections between the nodes. The chosen network model, called the Gaussian Graphical Model, contains edges that can be seen as partial correlations coefficients. This means that the connections shown in the model control for all other relations. The network creates estimations of pairwise association parameters between all nodes in the network. Estimating so many parameters leads to an increased false positive rate, which is controlled for by using the Least Absolute Shrinkage and Selection Operator (LASSO), which shrinks all coefficients and sets small relationships to exact zero. A more detailed explanation about this method can be found elsewhere (Epskamp & Fried, 2018).

There are three centrality measures commonly used to explain the graph. The first one is the strength (or degree) of the node, which adds up all the edges a node is directly connected to all the other nodes, to determine how strong the direct connection is of that node in the network analysis. The second centrality measure is closeness. Closeness centrality measures the indirect connection of the node in the network analysis, by taking the opposite of all the shortest pathlengths. The last centrality measure is betweenness. When a node scores high on betweenness, it has many shortest pathlengths to other nodes and lays central in the network analysis. Many studies focused on all three of the centrality measures. Only recent work has shown that the mean focus should primarily lay on degree (Bringmann et al., 2019). Therefore, in this current study we focus on degree in the interpretation, but present closeness and betweenness as well for the sake of completeness.

The networks will be visualised using colours. Positive edges will be green and negative edges will be printed in red. The lines will be thicker when connections are stronger and thinner when they are weaker.

3. Results

3.1 Sample characteristics

Table 1. shows some features of the participants in the four different samples. Comparing all four samples, age and combat history are alike. The sample is dominated by males, which should be taken into account.

Table 1. Demographic features of the samples

Sample	Age minimum	Age maximum	Age mean	male	Female	Combat veteran Yes	Combat veteran No
Resilience Baseline	20	92	62.09	958(89%)	118(11%)	434 (40.3%)	641 (59.6%)
Resilience Follow up	26	97	66.30	629(90.1%)	69(9.9%)	-	-
Purpose in life Baseline	20	92	62.00	975(89%)	121(11%)	441(40.2%)	654(59.7%)
Purpose in life follow up	26	97	66.30	642(90.3%)	69(9.7%)	-	-

For the baseline resilience network analysis, a total of 1076 participants met the inclusion criteria. The participants' mean score of resilience as a total score at baseline was 29.86(7.11), which lies below the average of the resilience characteristic compared to the general population (Campbell-Sills et al., 2007). The follow-up sample for the resilience network analysis contains 698 participants with a mean score of 30.08 (6.34) on resilience.

The baseline of the purpose in life network analysis contains 1096 participants and has a mean score of purpose in life as a total score of 21.58 (4.64). This is approximately one point lower than the score of the general population (Schulenberg, Schnetzer & Buchanan, 2011). The follow-up network analysis of purpose in life consists of 711 participants, who have a mean score of 21.55 (4.50).

Table 2. shows the mean scores of the individual PTSD symptoms at baseline and at follow up in the four samples as well as the short codes of the symptoms which are used in the network analyses. After testing the scores, a correlation of the mean and standard deviations was found of 0.94 or higher in every sample, indicating that there is a floor effect.

Table 2. Overview of the 20 PTSD symptoms including means and standard deviations from the sample at baseline and at follow up

	Symptoms	Short codes	B. Resilience Sample: Mean (SD)	B. Purpose in Life Sample: Mean (SD)	F. Resilience Sample: Mean (SD)	F. Purpose in Life Sample: Mean(SD)
1.	Unwanted upsetting memories	UnwanMem	.54(.92)	.54(.92)	.55(.86)	.55(.86)
2.	Nightmares	Nightm	.33(.76)	.33(.76)	.33(.76)	.33(.76)

3.	Flashbacks	Flash	.25(.65)	.24(.64)	.24(.70)	.24(.70)
4.	Emotional distress after exposure to traumatic reminders	EmoDis	.47(.89)	.47(.88)	.44(.86)	.45(.86)
5.	Physical reactivity after exposure to traumatic reminders	PhysReac	.31(.73)	.32(.75)	.26(.71)	.26(.72)
6.	Avoidance of trauma-related thoughts or feelings	AvoidThought	.54(.96)	.55(.96)	.46(.86)	.47(.86)
7.	Avoidance of trauma-related external reminders	AvoidExtRem	.41(.85)	.42(.85)	.36(.81)	.36(.81)
8.	Inability to recall key features of the trauma	InabRecall	.30(.74)	.30(.73)	.26(.67)	.26(.67)
9.	Overly negative thoughts and assumptions about oneself or the world	NegAssump	.47(.92)	.47(.93)	.38(.78)	.38(.77)
10.	Exaggerated blame of self or others for causing the trauma	ExaggBlame	.39(.87)	.39(.87)	.33(.76)	.33(.76)
11.	Negative affect	NegAffect	.45(.92)	.46(.93)	.31(.72)	.31(.72)
12.	Decreased interest in activities	DecInterest	.62(1.01)	.61(1.02)	.48(.85)	.48(.84)
13.	Feeling isolated	Feelisol	.60(1.01)	.61(1.02)	.45(.87)	.45(.88)
14.	Difficulty experiencing positive affect	DiffPosAffect	.51(.97)	.52(.97)	.40(.85)	.39(.84)
15.	Irritability or aggression	IrritAgress	.45(.81)	.46(.82)	.45(.87)	.45(.88)
16.	Risky or destructive behaviour	DestrucBeh	.23(.62)	.23(.62)	.15(.52)	.15(.52)
17.	Hypervigilance	HypVigil	.70(1.05)	.71(1.05)	.58(.98)	.59(.98)
18.	Heightened startle reaction	HeighStart	.46(.89)	.47(.90)	.32(.74)	.32(.75)
19	Difficulty concentrating	DiffConc	.57(.90)	.57(.90)	.41(.81)	.41(.80)
20.	Difficulty sleeping	DiffSleep	1.01(1.19)	1.05(1.20)	.69(1.01)	.70(1.00)

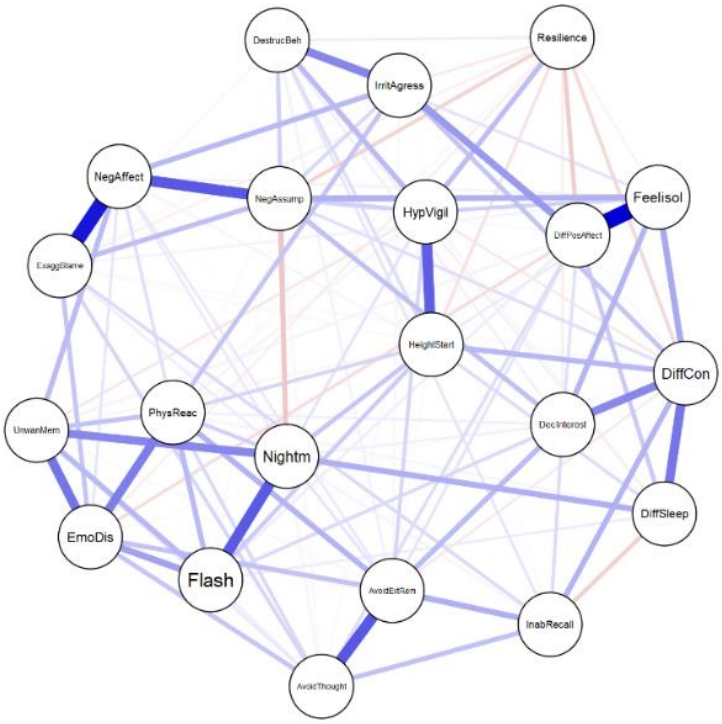
Note: Answers can range from 0-4, the B. stands for baseline data. F. stands for follow up data.

3.2 Resilience network

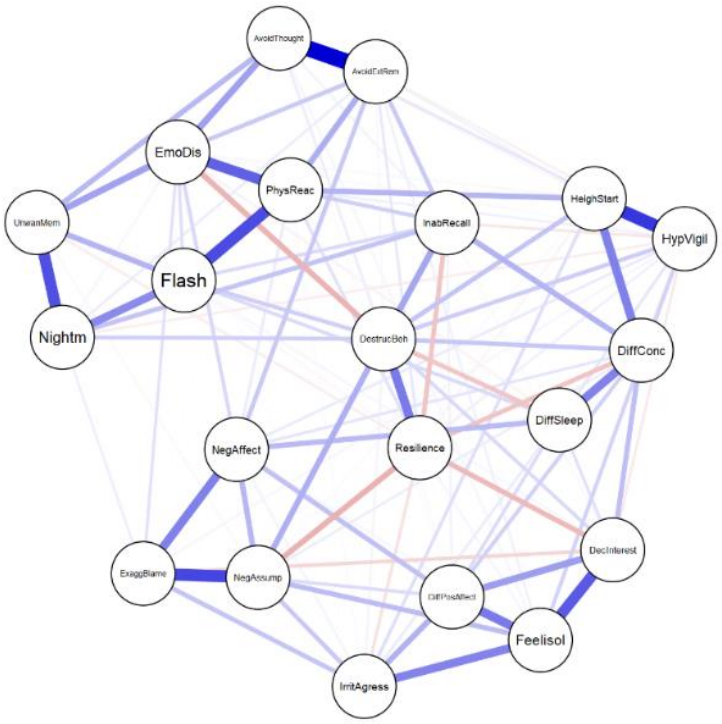
3.2.1 Results at baseline

Figure 1. displays all the network analyses. The upper left corner shows the network analysis of the individual PTSD symptoms and resilience at baseline. It contains 21 nodes and 130 of 210 possible edges are non-zero. Overall, the PTSD symptoms have a positive relationship with one another, of which some have a stronger relation, such as the symptoms flashbacks and having nightmares. Resilience has direct negative relations with seven symptoms: (1) Overly negative thoughts and assumptions about oneself or the world, (2) difficulty experiencing positive affect, (3) heightened startle reaction, (4) difficulty concentrating, (5) irritability or aggression and a small negative relation with (6) feeling isolated and (7) decreased interest in activities. Positive relations were found with (1) hypervigilance and a small one with (2) risky or destructive behaviour.

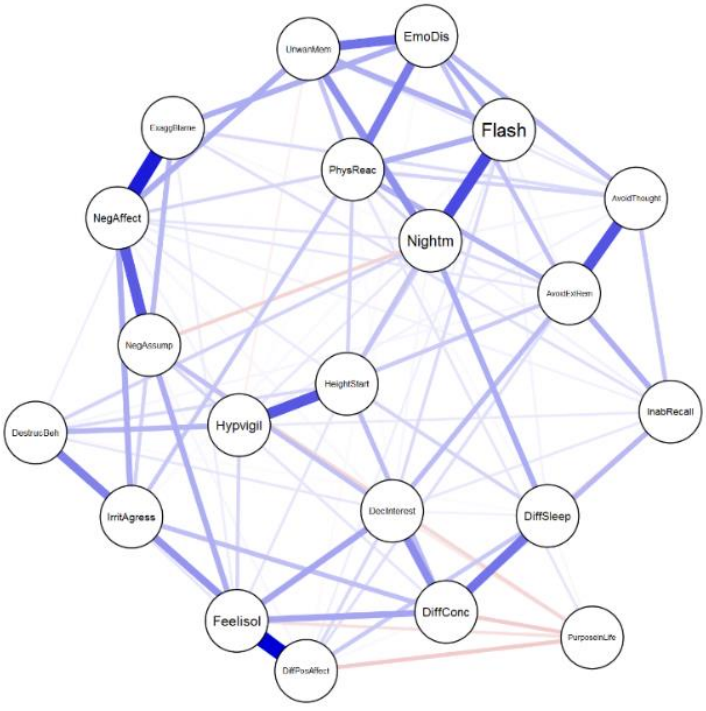
The degree of resilience in the network has a standard estimate score of -2.0, which means that the strength of resilience is two standard deviations away from the average strength of the PTSD symptoms. In figure 2. the standard estimate scores of the network are shown.



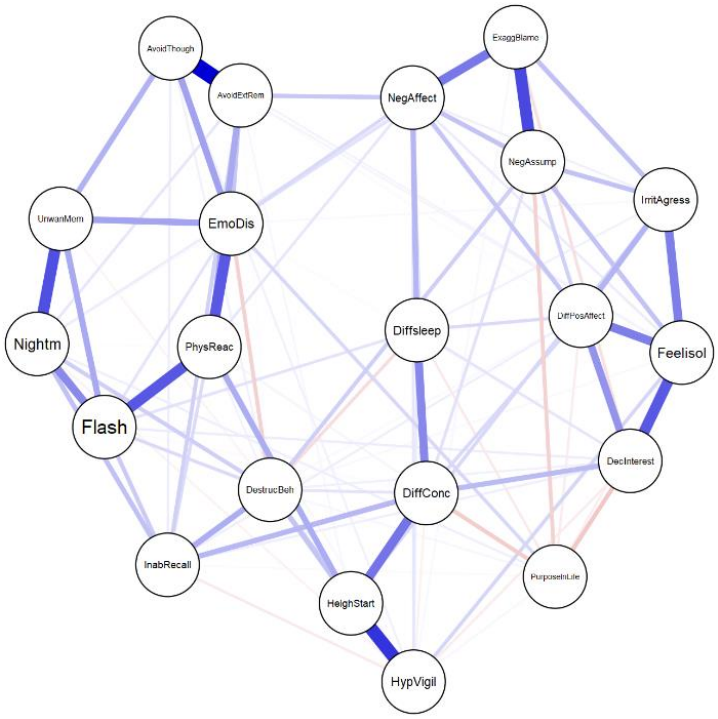
Resilience (baseline)



Resilience (follow up)



Purpose in life (baseline)



Purpose in life (follow up)

Figure 1.

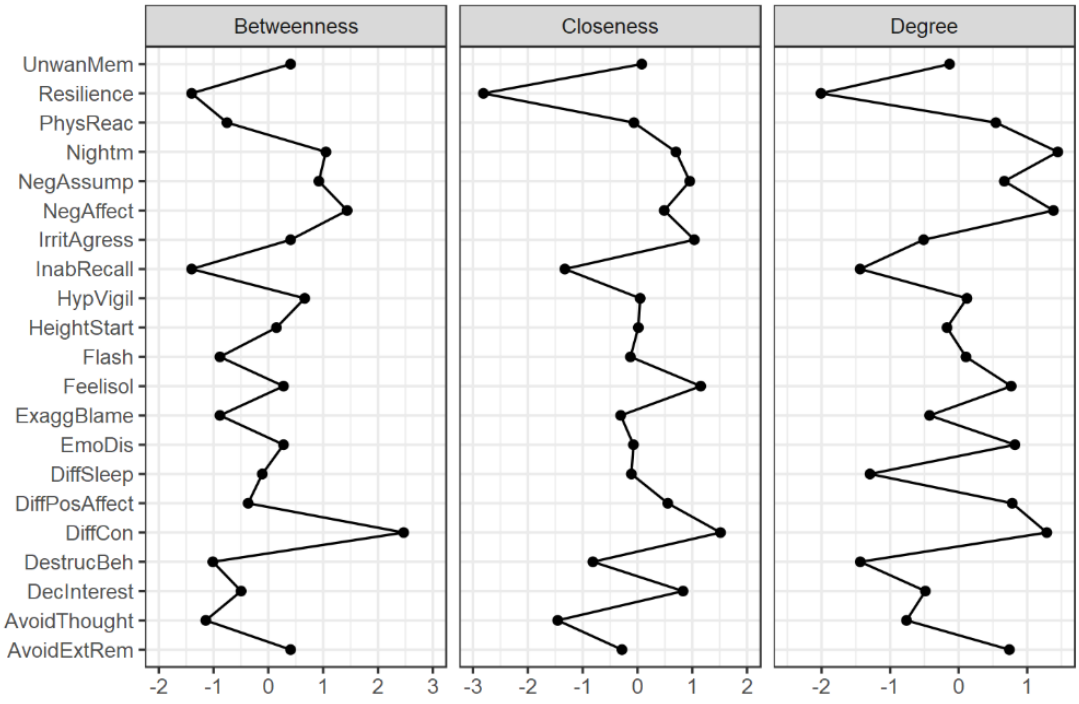


Figure 1.

3.2.2 Results at follow up

To see if the network is stable over time, follow up data was used to conduct the same network analysis at a different moment in time (using smaller samples, see methods section for details). The upper right corner of figure 1. shows the network analysis of PTSD symptoms and resilience in the follow up data. This data contains a highly similar sample as for the resilience network analysis at baseline. Resilience has a more central spot within this network. Resilience has negative relations with these five PTSD symptoms: (1) overly negative thoughts and assumptions about oneself or the world, (2) decreased interest in activities, (3) difficulty concentrating, (4) inability to recall key features of the trauma and a small negative relation with (5) irritability or aggression. High positive relations were found with the symptoms: (1) risky or destructive behaviour, (2) negative affect and (3) difficulty sleeping. Comparing this to the network analysis at baseline, it seems that some relations have disappeared or arisen. Stable relationships between the two analyses were found with the following symptoms:

- Overly negative thoughts and assumptions about oneself or the world (negative relation)
- Difficulty concentrating (negative relation)
- Decreased interest in activities (negative relation has become larger in follow up)
- Irritability or aggression (negative relation has become smaller in follow up)
- Risky or destructive behaviour (positive relation has become larger in follow up)

The centrality measures of the follow up network seem to have changed. The degree score of resilience is 0.02, of what we could say is average comparing to the other nodes. Figure 3. shows all the standard estimate scores of every node. Overall, we conclude that (compared to the interconnections among PTSD symptoms) resilience is rather weakly connected.

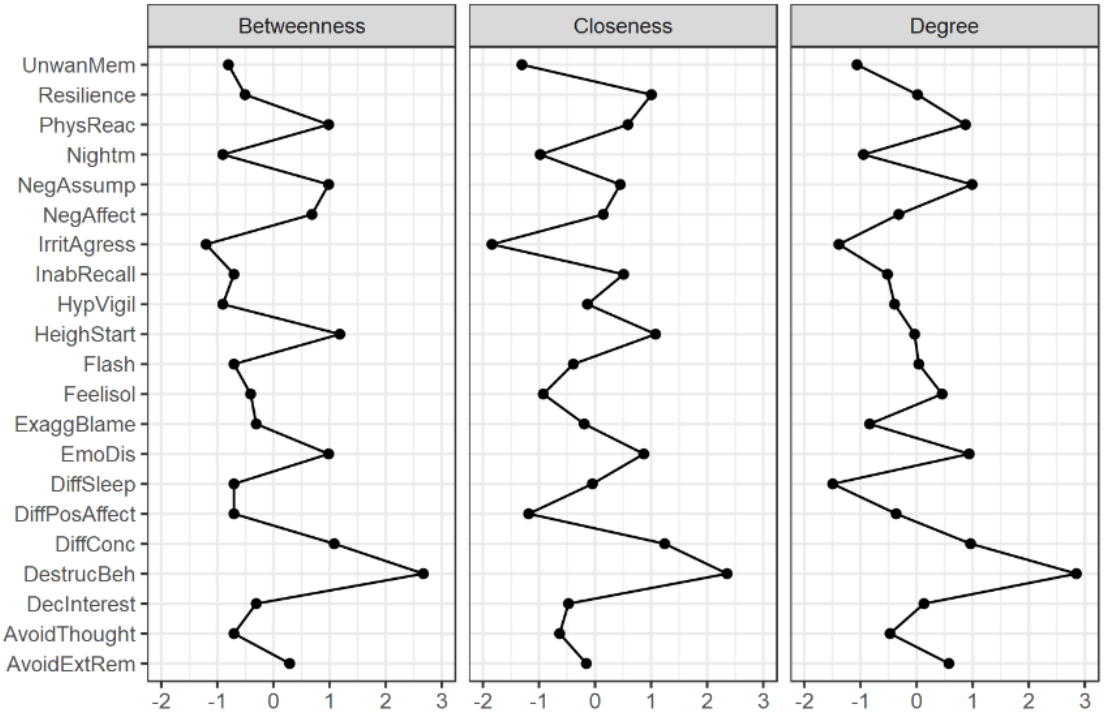


Figure 3.

3.3 Purpose in life network

3.3.1 Results at baseline

The network analysis of purpose in life and PTSD symptoms at baseline is shown in figure 1. in the lower left corner. Purpose in life has a direct negative relation with the PTSD symptoms (1) difficulty to concentrate and (2) difficulty experiencing positive effect and small negative relations with (3) feeling isolated and (4) decreased interest in activities. Difficulty sleeping has a positive relation with purpose in life.

The centrality measures for purpose in life and PTSD symptoms at baseline are depicted in figure 4. For degree the score is -2.4, which is very far below the mean.

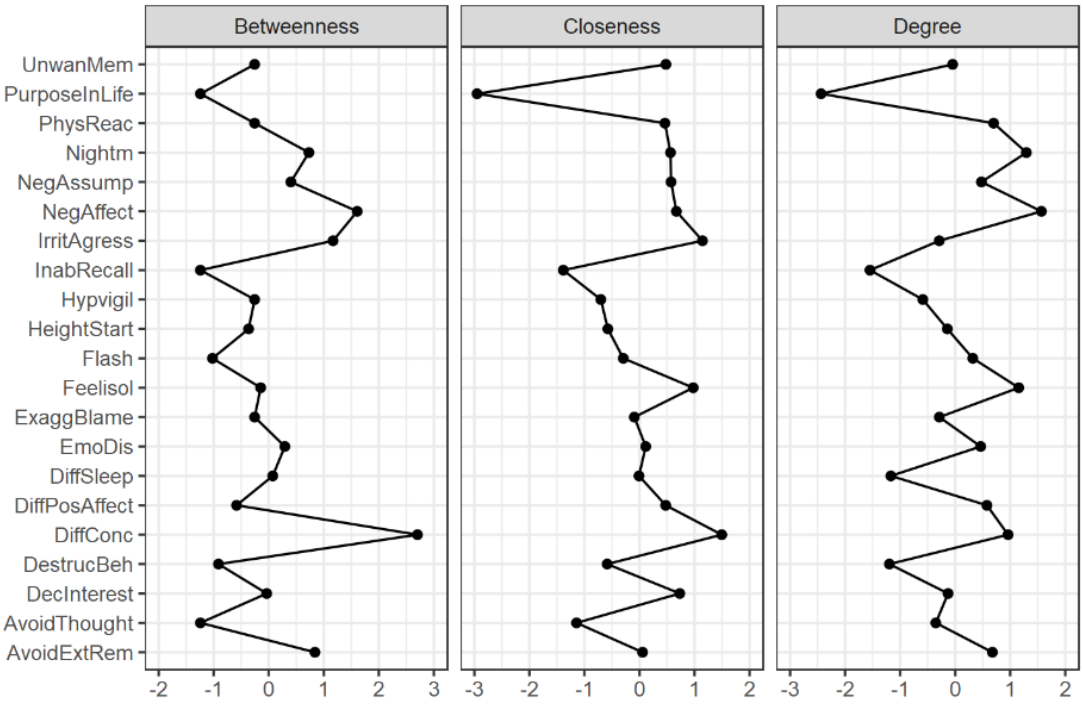


Figure 4.

3.2.2 Results at follow up

The network analysis of purpose in life and PTSD symptoms at follow up are depicted in figure 1. in the lower right corner. This data also consists of a highly similar sample. Purpose in life has a negative relation with the PTSD symptoms: (1) difficulty concentrating, (2) difficulty sleeping, (3) overly negative thoughts or assumptions about oneself or the world and (4) decreased interest in activities. A positive relation has been found with the PTSD symptom emotional distress after exposure to traumatic reminder. Comparing this to the network analysis at baseline, it seems that some relations have disappeared or changed. Stable relationships between the two analyses exist for the following symptoms:

- Difficulty concentrating (negative relation)
- Decreased interest in activities (negative relation has become larger in follow up)

The centrality measure degree for purpose in life in follow up is -2.6 and is comparable with the baseline. In figure 5. the centrality measures are depicted. The conclusion is that purpose in life is rather weakly connected in the network, when comparing to the interconnections among PTSD symptoms.

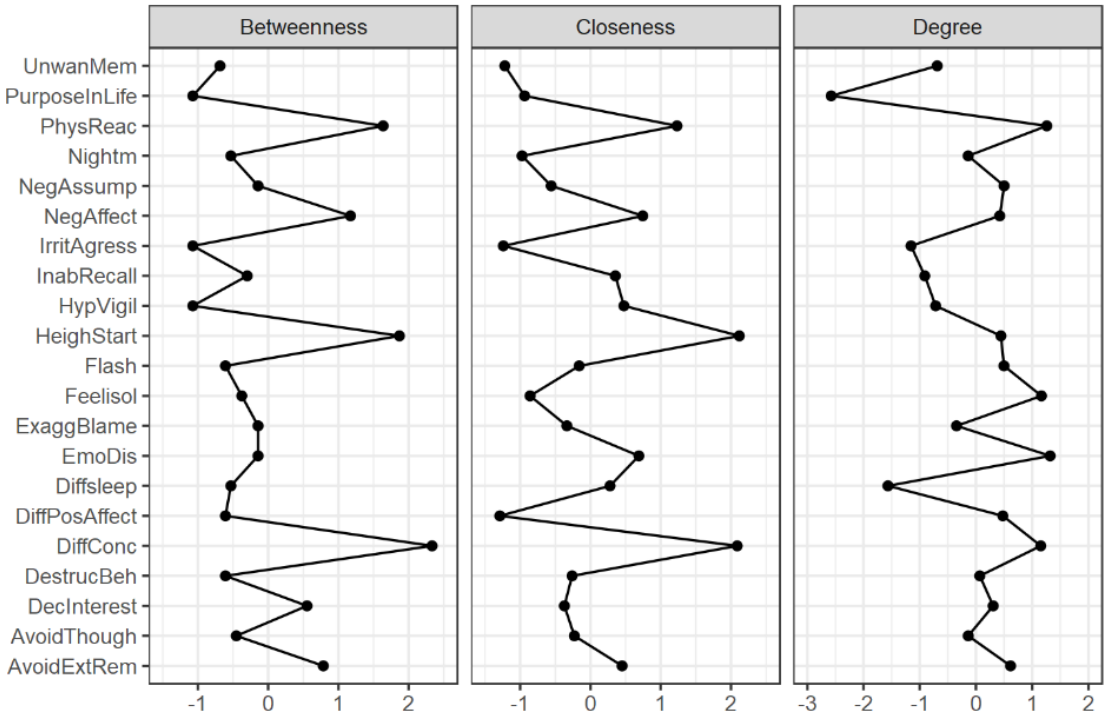


Figure 5.

4. Discussion

The current study analysed a network structure of DSM-5 PTSD symptoms combined with either resilience or purpose in life and also tested the stability of these network analyses. To the best of my knowledge, this is the first study to do so. This study was carried out with the prospect of contributing to the body of literature, of the network of PTSD symptoms and possible protective factors. Since the methodology is statistically challenging and this is the first study to venture into it, conservative conclusions need to be made.

4.1 Main findings

The four network analyses of this study showed that the individual PTSD symptoms are positively connected to each other overall, as was expected based on the literature (Bovin, et al., 2006; Armour, et al., 2017). Furthermore, the relations were all stable over time. The network analyses containing resilience and the PTSD symptoms showed negative relations between resilience and the PTSD symptoms: overly negative thoughts and assumptions about oneself or the world, difficulty concentrating, decreased interest in activities and irritability or aggression. The relations that were not stable over time are left out in the summation above. Research of Teche et al. (2017) stated that one of the different characteristics in participants with versus without PTSD was having strong personal values, solve problematic situation and face problems in an active manner. These are qualities recognizable in a resilient approach of

dealing with a stressful life event, to not let negative thoughts and assumptions get the upper hand and to keep seeing positive possibilities, yet this is only speculation. It is important to be aware of the fact that resilience is not just a characteristic one has. Resilience is an ongoing process influenced by the environment, experiences (Seery, Homan, Silver, 2010; Russo, Murrough, Han, Charney & Nestler, 2012) or maybe even by genetics as well (Wolf et al., 2017). The PTSD symptoms: negative thoughts and assumptions about oneself or the world as irritability or aggression may be related to the experiences and environment of the person. However, difficulty concentrating could be created by genetics. The question of which part of resilience has effect on the symptoms is yet unanswered. The negative relations found are smaller than expected. Yet, this might be due to the floor effect found in the study. Also, the degree of resilience went up to average in the follow up. Why this is, is not yet clear. Altogether, the results indicate that when resilience rises, the related symptoms should drop, which leads that resilience has the potential to be a protective factor against related PTSD symptoms. What was not expected, is the positive relation of resilience and the symptom risky or destructive behaviour. The relation also grew a lot stronger in the follow up network analysis than it was in the baseline network analysis. A clear explanation for this positive relation has not yet been found in existing literature. However, there is a study of Xing and Sun (2013) about the role of psychological resilience and risky decision making in investment choices. People with higher psychological resilience took more risky business decisions, creating more positive affect.

According to the network analyses, purpose in life has a negative relation with two PTSD symptoms: difficulty concentrating and decreased interest in activities. Even though these relations are stable over time, they are still weakly connected, which should be considered. The results suggest that when one's purpose in life goes up, difficulty with concentrating and having a decreased interest in activities should go down. Referring to the study of Teche et al. (2017) and specifically to the characteristic of having strong personal values of participants who did not develop PTSD, it seems logical that these two symptoms are negatively related to purpose in life. If focused on one's strong personal values, there might also be a strong purpose in life. This focus may ensure that one can still feel motivated to concentrate on one's goals and remain interested in the activities in life that correspond with those goals. On the other hand, literature suggests that a strong purpose in life can be created by being praised by parents and teachers or by feeling successful in events (Ishida & Okada, 2006). This study suggests that a firm purpose in life can decrease difficulty in concentrating. It is conceivable that children feel extra motivated to do their homework when they are praised for example, and as a consequence

their concentration level improves as they increasingly spend time on their homework assignment. The study of Henderlong and Lepper (2002) suggests that praise has a positive effect on intrinsic motivation in children and praised children were often seen as the ones with higher abilities and were very positive about their own effort and ability in their evaluations. If a child's ability to concentrate rises when they are motivated to work hard and this intrinsic motivation rises because of praise, it may lead to a moderator effect. If one's concentration ability rises by being praised or feeling successful because it improves intrinsic motivation, it might not have to do with the strong purpose in life which praise and success also creates. This in turn would mean that the protective effect of purpose in life on the concentration difficulties might not be exactly what it seems. The results do not say that purpose in life is not a protective factor, but since there are only two small negative relations out of the possible twenty, it would be an exaggeration to say this study proves the effect of purpose in life on individual PTSD symptoms. In addition, the two symptoms are also covered in the symptoms for which resilience is a protective factor. This is interesting on its own since purpose in life is often seen as a factor of resilience and raises questions. Is resilience protecting against the same two symptoms because it includes purpose in life or has resilience just a better reaching effect on its own? The answer is still unclear and might be a question for future research.

4.2 Limitations

The current study has a few limitations that influence the value of the results and generate suggestions for future research. The first limitation is the floor effect that was found. Because of this floor effect, it is possible that this study did not find stronger relations that may have been present. For this study, only participants who have a history of trauma filled in the PCL-5 and were used in the sample. It is possible that if the sample was pure clinical, the floor effect would have disappeared. Future research may benefit from different network structures for a healthy sample and a clinical sample. It could offer more light on the differences between people with PTSD and people without PTSD.

The second limitation is the gender inequality in the sample used. There was a male dominance in the participant groups of up to 90.3 percent. As a consequence, the results apply almost exclusively to men rather than the population as a whole. This has a negative effect on the external validity of this study. In addition, the ethnicity in the sample was skewed. Unfortunately, there was not enough data to process this correctly in the study, since only the follow-up samples were asked for their ethnicity. To ensure future research represents the whole population, a more evenly spread sample should be created. This would also enable a

comparison of results between men and women and/or race. A study argues that PTSD can screen differently for gender and/or ethnicity (Koo, Hebenstreit, Madden & Maguen, 2015), supporting the need to distinguish between these.

The third limitation of this study is that the analyses are group-level analyses. To create a starting point in illuminating how PTSD symptoms relate to resilience and purpose in life, network analyses in large groups are adequate for finding an average. When it comes to uncovering individual symptom networks, which may be dependent on one's personal trauma history or some other kind of this type of heterogeneity (Fried & Cramer, 2017), they are insufficient. The next step future research could try to take, is find a way to a more personalised approach.

The last limitation is the mix-up between 'meaning in life' and 'purpose in life'. In this study we speak of purpose in life, since the used measurement is created to test on purpose. The difference in the definition of meaning- and purpose in life changes within the different studies. This makes it harder to compare the results and find two clear, distinct definitions that are scientifically approved. In this study I did my best to keep the definition clear, but to some extent it might still be a grey area.

4.3 Conclusion

Resilience could be seen as a protective factor against four PTSD symptoms. Purpose in life could also be a protective factor against two PTSD symptoms, but the relations were too small to create enough evidence to prove this. Since the symptoms that were covered by purpose in life were also covered by resilience, it is still not clear if we should see those as separate or as one. This study does not yet answer the question of what the 'working part' is in resilience or purpose in life. It might be too early to conclude resilience and purpose in life are proven protective factors against the related PTSD symptoms. Future research is needed to clarify the exact relations and look into it in more detail. With this study, the first literal building blocks have been laid and we advise future research to benefit from a more equal clinical sample or even to try to take the next step in network analysis, for a more personalised approach.

Acknowledgement

The U.S. Department of Veterans Affairs National Center for Posttraumatic Stress Disorder supported The National Health and Resilience in Veterans Study.

References

Aiena, B. J., Buchanan, E. M., Smith, C. V. & Schulenberg, S. E. (2016). Meaning, Resilience and Traumatic Stress after the Deepwater Horizon Oil Spill: A study of Mississippi Coastal Residents Seeking Mental Health Services. *Journal of Clinical Psychology, 72,* 1264-1278. http://dx.doi.org/10.1002/jclp.22232

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. *Journal of Anxiety Disorders, 45,* 49-59. https://doi.org/10.1016/j.janxdis.2016.11.008

Bovin, M. J., Marx, B. P., Weathers, F. W., Gallagher, M. W., Rodriguez, P., Schnurr, P. P. & Keane, T. M. (2016). Psychometric Properties for the PTSD checklist for *Diagnostic and Statistical Manual of Mental Disorders - Fifth edition* (PCL-5) in Veterans. *Psychological Assessment, 28(11),* 1379-1391. http://dx.doi.org/10.1037/pas0000254

Bringmann, L. F., Elmer, T., Epskamp, S., Krause, W., Schoch, D., Wichers, M., & Snippe, E. (2019). What do centrality measures measure in psychological networks. *Journal of Abnormal Psychology, 128(8),* 892–90. http://doi.org/10.1037/abn0000446

Campbell-Sills, L. & Stein, M. B. (2007). Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): Validation of a 10-Item Measure of Resilience. *Journal of Traumatic Stress, 20 (6),* 1019-1028. http://dx.doi.org/10.1002/jts.20271

Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor–Davidson Resilience Scale (CDRISC). *Depression and Anxiety, 18,* 76–82. https://onlinelibrary.wiley.com/doi/abs/10.1002/da.10113

Cougle, J. R., Keough, M. E., Riccardi, C. J., & Sachs-Ericsson, N. (2009). Anxiety disorders and suicidality in the national comorbidity survey-replication. *Journal of Psychiatric Research, 43(9),* 825–829. http://dx.doi.org/10.1016/j.jpsychires.2008.12.004

Davidson JRT. Connor-Davidson Resilience Scale (CDRISC) Manual. Unpublished. 08-19-2018, accessible at www.cdrisc.com.

Epskamp, S. & Fried, E. I. (2018). A Tutorial on Regularized Partial Correlation Networks. *Psychological Methods, 23(4),* 617-634. http://dx.doi.org/10.1037/met0000167

Ferrada-Noli, M., Asberg, M., Ormstad, K., Lundin, T., & Sundbom, E. (1998). Suicidal behavior after severe trauma. Part 1. PTSD diagnoses, psychiatric comorbidity and assessments of suicidal behavior. *Journal of Traumatic Stress, 11(1),* 103–112. http://dx.doi.org/10.1023/A:1024461216994

Fried, E. I. & Cramer, A. O. J. (2017). Moving Forward: Challenges and Directions for Psychopathology Network Theory and Methodology. *Perspectives on Psychological Science,* 1-22. Http://dx.doi.org/10.1177/1745691617705892

Gross, G. M., Laws, H., Park, C. L., Hoff, R. & Hoffmire, C. A. (2019). Meaning in life following deployment sexual trauma: Prediction of posttraumatic stress symptoms, depressive symptoms, and suicidal ideation. *Psychiatric Research, 278 (19),* 78-85. https://doi.org/10.1016/j.psychres.2019.05.037

Henderlong, H. & Lepper, M.R. (2002). The effects of praise on children's intrinsic motivation: A review and Synthesis. *Psycholoogical Bulletin, 128(5),* 774-795. Http://dx.doi.org/10.1037//0033-2909.128.5.774

Ishida, R., & Okada, M. (2006). Effects of a firm purpose in life on anxiety and sympathetic nervous activity caused by emotional stress: assessment by psycho-psychological method. *Stress and Health, 22(4),* 275-281. http://dx.doi.org/10.1002/smi.1095

JASP - A Fresh way to do statistics. (2019, 20 november). Geraadpleegd van https://jasp-stats.org/

Kalish, R., Baker, D. G., Basten, U., Boks, M. P., Bonanno, G. A., Brummelman, E., … & Kleim, B. (2017). The resilience framework as a strategy to combat stress-related disorders. *Nature Human Behaviour, 1(11),* 784-790. Https://dx.doi.org/10.1038/s41562-017-0200-8

Kessler, R. C., Rose, S., Koenen, K. C., Karam, E. G., Stang, P. E., Stein, D. J., . . . & McLean, S. A. (2014). How well can post-traumatic stress disorder be predicted from pre-trauma risk factors? An exploratory study in the WHO World Mental Health Surveys. *World Psychiatry, 13(3),* 265–274. Https://dx.doi.org/10.1002/wps.20150

King, L. A., King, D. W., Keane T. M., Fairbank, J. A. & Adams, G. A. (1998). Resilience-recovery factors in post-traumatic stress disorder among female and male Vietnam veterans:

Hardiness, post-war social support, and additional stressful life events. *Journal of Personality and Social Psychology, 74*, 420-434. https://doi-org.ezproxy.leidenuniv.nl:2443/10.1111/j.1532-5415.2011.03788.x

Koo, K. H., Hebenstreit, C. L., Madden, E. & Maguen, S. (2015). PTSD detection and symptom presentation: Racial/ethnic differences by gender among veterans with PTSD returning from Iraq and Afghanistan. *Journal of Affective Disorders, 186,* 10-16. Http://dx.doi.org/10.1016/j.jad.2015.08.038

Owens, G. P., Steger, M. F., Whitsell, A. A. & Herrera, C. J. (2009). Posttraumatic Stress Disorder, Guilt, Depression, and Meaning in Life among Military Veterans. *Journal of Traumatic Stress, 22(6),* 654-657. http://dx.doi.org/10.1002/jts.20460

Pietrzak, R. H., Goldstein, R. B., Southwick, S. M., & Grant, B. F. (2011). Medical comorbidity of full and partial posttraumatic stress disorder in U. S. adults: Results from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychosomatic Medicine, 73,* 697–707. http://dx.doi.org/10.1038/nn.3234

Pietrzak R. H., Tsai J., Kirwin P. D., Southwick S. M. (2014). Successful aging among older veterans in the United States. *Am J Geriatr Psychiatry, 22(6),* 551-563. https://doi.org/10.1016/j.jagp.2012.11.018

Russo, S. J., Murrough, J. W., Han, M.-H., Charney, D. S. & Nestler, E. J. (2012). Neurobiology of resilience. *Nature Neuroscience 15,* 1475–1484. http://dx.doi.org/10.1038/nn.3234

Sareen J, Cox BJ, Stein MB, et al. (2007) Physical and mental comorbidity, disability, and suicidal behavior associated with posttraumatic stress disorder in a large community sample. *Psychosom Med 69(3),* 242–248. http://dx.doi.org/10.1097/PSY.0b013e31803146d8

Schulenberg, S. E., Schnetzer, L. W., & Buchanan, E.M. (2011). The Purpose in Life Test-Short Form: Development and Psychometric Support. *Journal of Happiness Studies, 12 (5),* 861-876. http://dx.doi.org/10.1007./s10902-010-9231-9

Seery, M. D., Holman, E. A. & Silver, R. C. (2010). Whatever does not kill us: cumulative lifetime adversity, vulnerability, and resilience. *J. Pers. Soc. Psychol.* 99, 1025–1041. http://dx.doi.org/10.1037/a0021344

Stockert von, S. H. H., Fried, E., Armour, C., & R. H. Pietrzak (2018). Evaluating the stability of DSM-5 symptom network structure in a national sample of U.S. military veterans. *Journal of Affective Disorders, 229,* 63-68. Http://doi.org/10.1016/j.jad.2017.12.043

Strauss, E., Norman, S. B., Tripp, J. C., Pitts, M. & Pietrzak, R. H. (2019). Purpose in life and conscientiousness protect against the development of suicidal ideation in U.S. military veterans with PTSD and MDD: Results from the National Health and Resilience in Veterans Study. *Chronic Stress, 3,* 1-10. https://doi.org/10.1177%2F2470547019872172

Tarrier, N., & Gregg, L. (2004). Suicide risk in civilian PTSD patients: predictors ofsuicidal ideation, planning and attempts. *Social Psychiatry and Psychiatric Epi-demiology, 39(8),* 655–661. http://dx.doi.org/10.1007/s00127-004-0799-4

Teche, S. P., Barros, A. J. S., Rosa, R. G., Guimarães, L. P., Cordini, K. L., Goi, J. D., Hauck, S. & Freitas, L. H. (2017). Association between resilience and posttraumatic stress disorder among Brazilian victims of urban violence: a cross-sectional case-control study. *Trends Psychiatry Psychoter, 39(2),* 116-123. http://dx.doi.org/10.1590/2237-6089-2016-0070

Whealin, J. M., Stotzer, R., Nelson, D., Li, F., Liu-Tom, H. T. & Pietrzak, R. H. (2013). Evaluating PTSD prevalence and resilience factors in a predominantly Asian American and Pacific Islander sample of Iraq and Istanbul Veterans. *Journal of Affective Disorders 150,* 1062-1068. http://dx.doi.org/10.1016/j.jad.2013.05.044

Wolf, E. J., Miller, M. W., Sullivan, D. R., Amstadter, A. B., Mitchell, K. S., Goldberg, J. & Magruder, K. M. (2017). A classical twin study of PTSD symptoms and resilience: Evidence for a single spectrum of vulnerability to traumatic stress. *Anxiety and Depression Association of America, 35,* 132-139. http://dx.doi.org/10.1002/da.22712

Xing, C. & Sun, J. (2013). The role of psychological resilience and positive affect in risky decision-making. *International Journal of Psychology, 48(5),* 935-943. http://dx.doi.org/10.1080/00207594.2012.729840