CONNECTIVITY BETWEEN BURNOUT DIMENSIONS IS STRONGER FOR PEOPLE WHO EXPERIENCE CHRONIC STRESS

A network approach to psychopathology

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Abstract

Scholars agree that chronic stress and burnout are related (Bayes et al., 2021; Maslach et al., 2001; Toker & Melamed, 2017) but primarily studied the impact of chronic stress on burnout, while overlooking the possible impact of chronic stress on the interaction of burnout dimensions. We want to fill this gap and hypothesize that individuals with high chronic stress show stronger connectivity between burnout dimensions. This hypothesis is derived from the network perspective, which states that symptoms can have a contagious effect on each other, and stronger connections and higher symptom activation are linked to negative health outcomes (Robinaugh et al., 2020).

We conducted a survey (n=451; working individuals) and assessed chronic stress (Perceived Stress Scale-10, Cohen et al., 1983) and burnout (Burnout Assessment Tool, Schaufeli et al., 2019; 4-Dimensional Symptom Questionnaire, Terluin, 1996).

We notice positive relationships ($p < .01$) between chronic stress and all of the burnout dimensions (exhaustion, mental distance, emotional impairment, cognitive impairment, psychosomatic complaints and psychological distress). We created low and high stress groups based on the norms of the PSS-10 and found a significant difference in centrality ($S=1.121, p=0$), and comparability in the weight of the edges ($M= .22, p= .189$). However, this effect could not be reproduced in the other analyses.

The three most central elements in all of the created networks are mental distance, exhaustion and psychological distress. This implies that prevention and intervention strategies should focus on these dimensions. Additionally, this study offers a contribution to the definition of burnout and the elements that should be included in it.

In summary, we showed that network analysis is promising and has clinical relevance. We hope that more studies will contribute to this domain to further unravel this relatively new approach.

Keywords: burnout, chronic stress, network, connectivity
Acknowledgements

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Literature review

Introduction

In this study, we handle two leading subjects: burnout and (chronic) stress. Burnout is a topic that receives increasing attention and quite some studies have been performed to unravel it, but a lot of ambiguity remains. After decades of burnout research, there still is no consensus regarding the definition, the diagnostical description and the measurement of burnout (Gerard & De Mol, 2020; Guzzi, 2019). Stress on the other hand, is a concept often used in daily conversations and thereby part of our everyday life. Additionally, relative unanimity exists regarding the association between burnout and (chronic) stress (Bayes et al., 2021; Gerber et al., 2020; Maslach et al., 2001, Toker & Melamed, 2017). But these studies remain quite general, in the sense that they focus on the impact of certain factors on symptoms and overlook that symptoms can also influence each other. This idea is intertwined in the network approach and forms a new way to look at mental disorders. In short, this approach states that symptoms form a network in which they interact with each other. When connections are stronger, the activation of a symptom will have a greater effect on the other symptoms (Borsboom & Cramer, 2013).

By our knowledge, the network approach has not yet been applied to chronic stress and burnout. The present study aims thereby to fill a gap in literature, by applying this upcoming approach and by hypothesizing that individuals with a high level of chronic stress will show stronger connections within their burnout network. The added value of this study is not just a contribution on a theoretical level, but can also provide valuable insights for clinical practice, as priorities regarding prevention and targeted interventions come forward, as will be explained later.

Further on in this study we predominantly prefer to use the term (burnout) dimensions instead of (burnout) symptoms. Dimensions represent a continuum, and this concept is thereby more nuanced as it demonstrates potential individual differences in terms of a degree (Kotov et al., 2017).

Structure of the present article

We begin with a literature review in which the impact of burnout and the prevalence are described. Then, we outline the classical definition of burnout and explain the approach that we will use in the current study. The Job Demands-Resources (JD-R) model, a leading model in burnout literature, is displayed to strengthen our choice in terms of the definition of burnout and the corresponding measurement instrument. To better understand burnout, (chronic) stress and its mechanisms, we highlight a biological approach. We conclude the literature
review by explaining the network framework and by formulating the research question and hypotheses. With the literature study providing a framework regarding burnout, chronic stress and the network approach, we then proceed to the performed study that will be described in the Method and Results-section. This study concludes with a Discussion and Conclusion in which the results are interpreted and compared to literature.

The impact of burnout

We start by explaining the ways in which burnout has an impact on individuals and society. Then, the prevalence of burnout is described, to highlight the relevance of this topic. There is great public interest nowadays in burnout, which can be observed by a growing amount of burnout coaches, plenty of keynotes on mental wellbeing at work, and countless articles in scientific literature and popular media. Attention to burnout is warranted, as psychosocial risks at work are higher since COVID-19, which can be explained by the higher demands, for example, for employees working in healthcare, or by a lack of control (Bourdeaud'hui et al., 2022). According to a systematic review performed by Deligkaris et al. (2014), burnout is linked to impairment in memory, executive functions, and attention. Burnout is also associated with turnover intention (Schaufeli & Bakker, 2004), emotional exhaustion (Lizano, 2015) and cognitive impairment in everyday life (van der Linden et al., 2005).

A systematic review demonstrated that burnout is a significant predictor of several physical parameters: "hypercholesterolemia, type 2 diabetes, coronary heart disease, hospitalization due to cardiovascular disorder, musculoskeletal pain, changes in pain experiences, prolonged fatigue, headaches, gastrointestinal issues, respiratory problems, severe injuries and mortality below the age of 45 years" (Salvagioni et al., 2017, p.1). Burnout is also related to psychological issues, such as: "insomnia, depressive symptoms, use of psychotropic and antidepressant medications and hospitalization for mental disorders" (Salvagioni et al., 2017, p.1).

Burnout does not only impact the employee but has huge consequences on organizations and society (Veldhuis et al., 2020), because of the influence on costs and productivity (Guzzi, 2019) by its impact on work ability (Glise et al., 2010), sickness absence, intention to leave work and early retirement (Ahola & Hakenen, 2014; Swider & Zimmerman, 2010). Furthermore, Bakker (2009) demonstrated that burnout can cross over to the intimate partner.
When considering the negative impact of burnout, both for the individual, partner, companies, and society, it is troubling to notice that the number of employees with burnout (symptoms) rises throughout the years. A study from Braeckman et al. (2019) estimated a prevalence of 1.4 percent of burnout in the Belgian working population. Bourdeaud'hui et al. (2019) found that in 2014, 10.2% of the Flemish employees reported burnout symptoms. In 2019, this number increased to 13.6%. Burnout symptoms were more often reported by women (15.2% versus 11.7% males), by employees working in healthcare (15.2%) and education (21.1%) and by people in the age category of 50-54 years (14.9%). When looking at the self-employed, similar numbers were found (Bourdeaud'hui et al., 2020): in 2019, 12% of the Flemish entrepreneurs reported burnout symptoms. Burnout symptoms were more frequently reported by self-employed persons in their thirties (16.6%), working in construction (16.6%) and in hospitality (16.1%).

The initial burnout literature focused on professions with a human services component, but in the meanwhile, scholars agree that burnout can occur in any occupation (Demerouti, 2001). Burnout is not even limited to the work context, but can also happen to students, the so-called academic burnout (Reis et al., 2015), to parents—parental burnout (Griffith, 2022)—or to people who work as a volunteer (Desart et al., 2017).

**The classical definition of burnout**

The arguments discussed above confirm that burnout affects many people and has an impact in multiple ways. To better understand what burnout is, we will investigate the way in which different instances describe burnout.

The Diagnostic and Statistical Manual of Mental Disorders (DSM) lists mental diseases. Burnout, however, is not included as a diagnosis in the fifth version of the DSM. This lack of a clear definition is not without consequences, as it complicates the diagnostic process, the development of successful treatment and the policy making (Gerard & De Mol, 2020).

The 11th revision of the International Classification of Diseases (ICD-11) on the other hand, did develop a definition for burnout and defines it as being work-related. The most common description of burnout states that it is a syndrome that consists of three parts: lack of energy, mental distancing and feeling incompetent (World Health Organization, 2019).

Hoge Gezondheidsraad, an advisory board for the Belgian government, endorses this rationale and explains the relationship between the symptoms. Burnout can be seen as a: “professional exhaustion which is caused by an imbalance between the investment someone
makes and the return that follows” (Gerard & De Mol, 2020, p.286). This gap results in emotion
dysregulation and causes problems on a cognitive level, which is linked to a change in behavior,
mental distancing, and reduced competencies. Burnout results from long-term exposure to
constant stress and is multifaceted. Societal factors, personality and organizational factors can
contribute to its development (Gerard & De Mol, 2020). Interesting elements in the approach of
Hoge Gezondheidsraad are the complexity of burnout, in the sense that many factors interplay
with it, and that burnout is seen as a consequence of exposure to chronic stress.

The lack of a clear definition and the link between burnout and exposure to (chronic)
stress motivated Swedish researchers to introduce a new diagnosis in 2005: stress-related
exhaustion disorder. Despite that this diagnosis needs to be distinguished from burnout, the
criteria for this disorder are somewhat comparable to how burnout is often operationalized,
namely: “lack of mental and physical energy, impairment of concentration and memory,
emotional lability and sleep disturbance, along with physical manifestations of stress”
(Kalliomäki & Brodda Jansen, 2021, p.2). The main difference is that burnout remains a
syndrome that is often viewed as work-related, while with exhaustion disorder, the symptoms
are due to general external stressors that must not be work-related (Kalliomäki & Brodda
Jansen, 2021).

Towards a new definition of burnout

In the previous section we described that there currently is no consensus on the
description of burnout. However, there is a leading definition. In this part, we will discuss the
current golden standard and explain why we prefer another approach.

When consulting burnout literature, the idea of it being a three-dimensional construct
(lack of energy, mental distancing and feeling incompetent) has huge popularity, which is
shown in the extensive usage of this definition in burnout research (Bianchi et al., 2015). The
Maslach Burnout Inventory (MBI), an instrument based on this definition is used in most of
burnout research (80 to 90%) (Bianchi et al., 2015). However, it seems that the three-
dimensional definition and its matching instrument are considered as the standard since it was
the first to be developed and not because of its theoretical strengths (Maslach & Leiter, 2016;
Schaufeli & Buunk, 1996). Meanwhile, scholars take a critical approach and state that the
selection of the items in the MBI is rather arbitrary and lacks a systematical investigation
(Bianchi et al., 2015).
Another finding is that the conceptualization of burnout consisting of three dimensions is incoherent since studies show that the core component, emotional exhaustion, is linked to depressive symptoms and not so much to the other two symptoms (mental distancing and reduced competence). This raises the question why depression is not part of the definition and the other two remain in it (Bianchi et al., 2015). Additionally, scholars suggest that mental distancing could be viewed as a behavior that follows exhaustion and feeling incompetent is often a consequence of chronic stress, meaning that these components should not be considered as distinct domains in the definition (Kristensen et al., 2005). Furthermore, studies show that people can experience burnout without personal incompetence, which suggests that it is not a core symptom but a possible side effect (Bakker et al., 2004; Green et al., 1991; Shirom, 1989). As a response to this critique, Schaufeli et al. (2020a) propose a new definition of burnout and a new instrument, the Burnout Assessment Tool (BAT), based on input from clinicians working in the field. Burnout is defined as a syndrome that consists of four core elements: "exhaustion, mental distance, cognitive and emotional impairment" (Figure 1) (Schaufeli et al., 2020a, p.1).

**Figure 1**

_The conceptualization of burnout as used in the Burnout Assessment Tool (BAT) (Schaufeli, De Witte, & Desart, 2020b)._
Exhaustion refers to energy depletion, on a psychological and physical level. Mental distancing can be seen as maladaptive behavior as a response to exhaustion, which unfortunately leads to more stress. Emotional impairment means that someone is less able to cope with their emotions, whereas cognitive impairment shows in difficulties with memory and attention (Schaufeli et al., 2020a). The four core dimensions are thus related to: “an inability, manifesting itself in lack of energy and unwillingness in increased resistance, reduced commitment, lack of interest and disengagement” (Schaufeli et al., 2020a, p.3). Notwithstanding that exhaustion is the symptom that stands out most, exhaustion alone is not sufficient to diagnose someone with burnout. It needs to be accompanied by mental distancing and cognitive difficulties (Desart et al., 2017).

On top of the four core symptoms, three secondary symptoms are uncovered: “non-specific psychological distress, psychosomatic complaints, and a depressed mood” (Schaufeli et al., 2020a, p.4). Psychological distress manifests itself in unwanted emotions, arousal, and problems in one’s daily functioning. Psychosomatic complaints are the physical issues that result from psychological factors. Depressed mood forms a consequence of experienced disillusion or loss (Schaufeli et al., 2020a).

**Job Demands-Resources model**

Because of the discussed critique towards the classical definition of burnout, we choose the burnout definition of Schaufeli et al. (2020a) and the BAT as matching instrument. To further argument our choice, we introduce the well-known JD-R model (Figure 2) and then shortly explain how the BAT fits into this approach.

**Figure 2**

*The Job Demands-Resources Model (Schaufeli, 2017).*
The JD-R model consists of two important elements, which are also part of each job: demands and resources. Job demands are “aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs” (Demerouti et al., 2001, p.501). In other words, these are negative elements that cost a lot of energy, such as: high work pressure and irregular work hours (Demerouti & Bakker, 2011). Job resources are positive factors, or “aspects of the job that may do any of the following: (a) be functional in achieving work goals; (b) reduce job demands and the associated physiological and psychological costs; (c) stimulate personal growth and development” (Demerouti et al., 2001, p.501). High job demands in combination with low job resources, are related to a stress process and can lead to burnout and by consequence, to negative health outcomes. The JD-R model also includes a beneficial pathway. A motivational process is activated when there are high job resources, which leads to work engagement and favourable consequences (Schaufeli, 2017). A more in-depth analysis of the JD-R model would unfortunately lead to far from the scope of the current study but can be found in the referred studies.

As mentioned, we want to clarify the connection between the JD-R model and the BAT. As shown in the model, job demands are positively correlated to burnout and job resources are negatively correlated to burnout. This is supported by the studies of Innstrand (2022), Mazzetti et al. (2022), Oprea et al. (2021) and Sjöblom et al. (2022) (Schaufeli & De Witte, 2023). Additionally, the model states that burnout acts as a mediator of the connection between work characteristics (job demands and job resources) and outcomes. This would imply that studies using the BAT should also be able to demonstrate this relationship (Schaufeli & De Witte, 2023). Multiple studies tested this assumption and were able to support it (Cho, 2020; Sakakibara et al., 2020). Guthier et al. (2020) found a reverse strain effect of burnout on job characteristics in which burnout impacts the perception. The BAT can also account for this effect, as studied by Buonomo et al. (2022).

**Chronic stress**

Since we investigate how chronic stress impacts burnout dimensions, we will discuss chronic stress and the relationship with burnout in this paragraph. When talking about burnout, stress is a word that is often mentioned in the same sentence. Furthermore, burnout and (chronic) stress are two concepts often used as if they are some sort of synonym, which is not correct. Burnout must be seen as a possible outcome of being exposed to chronic stress at the
workplace. Someone can experience chronic stress, and this can possibly lead to burnout, but it does not have to (World Health Organization, 2019).

Marin et al (2011) explain that chronic stress can function as an accelerator for already existing weaknesses. Since stress distorts the perception and assessment of a situation, long-term stress can create a vicious cycle. For example, early life adversity (ELA) is associated with multiple negative health outcomes such as a higher risk for stress-related disorders.

Gerber et al. (2020) demonstrate that higher occupational stress levels are positively related to burnout symptoms. Scholars also showed that burnout symptoms and chronic stress are connected (Bayes et al., 2021; Maslach et al., 2001), and at least moderately correlated (Toker & Melamed, 2017). Chronic stress being a crucial element in the definition of burnout is an approach that is more often used in clinical psychology than in work and organizational psychology. Van Dam (2021) arguments that clinical psychologists use a biopsychosocial view and emphasize that burnout occurs in a stress-related context (that can be work-related as well but does not have to). On the other hand, in work and organizational psychology, the psychosocial angle is stressed, and the focus is more on the work-related part. As we want to apply a comprehensive view, we shortly dive into the biological aspects as this further explains the impact of chronic stress on burnout symptoms. We will focus on the allostatic load (AL-)model since this is a multifaceted explanation. The AL-model forms an interesting angle because it describes burnout as a possible result of a process in which a wear and tear-effect arises because of ongoing chronic stress (McEwen & Stellar, 1993). Multiple studies showed a connection between allostatic load and burnout (Bellingrath et al., 2009; Juster et al., 2011; Kakiashvili et al., 2013).

**Figure 3**

*Stress, allostasis, and allostatic load (Lee, Kim, & Choi, 2015).*

![Stress, allostasis, and allostatic load](image)
Figure 3 demonstrates the impact of stress stimuli on the levels of stress mediators. Lee et al. (2015) describes that acute stress impacts adaptive responses and can have a motivational power. However, persistent stressors and prolonged overactivation without sufficient recovery can create a vicious cycle of dysregulation leading to pathology (McEwen, 1998).

Stressors implicate physical changes such as an elevated heart rate. When the stressor disappears, the body returns to homeostasis, as shown by the blue arrows (Lee et al., 2015). Homeostasis is the self-regulating process of the body and assures "internal stability while adjusting to changing external conditions" (Billman, 2020, p.1). When stress stimuli become chronic and excessive, it is possible that there is no recovery to the initial homeostatic level. As a result, a new set point is formed (Lee et al., 2015).

Allostatic load is the difference between the initial and the newly formed set point and presents how the body adapts to long-term stress. It can be measured physically in primary mediators (e.g.: hypercortisolemia), in secondary (e.g.: elevated body mass index) and tertiary outcomes (e.g.: coronary heart disease) (Lee et al., 2015).

Bellingrath et al. (2009) operationalized chronic work stress as an effort-reward imbalance (ERI) that demonstrates the disequilibrium between personal costs and gains. This imbalance leads to stress and an elevated risk for stress-related diseases. Even in a healthy sample, small but significant correlations were found between work stress (increased ERI) and allostatic load, as well as exhaustion and allostatic load. When someone constantly and during a long period needs to modify his behavior to stressors, a wear-and-tear effect comes forward.

The described studies demonstrate a vivid interaction between (chronic) stress and negative health impairment, such as burnout. In the following part, we look into the network approach, which is a new perspective to study psychopathology that allows us to define psychological constructs as being part of a network in which they influence each other through their connections and activation (Robinaugh et al., 2020).

**Analysis of psychological phenomena**

In this study we investigate how a certain factor, chronic stress, influences the interaction between burnout dimensions. The network approach is relatively new with its first conceptual basis in 2008 (Fried et al., 2017). In this paragraph, the network perspective and its predecessors are described.
In the past, researchers often used reflective and formative models to describe psychological phenomena. Reflective models imply a causal relationship between a psychological construct (cause) and multiple variables (effect). Formative models also visualize a causal relationship, but between multiple variables (cause) and a psychological construct (effect) (Fried, 2017). One of the methodological problems with reflective and formative models is that they are not suitable to model complex systems, because they overlook the possibility that multiple relationships may exist between psychological constructs, and it assumes a one-way causality (Borsboom et al., 2011a). This reductionism is shown in, for example, a narrow focus on the biological basis of mental disorders, an approach that dominated other positions on the formation of psychopathology in the past decades (Borsboom et al., 2019). Also, clinical research is overshadowed by prioritizing disorders instead of symptoms and thereby underestimates the autonomy of the latter (Borsboom et al., 2011a).

Therefore, a third perspective is put forward: the network perspective. In the context of psychopathology, the network view can be translated as follows: mental diseases have underlying interacting symptoms that influence each other and form a system. It is the direct interaction between the symptoms that causes the disorder (Borsboom, 2017; Fried, 2017). Networks with strongly connected symptoms demonstrate the connectivity hypothesis, meaning that the activation of a symptom has a contagious effect on the others (Robinaugh et al., 2020). Even a relatively small external stressor could start a cascade of activation in the network (Cramer et al., 2016). When the relations between the symptoms are strong, feedback loops emerge, which can lead to long-term elevated activation in the network (Borsboom, 2017; Robinaugh et al., 2020). Not only symptoms, but also environmental factors should be included in networks. These could be certain life events, relationships, or physical objects (de Boer et al., 2021).

The network perspective presents an explanation for comorbidity between mental disorders: the underlying symptoms and interactions between them are mutual (so-called bridge symptoms) (Fried, 2017). Borsboom et al. (2011a) found that connections exist between half of the symptoms in the DSM-IV network, which explains the comorbidity. Networks have a transdiagnostic nature, which is shown in the shared underlying symptoms. These symptoms are more inclined to act as bridge symptoms in comparison to specific disorder-related symptoms (Borsboom et al., 2011b).
Figure 4

Network structure, network state and the definition of mental disorder (Borsboom, 2017; Cramer, Waldorp, van der Maas & Borsboom, 2010; Robinaugh, Hoekstra, Toner & Borsboom, 2020).

Figure 4 shows different degrees of network state and network structure. These concepts can be used to define mental health and mental disorder (Borsboom, 2017; Cramer et al., 2010; Robinaugh et al., 2020). The top left panel shows mental health, this is when there is both low symptom activation and low connectivity. The bottom left panel shows transient symptoms. This means that the individual is neither in a state of mental health and neither suffers from a mental disorder. When a stressor disappears after a while, the symptoms will decrease. However, when the individual has a strongly connected network (top right panel), there may not be a symptom activation yet, but the person is at greater risk, which is called a silent disorder. The final network state is when the individual experiences symptom activation even when the stressor is no longer present. This is a stable phase, called mental disorder, in which the individual suffers from negative health consequences (bottom right panel) (Borsboom, 2017; Cramer et al., 2010; Robinaugh et al., 2020).

Phase transitions were found to be more expressed in networks with stronger connectivity. This means that external factors have a greater impact on strongly connected
networks leading to an abrupt change from a healthy to a pathological state (Fried et al., 2017). In less strongly connected networks, the activation follows a dimensional path meaning that it does not cause such instant changes (Robinaugh et al., 2020).

The network approach has great clinical importance since the networks of healthy individuals can show early signs before turning into an unfortunate condition, which can be relevant in terms of prevention (Fried et al., 2017). Also, it is important to focus on the most central and connected elements in the network, as they have fast access to the other components and can trigger them easily. Scholars agree that the most central elements are the ones to prioritize in the context of prevention and treatment (Fried et al., 2017). Stronger connectivity is also found to be related to a less positive prognosis (van Borkulo et al., 2015), which further underlines the clinical opportunities of the network approach.

On the other hand, we must admit that the functioning of network models is not yet fully unraveled. Madhoo & Levine (2016) showed that treatment caused changes in the connectivity of a person’s network. But Robinaugh et al. (2020) demonstrated in their metareview that multiple scholars did not find such a reduction in the network connectivity after treatment, and two studies even reported an increased connectivity (Beard et al., 2016; Bos et al., 2018). These findings show there still is a lot to discover regarding the network approach.

**Figure 5**

*Low stress (A) and high stress (B) networks of burnout dimensions. Simplified view created by the author for illustrative purposes.*

**A.**

**B.**

*Note.* Blue lines represent positive associations. The brightness and thickness of the edges show the association strength.
Conclusion

As revealed in the literature review, burnout and stress are much-discussed topics. But still, clarity is missing regarding the definition, measurement, and the theoretical framework. Besides this, there is a new approach which sees mental disorders as networks. This approach provides a great opportunity to test if it also holds for chronic stress and burnout dimensions. The network approach has potential in terms of theoretical importance and on a clinical level. This leads to the following research questions and hypotheses:

**Research question:** What is the effect of chronic stress on the connectivity between burnout dimensions?

**Hypotheses:**

H1: There is a positive relationship between burnout dimensions and chronic stress.

H2: The connectivity between burnout dimensions is stronger in people who experience high levels of chronic stress (as shown in Figure 5).
Method

Procedure

This study focuses on the Dutch speaking working population (employee and self-employed), ages 18 to 65 years. Students and people who are retired or looking for a job were excluded from the study. The survey was distributed through multiple social media channels: LinkedIn, Facebook groups, Discord and Whatsapp. Participants were encouraged to share the survey within their network. Additionally, the researchers contacted multiple companies from their personal network and asked them to distribute the survey among the employees to reach a larger number of respondents. Three organizations agreed and distributed the questionnaire internally. The respondents participated on a voluntary basis, with no incentive offered. To protect the privacy of the participants, the survey was completely anonymous.

Table 1

Sample sizes in network analysis studies.

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Year</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A network analysis of DSM-5 posttraumatic stress disorder symptoms and correlates in U.S. military veterans</td>
<td>Armour et al.</td>
<td>2017</td>
<td>(n = 221)</td>
</tr>
<tr>
<td>A network approach to parental burnout</td>
<td>Blanchard et al.</td>
<td>2021</td>
<td>(n = 1,551)</td>
</tr>
<tr>
<td>Exploring the idiographic dynamics of mood and anxiety via network analysis</td>
<td>Fisher et al.</td>
<td>2017</td>
<td>(n = 40)</td>
</tr>
<tr>
<td>Using network analysis to identify central symptoms of adolescent depression</td>
<td>Mullarkey et al.</td>
<td>2019</td>
<td>(n = 1,409)</td>
</tr>
<tr>
<td>Predictors of stigma in a sample of mental health professionals: network and moderator analysis on gender, years of experience, personality traits, and levels of burnout</td>
<td>Solmi et al.</td>
<td>2019</td>
<td>(n = 318)</td>
</tr>
<tr>
<td>Nursing professionals’ mental well-being and workplace impairment during the COVID-19 crisis: a network analysis</td>
<td>Tokac &amp; Razon</td>
<td>2021</td>
<td>(n = 83)</td>
</tr>
</tbody>
</table>
To determine the sample size, we analysed the number of participants in similar previous studies. Using a comparable sample size as previous studies is an adequate method when the sample size justification in the previous study also holds for the present one (Lakens, 2022). A search in Google Scholar shows the sample sizes which are used in previous network studies in the field of psychology (Table 1). Unfortunately, these studies do not mention a sample size justification. Also, the sample sizes differ a lot, ranging from 40 participants to 1,551. The mean sample size across the studies is 604.

To further explore the required number of participants, we could use simulation. Unfortunately, this was not a feasible method considering the time constraints of this study. As an alternative, we conducted a power analysis using G-power (version 3.1.9.7). We choose this tool since the Network Comparison Test (NCT) that we will use in the analysis is somewhat similar to a bootstrapped t-test and network analytical techniques are not available as an option in G-power. We choose for a two-tailed t-test (two independent means), a power of .80 and alpha of .05. For the effect size we simulated two results: one with a small effect size (Cohen’s $D = .2$) and one with a medium effect size (Cohen’s $D = .5$). To be able to detect a small effect size, a total sample of 788 participants ($n = 394$ in each group) is required. For a medium effect size, a total sample size of 128 participants ($n = 64$ in each group) is needed. Considering this information as well as the available time and resources, we decided to recruit a minimum of 400 participants. This will allow us to reliably detect a medium effect size (and thus also a large effect size). However, we will have low power to detect small effects.

**Questionnaire:** The survey was presented as an online questionnaire and was programmed in Qualtrics. The survey was accessible starting from February 15, 2023, until April 19, 2023. It took approximately 10 minutes to complete the survey. The survey consisted of multiple parts, such as: informed consent (Appendix 1), socio-demographic questions (Appendix 2), Burnout Assessment Tool (BAT: work-related version, Schaufeli et al., 2019, Appendix 3), 6 items from the 4-Dimensional Symptom Questionnaire (4-DSQ, Terluin, 1996, Appendix 4) and Perceived Stress Scale (PSS-10, Cohen et al., 1983, Appendix 5). More information about the scales can be found below. At the end of the questionnaire, the contact details of the researcher were once again shown, as well as the contact details of the Brussels University Consultation Center (BRUCC) and the national help services Zelfmoordlijn and Tele-Onthaal, so that participants could reach out to professional help if the questionnaire provoked unwanted thoughts or feelings.
Sample

Number of participants: We reached 590 participants with our survey. 3.73% of them are retired, 1.36% of them are looking for a job, 0.85% of them are currently inactive due to sickness and 6.78% are a student. Since we focus on the working population (employee or self-employed), we excluded these participants from the survey. Due to missing data, we can continue with 451 participants who are part of our target group and completed the survey.

Description of the sample:

- **Professional status:** 81.37% persons are an employee (of them 12.81% are a civil servant), 14.63% are self-employed and 3.55% are partly working as an employee and partly self-employed.
- **Age:** The youngest person in the sample is 20 years old and the oldest is 64 years old. The average age is 39.34 years (SD=11.07). The median is 38 years.
- **Educational level:** When we look at the highest degree that the participants obtained, we see that 0.67% only completed elementary school, 17.74% completed secondary school, 8.20% have a graduate degree, 32.82% have a bachelor’s degree, 39.25% have a master’s degree and 1.33% obtained a PhD.
- **Industry:** The participants work in different industries and are distributed as follows: 38.14% health and social services, 13.30% education, 9.09% administration and support, 4.88% public administration, defence and social security, 4.21% industry, 4.21% financial activities and insurance, 3.99% wholesale, retail and vehicle repair, 3.55% liberal professions, scientific and technical activities, 3.33% information and communication, 2.44% construction, 0.89% accommodation and meals, 0.67% art, amusement and recreation, 0.44% transportation and storage, 0.44% exploitation and real estate, 10.42% other.
- **Sex:** Of the 476 participants, 77.38% are female, 22.40% are male and one person chose not to answer this question.
- **Managerial function:** 24.17% of the participants perform a managerial function.
- **Number of years in the current function:** Participants were, on average, 8.78 years in their current function (SD=9.82). The median is 5 years.
- **Marital status:** 41.69% of the participants are married, 28.38% are in cohabitation, 19.07% of the participants are single (never married), 7.32% are in a relationship without cohabitation or marriage, 3.55% are divorced and not a single person is a widow.
Measurement

Socio-demographic variables: We included eight socio-demographic variables in our questionnaire (Appendix 2): professional status, age, educational level, industry, sex, managerial function, number of years in the current function and marital status. We only used these variables to gain insights into the sample, its characteristics and representativeness.

Burnout: We used the work-related version of the BAT to measure burnout dimensions (Appendix 3, Schaufeli et al., 2019). This version consists of 33 questions that are categorized into six subscales: exhaustion (eight items), mental distance (five items), emotional impairment (five items), cognitive impairment (five items), psychosomatic complaints (five items), and psychological distress (five items). The participant must assess how often each described feeling or thought is present: never (1), seldom (2), sometimes (3), often (4), always (5). The higher the total score, the higher the degree of burnout related concerns. Exhaustion, mental distance, emotional and cognitive impairment refer to the primary dimension of burnout. Psychosomatic and psychological distress are two of the three secondary dimensions (Schaufeli et al., 2020a).

The BAT is developed by Schaufeli et al. (2020a) as an alternative for the popular instrument Maslach Burnout Inventory (MBI) (Aguayo et al., 2011). We preferred the BAT because some critical remarks can be made about the MBI. First, there are some issues concerning the way burnout is conceptualized: the JD-R model explains the underlying process of burnout, however, this theoretical framework is not represented in the MBI (Desart et al., 2017). Additionally, there are no items regarding cognitive impairment and stress complaints (Deligkaris et al., 2014). Secondly, the MBI has psychometric issues concerning the wording of certain items and the scoring (Desart et al., 2017). Thirdly, the usefulness of the test results is unclear since there is no cut-off score to define if a person can be diagnosed with burnout. The MBI was originally meant to use in research contexts, and not to serve diagnostical purposes (Schaufeli et al., 2020a). Also, the norm groups are insufficient (Desart et al., 2017). To tackle the shortcomings of the MBI, Schaufeli et al. (2020a) developed the BAT. As mentioned, the BAT evaluates four core symptoms and two secondary symptoms. The authors choose not to implement the third secondary symptom, depressed mood, into the questionnaire, since there exist plenty of validated instruments for this.

To estimate the reliability of the BAT, we calculated the internal consistency. The subscales exhaustion ($k= 8, \alpha = .88$), mental distance ($k= 5, \alpha = .83$), emotional impairment ($k= 5, \alpha = .81$), cognitive impairment ($k= 5, \alpha = .88$) and psychological distress ($k= 5, \alpha = .82$) demonstrate a very
good internal consistency. The subscale psychosomatic complaints ($k = 5, \alpha = .78$) shows a good internal consistency.

**Depression:** As advised by Schaufeli et al. (2020a), we used six items from the depression scale of the 4-DSQ to measure the third secondary symptom, see Appendix 4 (Terluin, 1996). The 4-DSQ consists of 50 items that are grouped into four categories: distress, depression, anxiety, and somatisation. All the questions refer to concerns that the individual experienced during the past week. One can indicate how often these concerns were present: not (0), sometimes (1), frequently (2), often (2) or very often / all the time (2). When the scores are summed, the total score shows the level of depression: low, moderate increase ($>10$) or high increase ($>20$) (Terluin, 1996).

We calculated the internal consistency for the depression subscale ($k = 6, \alpha = .90$), which is excellent.

**Chronic stress:** We used the PSS-10 to measure chronic stress, see Appendix 5 (we used the Dutch version, Boon, 2022). The PSS-10 is a self-report questionnaire that reflects the extent that someone qualifies events that happen to them as stressful (Cohen et al., 1983). The ten items are focused on the feelings and thoughts someone experienced the last month. The response categories are constructed as a Likert-scale: never (0), almost never (1), sometimes (2), fairly often (3) and very often (4). The total score can be calculated by adding up the individual scores on each question (and reversing the scores for four questions) and shows the level of perceived stress: low (scores between 0 and 13), moderate (scores between 14 and 26) or high (scores between 27 and 40) (Cohen et al., 1983).

Lee (2012) performed a literature review on the PSS and found that it has acceptable psychometric characteristics. Taylor (2015) also found that conclusions derived from the PSS-10 scores are valid. However, as with many other instruments, there are certain limitations. The PSS-10 was not originally designed to measure chronic stress but has already been used for it. Scholars found the following: “our data suggest that the subjective ratings of stress were strongly associated with perceived chronic stress” (Knauft et al., 2021, p.5). However, a limitation is that these conclusions must be restricted to: “the individual’s perception of chronic stress, rather than chronic stress as measured by a life event schedule or physiology” (Knauft et al., 2021, p.11).

The internal consistency for the subscale chronic stress ($k = 10, \alpha = .88$) is very good.
Analysis

Data exploration

The data will be explored by performing the descriptive statistics, mean and standard deviation, of the subscales using R (version 2023.03.0).

**Hypothesis 1: There is a positive relationship between burnout dimensions and chronic stress**

The relationship between burnout dimensions and chronic stress will be studied by calculating the Pearson correlations between the scales, using R (version 2023.03.0). The correlations and significance levels will be presented in a table.

**Hypothesis 2: The connectivity between burnout dimensions is stronger in people who experience high levels of chronic stress (as visualised in Figure 5)**

The analysis consists primarily of a study on the connectivity between burnout dimensions and chronic stress. The analysis and visualisations will be performed in R (version 2023.03.0).

**Rationale for using networks analysis:** Psychometric networks consist of both nodes and edges. Nodes are the symptoms of a mental disease, and the edges form the connections between them (Fried et al., 2016). The thickness of the edges represents the connectedness between the nodes (Borsboom & Cramer, 2013). Networks of symptoms can have a weak or a strong connection (Fried, 2017). When connections are stronger, the activation of certain symptoms will have a greater effect on the other symptoms (Borsboom & Cramer, 2013). The strength of network analysis is that relationships cannot just be calculated statistically, but also represented visually (de Beurs, 2017).

**Groups:** To test the hypothesis of this study, participants will be divided into groups. This will be done in two different ways. First, we will create two groups based on the score on the PSS-10 scale. There will be a group with the participants who scored a total that is below the median score \( n = 245 \) (“low stress”) and a group with a score above the median score \( n = 206 \) (“high stress”). Second, we will create three groups based on the cut-off score for the PSS-10: “low” (score below 14) \( n = 173 \), “moderate” (score between 14 and 27) \( n = 252 \) or “high” (score above 28) \( n = 26 \). Since the group with a high chronic stress score is too small in comparison to the other groups, we decided to combine the moderate and high scoring participants in one group. Thus, this brings us to two groups: “low stress” (low stress scores) \( n = 173 \) and “high stress” (moderate and high stress scores) \( n = 278 \).
Variables: In the created networks of low versus high stress, we will first include the seven burnout dimensions (the six subscales of the BAT and the depression subscale of the 4-DSQ). Afterwards, we will also analyse the network based on the specific item-scores (n=39) of the seven burnout dimensions. This will allow us to investigate the networks in a more detailed way.

Estimation method: The networks will be estimated according to the defined groups described above. The networks will be stored in a bootnet object (Rodrigues, 2021) and estimated with EBICglasso, which is a regularized estimation method using glasso and Extended Bayesian Information Criteria (EBIC) Model selection (Burger et al., 2022). We only included the participants who completed at least one subscale. Of the 476 participants, 96.43% of the participants completed the full questionnaire. We assume that the missing data follows a random pattern (Rubin, 1976). EBICglasso uses pairwise deletion to handle missing data (Burger et al., 2022).

Group comparisons: The networks will be compared using the NetworkComparisonTest (van Borkulo et al., 2021).

Centrality indices: Centrality is a parameter to estimate the position of a symptom in comparison to other symptoms in the network. This has clinical relevance since highly central dimensions can spread their impact through the network and thereby activate other symptoms (Fried et al., 2016). When investigating the centrality differences, we focus on the strength of the edges between the nodes as well as the node strength centrality. Strength centrality is defined as: “the sum of all absolute edge weights a node is directly connected to” (Bringmann et al., 2019, p.10).

General network strength: The S statistic tests the activation and shows the potential differences between the networks to test the second hypothesis. Also, we test the significance of these differences with the Network Comparison Test using a permutation seed value of ‘123’ and 1,000 iterations (Rodrigues, 2021).

Differences between edges: The M statistic will show the highest difference value and thereby demonstrates the potential differences between the edges of both networks. We will test if this difference is significant by using a permutation test, namely the package Network Comparison Test with a permutation seed value of ‘123’ and 1,000 iterations. A significant result implies that at least one edge difference is detected between the two networks. Furthermore, when the M statistic is significant, we will perform a post hoc analysis (Rodrigues, 2021). We used Bonferroni-Holm corrections as they are advised to check for potential edge differences (van Borkulo et al., 2021).
Results

Descriptive statistics

Table 2 shows the mean and standard deviation of the variables from this study. When comparing the burnout variables, we note diverse values. In our sample, psychological distress \((M= 2.73, SD= .78)\) and exhaustion \((M= 2.50, SD= .62)\) are the burnout dimensions with the highest mean. Mental distance \((M= 1.90, SD= .69)\) and emotional impairment \((M= 1.90, SD= .58)\) have the lowest mean score. The mean score on depression is low in comparison to the other variables \((M= .21, SD=.41)\), which can be explained by the coding of the answers. When a participant answers that the symptoms were not present, this is coded as the number zero, while in the BAT, the lowest possible score is one.

Table 2

Descriptive statistics, mean and standard deviation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burnout (BAT):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaustion</td>
<td>2.50</td>
<td>0.62</td>
</tr>
<tr>
<td>Mental distance</td>
<td>1.90</td>
<td>0.69</td>
</tr>
<tr>
<td>Emotional impairment</td>
<td>1.90</td>
<td>0.58</td>
</tr>
<tr>
<td>Cognitive impairment</td>
<td>2.30</td>
<td>0.65</td>
</tr>
<tr>
<td>Psychosomatic complaints</td>
<td>2.33</td>
<td>0.69</td>
</tr>
<tr>
<td>Psychological distress</td>
<td>2.73</td>
<td>0.78</td>
</tr>
<tr>
<td><strong>Depression (4-DSQ):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>.21</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Chronic stress (PSS-10):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic stress</td>
<td>1.58</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Note. \(M= \) mean, \(SD= \) standard deviation.
### Table 3

*Pearson correlations.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burnout (BAT):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Exhaustion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mental distance</td>
<td>.61**</td>
<td>.53**</td>
<td>.51**</td>
<td>.56**</td>
<td>.60**</td>
<td>.45**</td>
<td>.61**</td>
<td></td>
</tr>
<tr>
<td>3. Emotional impairment</td>
<td>.53**</td>
<td>.52**</td>
<td>.40**</td>
<td>.40**</td>
<td>.48**</td>
<td>.40**</td>
<td>.49**</td>
<td></td>
</tr>
<tr>
<td>4. Cognitive impairment</td>
<td>.51**</td>
<td>.44**</td>
<td>.40**</td>
<td>.32**</td>
<td>.43**</td>
<td>.36**</td>
<td>.43**</td>
<td></td>
</tr>
<tr>
<td>5. Psychosomatic complaints</td>
<td>.56**</td>
<td>.27**</td>
<td>.40**</td>
<td>.32**</td>
<td>.63*</td>
<td>.30**</td>
<td>.55**</td>
<td></td>
</tr>
<tr>
<td>6. Psychological distress</td>
<td>.60**</td>
<td>.39**</td>
<td>.48**</td>
<td>.43**</td>
<td>.63**</td>
<td>.45**</td>
<td>.65**</td>
<td></td>
</tr>
<tr>
<td><strong>Depression (4-DSQ):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Depression</td>
<td>.45**</td>
<td>.44**</td>
<td>.40**</td>
<td>.36**</td>
<td>.30**</td>
<td>.45**</td>
<td>.52**</td>
<td></td>
</tr>
<tr>
<td><strong>Chronic stress (PSS-10):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Chronic stress</td>
<td>.61**</td>
<td>.41**</td>
<td>.49**</td>
<td>.43**</td>
<td>.55**</td>
<td>.65**</td>
<td>.52**</td>
<td></td>
</tr>
</tbody>
</table>

*Note.*  *p < .05,  **p < .01*
Hypotheses

H1: There is a positive relationship between burnout dimensions and chronic stress

Table 3 shows the correlations between the variables of this study. Only positive and significant ($p < .01$) correlations were found, which supports hypothesis 1. When zooming in on the correlations between burnout dimensions and chronic stress, we notice a great variation in the strength of the correlations. The strongest correlation is found between chronic stress and psychological distress ($r = .65, p < .01$). Psychosomatic complaints and mental distance have the weakest correlation ($r = .27, p < .01$).

H2: The connectivity between burnout dimensions is stronger in people who experience high levels of chronic stress

This hypothesis will be examined by dividing the participants into groups: a low stress versus a high stress score. These groups are created by splitting the sample based on the median stress score (PSS-10). In each group, a psychometric network is estimated. In addition, we created groups based on the norms of the PSS-10, and again estimated a psychometric network in each group. To finish, we will zoom in on the burnout dimensions by analysing them on the item level to see how this potentially influences the connectivity.

Table 4

<table>
<thead>
<tr>
<th>Burnout dimension</th>
<th>Short code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive impairment</td>
<td>COG</td>
</tr>
<tr>
<td>Emotional impairment</td>
<td>EMO</td>
</tr>
<tr>
<td>Mental distance</td>
<td>MEN</td>
</tr>
<tr>
<td>Exhaustion</td>
<td>UIT</td>
</tr>
<tr>
<td>Depression</td>
<td>DEP</td>
</tr>
<tr>
<td>Psychological distress</td>
<td>PSY</td>
</tr>
<tr>
<td>Psychosomatic complaints</td>
<td>PSO</td>
</tr>
</tbody>
</table>
Psychometric networks based on the median score on the PSS-10 – subscale level

Figure 6
Low stress (A) and high stress (B) networks. The groups are based on the median score of the PSS-10.

We create two networks based on the median score on the PSS-10: a low stress ($n=245$) versus a high stress group ($n=206$) (Figure 6). Both networks consist of seven nodes and represent the burnout dimensions from the BAT (Schaufeli et al., 2019). In the low stress network, there is one negatively correlated connection, namely between mental distance (MEN) and psychosomatic complaints (PSO). In the high stress network, only positive associations are found. In the low stress network, the strongest connections are found between exhaustion (UIT) and mental distance (MEN), mental distance (MEN) and emotional impairment (EMO) and between psychological distress (PSY) and psychosomatic complaints (PSO). In the high stress network, the same three connections are strong. On the other hand,
the connection between depression (DEP) and mental distance (MEN) is stronger in the high stress network. It is remarkable how some dimensions are not connected, for example: depression (DEP) and cognitive impairment (COG) in the low stress network, while in the high stress network, these dimensions have a weak connection. In the high stress network, cognitive impairment (COG) and psychosomatic complaints (PSO) have no connection, while in the low stress network, a weak connection exists.

The low stress network has 18 out of 21 non-zero edges (85.71%) and a mean weight of the edges of 0.11. In the high stress network, the number of non-zero edges is comparably but somewhat lower, 17 out of 21 (80.95%) and the mean weight is 0.1. The max value is 0.41 and the biggest edge difference is 0.15. The global strengths per group are 2.57 and 2.61 resulting into a strength difference between the two networks of 0.05. After examining the network invariance and the general network strength, we notice that the networks are not significantly different since $M=.15, p=.8$ and $S=.05, p=.905$. This means that based on a group comparison with the median score on the PSS-10, hypothesis 2 is rejected.

**Figure 7**

*Node strength centrality: low stress (A) and high stress (B) network. The groups are based on the median score of the PSS-10.*

Note. See Table 4 for dimension short codes.
We visualized the node strength centrality (Figure 7). In both networks, we find a rather abrupt change in the dimension’s importance. The dimension which is most central in the network differs: for network A, mental distance (MEN) has the highest importance and for network B, this is exhaustion (UIT). However, the three most central dimensions are the same for both networks: mental distance (MEN), exhaustion (UIT) and psychological distress (PSY). In the low stress group, depression (DEP) has the lowest strength of all dimensions. For the high stress group, cognitive impairment (COG) has the lowest dimension centrality. This was shown in Figure 6, where these dimensions are located in the periphery of the network and have fewer and weaker connections leading to them.

**Psychometric networks based on the norms of the PSS-10 – subscale level**

**Figure 8**

Low stress (A) and high stress (B) networks. The groups are based on the norms of the PSS-10.

*Note.* Blue lines represent positive associations, red lines negative ones. The brightness and thickness of the edges show the association strength. See Table 4 for dimension short codes.
We examine the groups based on the norms of the PSS-10: “low stress” ($n=173$) and “high stress” ($n=278$) (Figure 8). These networks consist of seven nodes representing the burnout dimensions from the BAT (Schaufeli et al., 2019). In the low stress network, there are only positive associations. The strongest associations are between mental distance (MEN) and exhaustion (UIT) and between mental distance (MEN) and emotional impairment (EMO). In general, there are fewer and weaker connections in comparison to the high stress network. There are dimensions with only two connections leading to them, such as: depression (DEP) and psychosomatic complaints (PSO). In the high stress network, there is one negative relationship between mental distance (MEN) and psychological distress (PSY). Psychological distress (PSY) and psychosomatic complaints (PSO) demonstrate the strongest connection.

In the low stress group, 14 out of 21 are estimated to be above zero (66.67%) and the mean weight is 0.09. In the high stress network, the number of non-zero edges and the mean weight are slightly higher, namely: 20 out of 21 (95.24%) and 0.130. The max value is 0.43 and the biggest edge difference is 0.22. The global strengths per group are 1.94 and 3.06, which leads to a strength difference of 1.12. The networks seem to be comparable in the weight of the edges, but there is a difference in centrality (i.e.: edge strength) since $M=\cdot22, p=\cdot189$ and $S=1.12, p=\cdot0$.

**Table 5**

*Strength differences.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>UIT</td>
<td>.40</td>
</tr>
<tr>
<td>MEN</td>
<td>.15</td>
</tr>
<tr>
<td>EMO</td>
<td>.16</td>
</tr>
<tr>
<td>COG</td>
<td>.40</td>
</tr>
<tr>
<td>PSO</td>
<td>.16</td>
</tr>
<tr>
<td>PSY</td>
<td>.01</td>
</tr>
<tr>
<td>DEP</td>
<td>.00</td>
</tr>
</tbody>
</table>

*Note.* See Table 4 for dimension short codes.

Because of the significant difference in the strengths, we show them in Table 5. We see that exhaustion (UIT) and cognitive impairment (COG) have the largest difference in
strength between the two networks, namely: .40. This implicates that these dimensions are more central in the high stress group compared to the low stress group. Depression (DEP) has the smallest difference in strength between the two networks, namely: no difference at all, which means that for this dimension there are no differences in term of centrality in the low versus high stress network. Psychological distress (PSY) also has a very low strength of .01. Based on this group comparison, hypothesis 2 can partly be accepted since there is a significant difference in centrality between the two networks.

**Figure 9**

*Node strength centrality: low stress (A) versus high stress (B) network. The groups are based on the norms of the PSS-10.*

![Figure 9](image)

**Note.** See Table 4 for dimension short codes.

Figure 9 shows the node strength centrality. The decline in dimension importance is smoother in comparison to Figure 7. Nevertheless, there are great differences between the strength of the dimensions. In the low stress network, exhaustion (UIT) is the most influential dimension and for the high stress network, this is mental distance (MEN). The three most
influential dimensions for both networks are: exhaustion (UIT), mental distance (MEN) and psychological distress (PSY). In the high stress network, the strength of these three dimensions is somewhat comparable, in comparison to the low stress network where the differences are more pronounced. Depression (DEP) has the lowest centrality in the low stress network. In the high stress network, cognitive impairment (COG) can be considered as a centrality outlier. These findings are shown visually in Figure 8 as depression (DEP) and cognitive impairment (COG) lie in the periphery of the network and the connections with the other dimensions are weaker.

**Psychometric networks based on median score on the PSS-10 – item level**

**Figure 10**

Low stress (A) and high stress (B) networks. The groups are based on the median score of the PSS-10.

Note. Blue lines represent positive associations, red lines negative ones. The brightness and thickness of the edges show the association strength. See Table 4 for dimension short codes.
We zoom in on item level and examine the groups based on the median chronic stress score (Figure 10). 39 nodes represent the burnout items (BAT and 4-DSQ). The networks show similarities: only positive associations are found, and exhaustion (UIT) lies central, while the psychosomatic items (PSO) are in the periphery. In the high stress network, item PSO 5: “I often get sick” has no connections at all. In the low stress network, the depression-items only connect with themselves, while in the high stress network, there are a few, relatively weak, direct connections with exhaustion (UIT) and mental distance (MEN). The number of non-zero edges are 112 out of 741 (15.11%) (low stress) and 135 (18.22%) (high stress). The mean weights are: 0.0135 (low stress) and 0.01 (high stress). The max value is 0.50 and the biggest edge difference is 0.23. The global strengths per group are 9.96 and 10.65 (strength difference: 0.69). Hypothesis 2 is rejected since there are no differences between the network’s edges weight or the network strength, $M = .23, p = .391$, and $S = .69, p = .176$.

**Figure 11**

Node strength centrality: low stress (A) versus high stress (B) network. The groups are based on the median score on the PSS-10.

*Note.* See Table 4 for dimension short codes.
Figure 11 shows the node strength centrality. In the low stress network, there is a less smooth decline in the dimension’s importance, e.g.: there is a great difference between the item with the highest importance: MEN3: "I feel a strong aversion towards my job” and the one with the second highest importance: EMOS: "At work I may overreact unintentionally". The items with the lowest importance have a remarkably low strength of (almost) zero. In the high stress network, the differences between the centrality are less pronounced and the items with the lowest strength still have a relatively high strength of .6. It is remarkable that the item with the highest strength in the high stress network: UIT8: “At the end of my working day, I feel mentally exhausted and drained” is only situated on the 18th place in the low stress network and thus has a much lower importance in this network.

For the low stress network, the item with the highest importance: MEN3: “I feel a strong aversion towards my job” scores much lower in the high stress network (14th place).

**Psychometric networks based on the norms of the PSS-10 – item level**

Lastly, we examine the groups based on the norms of the PSS-10 and we focus on item level (Figure 12). We again include 39 nodes that represent the items of the BAT and the depression scale of the 4-DSQ (Schaufeli et al., 2020a). In both networks, no negative associations are found. In the high stress network, much more and stronger associations are found in comparison to the low stress network. The low stress network has certain items that are almost isolated since they have very few and weak connections, such as PSY1: "I have trouble falling or staying asleep", PSY4: "I feel anxious and/or suffer from panic attacks", PSY5: "Noise and crowds disturb me" and DEP1: "During the past week, did you feel that everything is meaningless". In general, the low stress network appears to be a recollection of isolated islands of dimensions where the items mostly connect with other items of the same dimension and to a lesser extent with items of other dimensions. In the high stress network, there are no items that are isolated, they all have multiple connections (however some of them are relatively weak). The high stress network shows a very prominent and strong connection between item DEP3: “During the past week, did you feel that you would be better off if you were dead” and DEP6: “During the past week, did you ever think ‘I wish I was dead’”. This connection exists in the low stress network but is considerably weaker. This strong relationship is likely due to the similar wording of both items.
Figure 12

*Low stress (A) and high stress (B) networks. The groups are based on the norms of the PSS-10.*

In the low stress network, the number of non-zero edges is 76 out of 741 (10.26%) and the mean weight is 0.00911. In network high stress, the number of non-zero edges is considerably higher, namely: 250 out of 741 (33.74%) and the mean weight is 0.02. The max value is 0.64 and the biggest edge difference is 0.46. The global strengths per group are 6.75 and 17.74, which means a strength difference of 10.99. There is no significant difference between the network’s edges weight since, \( M = 0.46, p = .053 \) and there is no significant difference in the general network strength, since \( S = 10.99, p = .294 \). Based on these results, hypothesis 2 is rejected.
Discussion

In this study we wanted to gain insights into the connectivity of burnout dimensions in individuals with low versus high chronic stress. The first hypothesis is that there would be a positive relationship between chronic stress and burnout dimensions. This stems from the frameworks that are described in the literature review, such as the allostatic load model (Lee et al., 2015), which explains the biological mechanisms of (chronic) stress and the JD-R model (Schaufeli, 2017). The second hypothesis investigates the connectivity between burnout dimensions and states that this would be stronger in people with higher levels of chronic stress. To investigate the research questions of this study, we conducted a survey in which we assessed chronic stress with the PSS-10 (Cohen et al., 1983) and burnout dimensions with the BAT (Schaufeli et al., 2019) and the 4-DSQ (Terluin, 1996) in the working population (n=451).

As part of the analysis, we created visual representations of the networks (Figures 6 to 12). The edges in the psychometric networks represent the partial correlations between the dimensions. The edges are weighted since the thickness of the edges demonstrates the magnitude of the connection. Also, the edges are undirected since they connect the dimensions but do not show which dimension is the originator of the activation (McNally, 2016). Next, we investigated the strength centrality. Strength centrality is an interesting parameter since it visualizes the chance that when a dimension activates, this will lead to other dimensions’ activation (McNally, 2016). We performed statistical tests to compare the strength and activation of the networks and the significance of potential differences.

The current study shows that there is a connection between chronic stress and burnout dimensions. We found positive and significant relationships between chronic stress and all of the burnout dimensions. This means that hypothesis 1 can be accepted. These results are consistent with the findings of Gerber et al. (2020) who demonstrated that higher occupational stress levels are positively related to burnout dimensions and other scholars that found correlations between chronic stress and burnout (Bayes et al., 2021; Maslach et al., 2001, Toker & Melamed, 2017).

For the second hypothesis, we divided the participants into groups based on low versus high stress scores. First, we divided them based on the median score on the PSS-10. We compared the connectivity between the burnout dimensions on subscale level and on item level. Both types of analysis could not demonstrate significant differences between the two
networks. Second, we divided the participants into groups based on the norms of the PSS-10. On item level, no significant differences were found, however on subscale level, we could demonstrate significant differences between the networks, which is why we focus on the interpretation of these results.

The negative correlation in the high stress network between mental distance (MEN) and psychological distress (PSY) is quite surprising as literature states that mental distancing can be defined as maladaptive behaviour resulting from exhaustion and leads to more stress (Schaufeli et al., 2020a). We would thereby rather expect a positive correlation.

The visual representation of the networks shows more and stronger connections in the high stress network. Statistical analysis demonstrates that the networks show a significant difference in centrality. When zooming in on the differences, exhaustion (UIT) and cognitive impairment (COG) are more central in the high stress group compared to the low stress group. This is coherent with literature that emphasises the central role of exhaustion as well as cognitive difficulties resulting from stress and burnout (Desart et al., 2017; Schaufeli et al., 2020a).

As scholars found that depression is linked to exhaustion and argument that it needs to be included in the definition of burnout (Bianchi et al., 2015), we could expect that depression (DEP) would be more central in the high stress group than in the low stress group, however this is not the case in our sample. Also, we can conclude that differences between the networks are more likely to occur when the individuals are grouped based on the norms of the PSS-10 rather than based on the median score, which could mean that the categorization based on clinical norms is more meaningful than based on a statistical metric.

In summary, this study was able to detect a relationship between chronic stress and burnout. However, the impact of chronic stress on the connectivity of burnout dimensions was harder to demonstrate as we did not find significant differences in all the analyses. The possible reasons for the null effects will be discussed in the limitations section.

**Practical implications**

This study showed that chronic stress correlates to burnout dimensions. This suggests that prevention and intervention strategies aimed at the reduction of chronic stress in the workplace would be valuable. The JD-R model could help to list the perceived job demands and resources and thereby detect improvement areas by trying find a better balance between these components (Schaufeli, 2017).
This study shows that in all the groups, both based on the median score of the PSS-10 as on the norms of the PSS-10, and in both low and high stress networks, the dimensions: mental distance, exhaustion and psychological distress are the three most central ones. This means that these dimensions are likely to activate others, which is an important insight with clinical relevance. When clinicians focus on these dimensions when treating burnout patients or while setting up prevention programs, there is an impact not only on the targeted dimensions but on the entire network. This could have thus a great impact on the prevention and intervention strategies of burnout and the symptoms they should prioritize (Fried et al., 2016). Our finding of exhaustion being one of the most central elements is found in other studies as well (Bianchi et al., 2015).

Furthermore, these three dimensions contribute to the definition of burnout since one could argue that the most central elements should be included in it. The definition of the ICD-11 states that burnout is a syndrome that consists of three parts: lack of energy, increased mental distance and reduced professional competence (World Health Organization, 2019) and thereby has two of the central elements of our study in it. The definition of Schaufeli et al. (2020a) made a split between four core dimensions: “exhaustion, mental distance, cognitive and emotional impairment” (Schaufeli et al., 2020a, p.1) and three secondary symptoms: “non-specific psychological distress, psychosomatic complaints, and a depressed mood” (Schaufeli et al., 2020a, p.4). It is interesting that of the four core dimensions, only two of them are part of the most central ones of our study and that the third most central one is part of the secondary dimensions.

Additionally, it could be part of a prevention strategy to analyse the dimension’s connectivity of individuals, because the networks can show early warning signs (Fried et al., 2017) and in persons with strong connected networks, even small external stressors can start a sudden cascade of activation (Cramer et al., 2016). The analyses of the dimension’s connectivity and interventions aimed at reducing it, could prevent further activation and could prohibit the evolution to a mental disorder (Robinaugh et al., 2020).

Scholars showed that symptom connectivity is related to a less positive treatment outcome (Madhoo & Levine, 2016) and can lead to long-term elevated activation (Borsboom, 2017; Robinaugh et al., 2020). Thereby, it would be interesting to measure the connectivity of an individual’s symptoms at baseline. When someone shows strong connectivity at baseline, the treatment could be adjusted accordingly, for example in terms of duration or
intensity. A follow-up measurement after the treatment can be used to measure the
effectivity of the therapy.

**Strengths**

Despite, burnout being a much-discussed topic, clarity is still missing regarding the
definition and the theoretical framework. To our knowledge, this study is the first one that
applies the network approach in the context of burnout and chronic stress. This way, a
knowledge gap in literature is handled. Besides this, the approach used in this study, that
treats mental disorders as networks, provided a great opportunity to test how chronic stress
influences the connectivity of the burnout dimensions. In addition to the analysis of burnout
on subscale-level, we performed a study on item-level to provide an in-depth analysis of the
connectivity within the networks.

Our results are partly in line with literature, such as the central role of exhaustion,
mental distance and psychological distress in the burnout network. On the other hand, our
results contradict certain aspects such as the role of depression, which suggests that further
research on the definition and dimensions of burnout is advised.

The BAT (Schaufeli et al., 2020a) is used to measure the burnout dimensions and has
great psychometric features and fits well into the JD-R model. We found a good internal
consistency for exhaustion, mental distance, emotional impairment, cognitive impairment,
psychological distress, psychosomatic complaints. The PSS-10 and 4-DSQ, showed a very
good to excellent internal consistency.

**Limitations**

A first limitation concerns the participants and the recruitment procedure. 451
persons participated in this study. In comparison to other psychometric network studies, this
is a comparable number. An analysis of recent studies shows that the sample sizes differ a
lot, ranging from 40 participants to 1,551 with a mean sample size of 604. Additionally, there
are no clear guidelines regarding the needed number of participants in network analysis. Fried
& Cramer (2017) agree on this by stating that network analysis needs methodological
progress, including clear power guidelines. This is why we conducted a power analysis using
G-power (version 3.1.9.7) to estimate the number of participants needed. Taking the
available resources and time for this study into account, we decided to recruit a minimum of
400 individuals. However, to be able to detect small effect sizes in this study (Cohen’s $D = .2$),
a greater group was needed. Consequently, we are only able to detect medium (Cohen’s $D=$
and great effects sizes (Cohen’s $D = .8$). This can explain why we had null effects in some of our statistical tests (Burger et al., 2022). Due to a relatively small group with a high score on chronic stress, we needed to create a grouping based on low stress versus moderate and high stress put together. De Ron et al. (2019) and Robinaugh et al. (2020) pointed out that the grouping of individuals based on the severity of their symptoms holds certain risks as this can affect the network’s estimation, which means that the results of such studies must be interpreted cautiously. Also, as we only had a small group with a high stress score and had to add them to the moderately scoring individuals, this could influence the network by having a lower symptom’s severity and thereby less outspoken symptom differences in comparison to the low stress group, which can possibly explain the null effects. Next, the sampling technique we used was a convenience sample. This implies that we cannot generalize the results to the general population. In our sample, the share of women (77.38%) and highly educated persons (81.60% has a graduate degree or higher) were strongly represented.

Second, there are limitations concerning the research design. Since we used a cross-sectional design, we are not able to measure causality or the impact of chronic stress on burnout dimensions on the long-term. Also, because we only used self-report questionnaires, it is possible that a response bias or common method variance occurs. This could lead to an over- or underestimation of the true dimensions scores. A future alternative could be to use a combination of multiple methods (McNally, 2016).

Thirdly, the analysis we performed holds certain risks, such as the error rate from the estimation technique EBICglasso and the critique on network models. First, EBICglasso is a sensitive technique but has a low specificity to detect the edges and could thus lead to Type I errors: false positives (Burger et al., 2022). On the other hand, there will always be a dilemma between the sensitivity and specificity since a combination in which both are highly present is impossible. Since we wanted to optimize the chances at discovering any effects, our preference went to a sensitive method.

Next, scholars propose caution regarding the network approach. Bringmann (2019) explains that symptoms often have multicollinearity and the overlap between them is not shown in the network edges and visualizations. This can pose a problem in the sense that it is hard to argument that a certain node has a greater influence than another if they are not distinct elements (Bringmann & Eronen, 2018; Fried & Cramer, 2017). We came across this limitation when we noticed a very prominent and strong connection in the high stress network
between item DEP3: “During the past week, did you feel that you would be better off if you were dead” and DEP6: “During the past week, did you ever think ‘I wish I was dead’”. The strong relationship is likely due to the similar wording of these items. The scales that were used in this study are not developed to perform network analyses which means that they obtain items that are worded similarly, and this creates unwanted topological overlap. Ideally, a scale would be used that does not contain items with such topological overlap. Another solution to this can be to use $R^2$ as a measure to demonstrate the relative importance (Bringmann, 2019).

As network models are data-driven and have an exploratory character, this implies that they have a low external validity (Yarkoni & Westfall, 2017). Additionally, one must be cautious to generalize the findings of cross-sectional network models to an individual level as the global network is not necessarily a good representation of the network of an individual (Robinaugh et al., 2020). Furthermore, we were not able to investigate the direction of the nodes since we created undirected networks and used cross-sectional data, which implicates that we cannot estimate the outdegree and indegree centrality (Bringmann et al., 2014; Fried et al., 2016). Outdegree centrality is: “whether a symptom mostly actively triggers other symptoms” (Fried et al., 2016, p.319) and indegree centrality is: “whether a symptom mostly is triggered by other nodes” (Fried et al., 2016, p.319). Such an analysis could provide further insights into connectivity in the psychometric network and would be of clinical relevance.

A last limitation of network representations is that it is crucial that all relevant nodes are visualised. Thus, the choice of dimensions or symptoms has a great impact and needs to be done carefully. This could be addressed by focussing on the analysis of the network and the dynamics as such instead of trying to find the most influential dimension (Bringmann, 2019).

In summary, we can conclude that there are certain limitations in this study regarding the participants, recruitment procedure, the research design, and the network approach. These elements can hold explanations for the null effects that were found and implicate that we must interpret the results with caution, as this was an exploratory study in a relatively new scientific field.
**Future research**

First, as network models form a quite new research domain, multiple topics need further investigation. For example, more studies on within-person level are needed to better understand if the principles of network analyses can be applied on an individual level (Fried et al., 2017). Another domain in network theory that needs more clarity, are the conflicting findings regarding the impact of treatment on the connectivity of an individual. Some scholars found a positive evolution (Madhoo & Levin, 2016), but other studies reported an increased connectivity (Beard et al.; Bos et al., 2018). This shows that the functioning of network models is not yet fully unraveled (Robinaugh et al., 2020). More insights in these topics, for example, by the development and testing of micro-interventions that can be undertaken in the work context would benefit the theoretical understanding and the translation of the findings to clinical practice.

Second, it would be interesting to redo the current study with a larger number of participants and a broader range in symptom’s severity so that there would be fewer power issues and an ability to detect smaller effect sizes. Epskamp et al. (2018) confirm this and state that with a larger sample size it is easier to identify potential differences between the centrality parameters. However, the ideal number of participants to estimate a psychometric network remains unclear (Fried & Cramer, 2017). A sample that forms a better representation of the population would allow to generalize the results.

Thirdly, a longitudinal research design that studies the impact of chronic stress on burnout dimensions would reveal valuable insights on the long-term effects. Such study would be clinically relevant since burnout can be explained as a complex interaction between individual factors and the work environment (Desart et al., 2017) and thereby is not just something that develops suddenly.

Fourthly, we focused on professionally active persons (as an employee or self-employed). It would be interesting to apply this study on other target groups such as students, partners, volunteers, or parents since scholars already demonstrated that these groups are vulnerable to burnout (Bakker, 2009; Desart et al., 2017; Griffith, 2022; Reis et al., 2015).

To conclude, we put the focus in our study on the impact of chronic stress on burnout dimensions. However, it would be of great clinical relevance to include the impact of
protective factors (such as: resilience or social support) in the network approach as this can provide further insights into the factors that are beneficial for the individual and risk-reducing.

**Conclusion**

In this study we investigated the relationship between chronic stress and burnout dimensions and if the connectivity of burnout dimensions is different for people with low versus high chronic stress. The research question sprung from a gap in literature, as this approach is not tested before, and is thereby relevant on a theoretical level. Additionally, this study has implications for clinical practice as scholars showed that stronger connections can lead to greater activity in the network and thereby start a cascade (Robinaugh et al., 2020, Cramer et al., 2016).

We used a self-report questionnaire to whom 451 persons participated and included the scales of the BAT (Schaufeli et al., 2019), PSS-10 (Cohen et al., 1983) and the depression scale of the 4-DSQ (Terluin, 1996).

Then, we created visuals of the network models and performed statistical tests. We found that there is a positive and significant relationship between chronic stress and all the investigated burnout dimensions (exhaustion, mental distance, emotional impairment, cognitive impairment, psychosomatic complaints, and psychological distress).

Furthermore, we found that, when we divided the respondents into groups based on the norms of the PSS-10, there is a significant difference in centrality. Exhaustion and cognitive impairment showed themselves more central in the high stress network in comparison to the low stress network. Unfortunately, no other significant differences could not be reproduced in the other analyses.

The three most central dimensions in all of the performed analyses are mental distance, exhaustion, and psychological distress. These insights imply that prevention and intervention strategies should focus on these three dimensions because of their connections to the other dimensions in the network. Additionally, this study offers a contribution to the definition of burnout and the elements that should be included in it.

By our knowledge, this is the first study that uses the network approach to study the impact of chronic stress on burnout dimensions. We hope that this study can be replicated in the future and inspires others to further expand the knowledge of burnout and chronic stress and thereby provides useful insights for clinical practice.
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Appendix 1

**Informed consent**

Beste deelnemer,

Bedankt voor je deelname aan mijn thesisonderzoek in het kader van de studies Master of Science in de Psychologie. Dit onderzoek peilt naar het mentaal welzijn van de beroepsbevolking. Meer bepaald wordt er onderzoek gedaan naar de relatie tussen de connectiviteit van burn-out dimensies en chronische stress. Het invullen van deze vragenlijst neemt ongeveer 10 minuten in beslag.

De gegevens die in het kader van dit onderzoek worden verzameld worden confidentieel behandeld. De anonimiteit zal verzekerd worden door geen namen of verwijzingen naar een persoon op te nemen in deze masterthesis. De informatie wordt louter gebruikt voor onderzoeksdoeleinden en houdt dus geen diagnose in. Dit onderzoek staat onder begeleiding van professor Dr. T. Vantilborgh en mevrouw V. Sagmeister.

De gegevens worden gedurende 5 jaar opgeslagen op een veilige locatie met beperkte toegangsvoorwaarden. Verder zal de relevante privacy-en gegevensbeschermingswetgeving worden gevolgd om de privacy en de bescherming van uw persoonlijke gegevens te garanderen. De functionaris voor gegevensbescherming (DPO) van de Vrije Universiteit Brussel kan gecontacteerd worden op DPO@vub.be in geval van vragen. Informatie over het privacy beleid van de VUB is hier te vinden: [https://www.vub.be/nl/privacybeleid-vub](https://www.vub.be/nl/privacybeleid-vub)

Ook kan u op elk moment uw deelname aan de vragenlijst beëindigen en u dus terugtrekken uit het onderzoek. Als u dat wenst, zullen we uw gegevens uit de dataset verwijderen. Het verwijderen van de gegevens is echter niet meer mogelijk als deze al in de analyses verwerkt zitten.

Er zijn naar alle verwachting geen risico’s verbonden aan deelname aan deze studie. Als de gestelde vragen onbedoeld toch aanleiding geven tot ongewenste gedachten of gevoelens, dan kan je contact opnemen met de onderzoekers: eva.mertens@vub.be en senna.bombeeck@vub.be, of met het BRUCC: brucc@vub.be. Ook in geval je bijkomende informatie wenst of vragen hebt bij het onderzoek, kan je steeds contact opnemen met de onderzoekers.

Als je akkoord gaat met onderstaande voorwaarden, klik dan op akkoord, dit staat gelijk aan het geven van een handtekening. Als je niet akkoord bent, kan je dit venster gewoon sluiten.

- Ik neem uit vrije wil en op vrijwillige basis deel aan het onderzoek.
- Ik geef toestemming aan de onderzoeker om mijn resultaten op een vertrouwelijke en anonieme wijze te bewaren, te verwerken en te rapporteren.
- Ik kan op ieder moment het onderzoek stopzetten en hoef hier geen reden voor op te geven.

Alvast erg bedankt voor uw deelname!

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Promotor: Prof. Dr. Tim Vantilborgh – tim.vantilborgh@vub.be
Appendix 2

Socio-demographic questions

1. Wat is je huidige professionele status?
   - Werknemer
   - Zelfstandige
   - Ambtenaar
   - Werkzoekend
   - Pensioen
   - Student
   - Andere (specifieer)

2. In welke sector ben je actief?
   - Gezondheidszorg en maatschappelijke diensten
   - Industrie
   - Groot- en detailhandel en reparatie voertuigen
   - Onderwijs
   - Openbaar bestuur, defensie en sociale zekerheid
   - Bouwnijverheid
   - Vervoer en opslag
   - Vrije beroepen, wetenschappelijke en technische activiteiten
   - Administratieve en ondersteunende diensten
   - Informatie en communicatie
   - Financiële activiteiten en verzekeringen
   - Accommodatie en maaltijden
   - Kunst, amusement en recreatie
   - Exploitatie en handel onroerend goed
   - Andere (specifieer)

3. Hoeveel jaar ben je tewerkgesteld in je huidige job? (open vraag)
4. Oefen je een leidinggevende functie uit?
   - Ja
   - Nee

5. Wat is je leeftijd? (open vraag)

6. Wat is je hoogst behaalde opleidingsniveau?
   - Lager onderwijs
   - Secundair onderwijs
   - Graduaat
   - Bachelor
   - Master
   - Doctoraat

7. Met welk geslacht identificeer je jezelf?
   - Man
   - Vrouw
   - Anders (specifier)
   - Zeg ik liever niet

8. Wat is je burgerlijke staat?
   - Alleenstaand (nooit getrouwd)
   - Relatie zonder samenwonen of huwelijk
   - Samenwonend
   - Getrouwd
   - Weduwe/weduwnaar
   - Gescheiden
Appendix 3

**Burnout symptoms – workrelated version BAT**

**Instructie**

De volgende uitspraken hebben betrekking op hoe u uw werk beleeft en hoe u zich daarbij voelt. Wilt u aangeven hoe vaak iedere uitspraak op u van toepassing is door steeds het best passende antwoord aan te kruisen.

**Scoring**

Nooit Zelden Soms Vaak Altijd
1 2 3 4 5

**Items**

_Uitputting_

1) Op het werk voel ik me geestelijk uitgeput.
2) Alles wat ik doe op mijn werk, kost mij moeite.
3) Ik raak maar niet uitgerust nadat ik gewerkt heb.
4) Op het werk voel ik me lichamelijk uitgeput.
5) Als ik 's morgens opsta, mis ik de energie om aan de werkdag te beginnen.
6) Ik wil wel actief zijn op het werk, maar het lukt mij niet.
7) Als ik me inspan op het werk, dan word ik snel moe.
8) Op het einde van de werkdag voel ik me mentaal uitgeput en leeg.

_Mentale distantie_

1) Ik kan geen belangstelling en enthousiasme opbrengen voor mijn werk.
2) Op mijn werk denk ik niet veel na en functioneer ik op automatische piloot.*
3) Ik voel een sterke weerzin tegen mijn werk.
4) Mijn werk laat mij onverschillig.
5) Ik ben cynisch over wat mijn werk voor anderen betekent.

*Emotionele ontregeling*

1) Op mijn werk heb ik het gevoel geen controle te hebben over mijn emoties.

2) Ik herken mezelf niet in de wijze waarop ik emotioneel reageer op mijn werk.

3) Tijdens mijn werk raak ik snel geïrriteerd als de dingen niet lopen zoals ik dat wil.

4) Ik word kwaad of verdrietig op mijn werk zonder goed te weten waarom.

5) Op mijn werk kan ik onbedoeld te sterk emotioneel reageren.

*Cognitieve ontregeling*

1) Op het werk kan ik er mijn aandacht moeilijk bijhouden.

2) Tijdens mijn werk heb ik moeite om helder na te denken.

3) Ik ben vergeetachtig en verstoord tijdens mijn werk.

4) Als ik aan het werk ben, kan ik me moeilijk concentreren.

5) Ik maak fouten in mijn werk omdat ik er met mijn hoofd 'niet goed bij ben'.

*Psychosomatische klachten*

1) Ik heb last van hartkloppingen of pijn in de borststreek.

2) Ik heb last van maag-en/of darmklachten.

3) Ik heb last van hoofdpijn.

4) Ik heb last van pijnlijke spieren, bijvoorbeeld in de nek, schouder of rug.

5) Ik word snel ziek.

*Psychische spanningsklachten*

1) Ik heb problemen met inslapen of doorslapen.

2) Ik heb de neiging om te piekeren.

3) Ik voel mij opgejaagd en gespannen.
4) Ik voel me angstig en/of heb last van paniekaanvallen.

5) Ik heb moeite met drukte en/of lawaaï.
Appendix 4

4-DSQ

<table>
<thead>
<tr>
<th>Nee</th>
<th>Soms</th>
<th>Regelmatig</th>
<th>Vaak</th>
<th>Heel vaak of voortdurend</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

- Had u de afgelopen week het gevoel dat alles zinloos is?
- Had u de afgelopen week het gevoel dat het leven niet de moeite waard is?
- Had u de afgelopen week het gevoel dat het beter zou zijn als u maar dood was?
- Had u de afgelopen week het gevoel dat u nergens meer plezier in kunt hebben?
- Had u de afgelopen week het gevoel dat er geen uitweg is uit uw situatie?
- Denkt u de afgelopen week weleens “was ik maar dood”? 
Appendix 5

Chronic stress

Instructie

De vragen in deze schaal peilen naar uw gevoelens en gedachten van de afgelopen maand. In elk geval wordt u gevraagd om aan te geven hoe vaak u zich op een bepaalde manier voelde of dacht.

Scoring

Nooit   Bijna nooit   Soms   Redelijk vaak   Heel vaak
1       2            3       4           5

Items

- Hoe vaak was je de afgelopen maand van streek door iets dat onverwachts gebeurde?
- Hoe vaak heb je de afgelopen maand het gevoel gehad dat je de belangrijke dingen in jouw leven niet onder controle had?
- Hoe vaak heb je de afgelopen maand nerveus en "gestrest" gevoeld?
- Hoe vaak had je de afgelopen maand vertrouwen in jouw vermogen om jouw persoonlijke problemen aan te pakken?
- Hoe vaak heb je de afgelopen maand het gevoel gehad dat dingen volgens plan verliepen?
- Hoe vaak heb je de afgelopen maand geconstateerd dat je niet alle dingen aankon die je moest doen?
- Hoe vaak heb je de afgelopen maand irritaties in uw leven onder controle kunnen houden?
- Hoe vaak heb je de afgelopen maand het gevoel gehad dat je alles onder controle had?
- Hoe vaak ben je de afgelopen maand boos geweest vanwege dingen waar je geen controle over had?
- Hoe vaak heb je de afgelopen maand het gevoel gehad dat de moeilijkheden zich zo hoog opstapelden dat je ze niet kon overwinnen?