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**Cognitive Function, Affective Symptoms, and Everyday Activities
in Patients Previously Diagnosed With Exhaustion Disorder**

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Abstract: Exhaustion disorder (ED; *swe: utmattningssyndrom*) is an increasing diagnose in Sweden, significantly impacting patients' daily lives. This study aimed to explore the cognitive function of individuals diagnosed with ED, 7-12 years post-diagnosis, examining the relationship between their responses on the Sahlgrenska Academy Self-Reported Cognitive Impairments Questionnaire (SASCI-Q) and neuropsychological test results. Additionally, we investigated the relationship between SASCI-Q responses and symptoms of anxiety and depression measured by the Hospital Anxiety and Depression scale (HAD). Furthermore, we assessed the relationship between the cognitive function and daily activities domains in SASCI-Q. Among 49 participants (mean age: 50.3 years), no significant correlation emerged between self-reported cognitive function and neuropsychological test performance, highlighting a discrepancy. Notably, SASCI-Q responses significantly correlated with symptoms of anxiety and depression, with anxiety playing a more prominent role. Furtherly, no significant correlation was found between SASCI-Q responses of cognitive function and everyday activities. These findings underscore the need for further research to enhance understanding of the relationship between self-reported cognition and other symptoms as well as level of functioning, in the long-term course of ED.

Introduction

Exhaustion Disorder (ED) is a clinical diagnosis which affects the everyday life of diagnosed individuals. It is an increasing diagnosis in many countries, including Sweden (Mather et al., 2020). The severity and duration of symptoms in Exhaustion Disorder vary among patients. (Glise et al., 2012). However, patients commonly exhibit reduced mental energy and cognitive impairment such as problems with memory. Furthermore, patients also exhibit physiological symptoms i.e. extreme fatigue, and intolerance to stress (Glise et al., 2012). A substantial overlap between exhaustion disorder and symptoms of depression and anxiety has been documented in a study by Glise et al. (2012). This study suggests that differences in the progression of mental symptoms among patients may partially account for the broad variability observed in patient recovery and symptom severity.

The cognitive impairments amongst ED patients have been confirmed through different objective cognitive tests, i.e. neuropsychological tests, where the patients' test scores have been compared to healthy controls, revealing a significant difference regarding performance (Jonsdottir et al., 2013). Additional research has unveiled that individuals diagnosed with the condition continue to experience physiological and cognitive challenges several years post-diagnosis (Jonsdottir et al., 2013). This data suggests that persistence of

adverse long-term effects remains, despite clinical interventions, as individuals still experience cognitive impairments (Jonsdottir et al., 2013).

Previous longitudinal investigations involving patients with Exhaustion Disorder have investigated both patients' subjective perception of their cognitive abilities, and their objective performance on neuropsychological tests, respectively (Ellbin et al., 2021; Jonsdottir et al., 2017; Oosterholt et al., 2012). Consequently, there appears to be a lack of association between performance levels on objective tests and subjective perception among these individuals (Burmester et al., 2016). However, few studies have examined the relationship between subjective and objective measures in patients with Exhaustion Disorder. Therefore, it is evident that further investigation and comparison of these measures are necessary. Studies on neurodegenerative diseases have established that there is generally only a weak relationship between subjective and objective assessments of cognitive function, see for example (Burmester et al., 2016). Based on the current literature, there is no clear consensus regarding the relationship between subjective and objective measures, and reports have been inconsistent. Therefore, it is essential to continue investigating which measurement should be used to determine the most accurate approach for capturing patients' conditions. In the case of Exhaustion Disorder, self-reported questionnaires are today only considered as supplementary and supportive tools in the diagnostic process (Glise et al., 2012).

Due to the significant overlap in symptomology observed in Exhaustion Disorder and similar conditions, such as the concept of clinical burnout (Grossi et al., 2015), there has been considerable variability in the definition and assessment methods utilized in related research (Bayes et al., 2021). Therefore, for this study, we have referred to previous studies that have included symptoms closely related to Exhaustion Disorder, encompassing concepts such as stress-related exhaustion, burnout, and stress-related mental disorder.

In this thesis, we are investigating if there is a correlation between self-reported cognitive function (i.e., *subjective cognitive function* [SCF]), measured through a comprehensive self-report questionnaire, and objectively measured cognitive function (i.e., *objective cognitive function* [OCF]), measured through standardized neuropsychological tests, amongst individuals diagnosed with exhaustion disorder, seven years after their diagnosis. Additionally, we will investigate the effect of co-morbid affective symptoms that some patients with Exhaustion Disorder experience and how these symptoms affect their self-reported cognition. Given the prevalence of depressive and anxiety symptoms among patients diagnosed with ED and the notable comorbidity with depression and anxiety disorders in this population (Glise et al., 2012), it is imperative to explore the relationship between patients' self-reported cognitive difficulties and these affective symptoms.

Moreover, we will examine self-reported daily activities (i.e., *daily life activities* [DLA]) and their relationship with self-reported cognition. Acknowledging the duration elapsed since the patients' initial care-seeking and that most of these individuals are not currently on sick leave, it could therefore be assumed they are likely to maintain regular performance at work and engage in everyday activities, such as being physically active. However, research has concluded otherwise, suggesting that patients with exhaustion disorder face challenges in returning to their previous everyday lives for many years after their diagnosis (Ellbin et al., 2021). Therefore, it is of interest to investigate the correlation between subjective cognitive function (SCF), and everyday activities.

This study may be of importance to clarify the associations between reported symptoms and levels of cognitive and everyday functioning in the long-term course of ED. The results of this study can be of interest from both a clinical and research perspective and provide more knowledge and insight into the long-term course of exhaustion disorder.

Exhaustion disorder

Despite the severe impact of exhaustion on society, there is still no global consensus regarding diagnostics, terminology, and treatment (Bayes et al., 2021; Gavelin et al., 2022). Exhaustion Disorder (*utmattningssyndrom*) is associated with an increase in stress-exposure leading up to the many symptoms that patients experience daily which affects and influences their daily functioning. Different factors, so called stressors, must have been persistent for a minimum of 6 months for receiving a diagnosis of Exhaustion Disorder (Socialstyrelsen, 2005). Symptoms related to these stressors are widespread and result in considerable societal costs. Moreover, exposure to work-related stress has been recognized as a significant occupational health risk factor, linked to impaired mental health and substantial economic burdens on society (Grossi et al., 2015). Given the large variability in the definition of stress-related burnout and the fact that ED is a formal diagnosis used exclusively in Sweden, there have been few studies on its prevalence and effects. Grossi et al. (2015) have proposed that the diagnosis of ED is a more viable way of operationalizing 'clinical burnout,' which is often poorly recognized and not classified as an actual disease in the ICD or DSM (Bayes et al., 2021; Gavelin et al., 2022).

Since 2005, ED has been classified in the Swedish version of ICD-10 with code F43.8A, along with the diagnostic criteria for the disease (Table 1) (Socialstyrelsen, 2005). A minimum of four of the symptoms delineated in Table 1 must have been present every day for at least two weeks for fulfilment of the criteria of ED. These symptoms, both work and non-work related, induce pathological and physiological processes that affects the daily life of diagnosed individuals. Cognitive symptoms, specifically reports of impaired memory, are included as criteria. Furthermore, patients also exhibit physiological symptoms such as sleep disturbances and fatigue (Socialstyrelsen, 2005). The symptoms must be a consequence of stressors alone; thus, they should not be directly attributed to other underlying diseases or conditions (Socialstyrelsen, 2005). If a patient fulfills the criteria for Major Depressive Disorder (MDD), Dysthymic Disorder (DD), or Generalized Anxiety Disorder (GAD), ED should only be used as a secondary diagnosis (Grossi et al., 2015). Since the introduction of ED into the Swedish ICD-10, it has become easier for clinicians to categorize and recognize patients' symptoms. This has led to an increased use of this diagnosis (Gavelin et al., 2022).

Table 1

Diagnostic criteria for Exhaustion disorder (ICD-10 code 43.8A), Swedish National Board of Health and Welfare 2005.

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- A. The presence of both physical and mental symptoms persisting for a minimum duration of two weeks. These symptoms must have emerged in response to one or more identifiable stressors, which have endured for at least six months.
 - B. Markedly diminished mental energy characterized by reduced initiative, diminished endurance, or prolonged recovery time following mental exertion.
 - C. During the same two-week period, at least four of the following symptoms must have been present for most of the day, nearly every day:
 - 1. Consistent reports of impaired memory.
 - 2. Significantly reduced ability to handle demands or work efficiently under time constraints.
 - 3. Emotional volatility or irritability.
 - 4. Insomnia or excessive sleepiness.
 - 5. Continuous complaints of physical weakness or fatigue.
 - 6. Manifestation of physical symptoms like muscle pain, chest discomfort, palpitations, gastrointestinal disturbances, dizziness, or heightened sensitivity to sounds.
 - D. The symptoms result in clinically significant distress or impairment in social, occupational, or other crucial areas of functioning.
 - E. The symptoms cannot be attributed to the direct physiological effects of a substance, such as drug abuse or medication, nor can they stem from a general medical condition like hypothyroidism, diabetes, or infectious diseases.
 - F. The stress-related disorder does not fulfill the criteria for major depressive disorder, dysthymic disorder, or generalized anxiety disorder.
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Cognitive functioning in ED

Cognitive function is defined by the American Psychological Association as “*the performance of the mental processes of perception, learning, memory, understanding, awareness, reasoning, judgement, intuition and language*” (APA, 2018). The conventional approach to measure cognitive function involves the utilization of neuropsychological tests, which offer a standardized means of assessment. These tests provide an objective measure against which patient performance can be compared to that of healthy control groups, facilitating a thorough evaluation of cognitive abilities (Deligkaris et al., 2014).

Cognitive impairments are consistently clinically reported within patients with stress-related mental health problems (Jonsdottir et al., 2013). The degree of cognitive impairment varies in patients diagnosed with ED and it has not been concluded which specific cognitive functions are affected (Gavelin et al., 2022). However, a review of previous literature focusing on cognitive function in patients with ED revealed, through neuropsychological tests, cognitive impairments in working memory, episodic memory, attention, and executive functioning (Deligkaris et al., 2014; Gavelin et al., 2022).

Working memory constitutes the cerebral mechanism responsible for transiently retaining and manipulating essential information essential for engaging in complex cognitive tasks, such as language processing, comprehension, learning, and reasoning (Baddeley, 1992). This cognitive system is often conceptualized as encompassing general-purpose control mechanisms that regulate the functioning of diverse cognitive subprocesses, exerting a significant influence on the dynamics of human cognition (Miyake et al., 2000). Thus,

working memory has been linked with all executive functions, attention and memory functions (Baddeley & Della Sala, 1996). Based on Baddeley's original model on working memory (1992), it comprises three primary components: the central executive, responsible for attentional control; the visuospatial sketchpad, managing visual and spatial information; and the phonological loop, overseeing auditory information processing. Deficits in working memory have been documented across various conditions, including autism, and schizophrenia (Park & Gooding, 2014; Wang et al., 2017). Thus, it is essential to acknowledge that deficits in working memory function are not exclusive to any particular disorder (Wang et al., 2017).

Attention has been defined by Krauzlis et al. (2021) as “*The set of evolved brain processes that leads to adaptive and effective behavioral selection.*”. The concept of attention encompasses a range of cognitive processes through which individuals selectively focus on and process specific aspects of their environment while excluding others to varying degrees (Krauzlis et al., 2023). Episodic memory pertains to a form of declarative memory containing information specific to the time and place of acquisition (Tulving, 1983).

Executive functioning encompasses goal-directed behavior aimed at optimizing performance to achieve a specific objective. These cognitive abilities aid in reasoning, planning, problem-solving, and managing various aspects of one's life. The brain regions responsible for executive functions are interconnected and influenced by activity in numerous brain areas, including those associated with emotion and stress (Blair, 2017). Visuospatial function encompasses cognitive processes related to visual and spatial awareness and the interpretation of their relationships (Koutsimani & Montgomery, 2022).

Self-reported cognitive functioning in ED

To assess subjective cognitive function, subjective experiences of impairments often lead to the utilization of the concept of *subjective cognitive decline* (SCD). Previous studies have revealed that ED patients frequently experience subjective cognitive decline (Ellbin et al., 2021). SCD can thus be a descriptive concept for ED patients, although it is more commonly used in the context of neurodegenerative disorders such as Alzheimer's disease. SCD encompasses the criterion of self-reported persistent decline in cognitive capacity. In the context of cognitive disorders, individuals with SCD perform within the healthy range on cognitive tests and are therefore considered not cognitively impaired, despite their subjective experiences. If objective cognitive impairments are present, patients are instead categorized as having *mild cognitive impairment* (MCI) (Jessen et al., 2020). However, it is important to acknowledge that some degree of cognitive impairments, subjective as well as objective, are also frequently observed in healthy individuals within the normal population (Jessen et al., 2020; Jonker et al., 2000).

The challenge with subjective cognitive dysfunction lies in its inconsistent correlation with cognitive performance assessed through neuropsychological tests (Jessen et al., 2014). Furthermore, in clinical practice, it is challenging to distinguish between a healthy individual and a patient solely based on their reported symptoms. The distinction often relies on their performance in neuropsychological tests. However, the challenges of subjective decline in cognitive function are growing, particularly as more individuals seek healthcare for such concerns (Jessen et al., 2014). Many patients with ED also report psychological problems, such as loss of self-recognition, withdrawal, and detachment, which highlights the effect of the condition on the patients' daily lives (Jessen et al., 2014; Mitchell et al., 2014). For this study, we have decided to include both the terms "subjective" and "self-reported" interchangeably to comprehensively address the construct of experienced cognition.

Affective symptoms in ED

Patients diagnosed with ED commonly experience symptoms related to anxiety and depressive states, and even a clinical diagnosis of these comorbidities can be evident. In a longitudinal study conducted by Glise et al. (2012), psychopathological symptoms in patients with ED have been measured. In that study, both male and female participants demonstrated a similar progression of symptoms. Furthermore, the study observed a notable divergence between clinical diagnoses, objective indicators of mental health symptoms, and subjective, self-reported symptoms. Specifically, only 40% of participants clinically diagnosed with depression scored above 10 on the HAD scale, highlighting the discrepancy between clinical diagnoses and self-reported symptom severity (Glise et al., 2012). Additionally, only 9% of participants met the exclusive criteria for ED without comorbid affective symptoms, such as anxiety and depression, thereby qualifying for a clinical diagnosis of ED alone (Glise et al., 2012). In contrast, 67% of patients fulfilled the criteria for both clinical depression and anxiety disorder alongside ED. This underscores the challenge in appropriately measuring and diagnosing ED, particularly when considering the alignment between clinical and self-reported assessments.

Impact of daily life activities in ED

When cognitive function and self-perception are compromised, it invariably impacts various aspects of individuals' daily lives. Cognitive abilities such as memory, attention, and problem-solving are essential for performing routine tasks and navigating everyday challenges (Jonsdottir et al., 2017). Moreover, self-perception influences how individuals perceive and interpret their own capabilities and limitations, as described by Ellbin et al. (2021). Individuals diagnosed with ED may encounter challenges in planning and executing tasks, managing time efficiently, and adapting to new situations. Moreover, these deficits have been suggested to result in decreased effectiveness in the workplace, particularly in managing complex tasks and maintaining job performance, thereby hindering their return to work and other everyday activities (Arnsten & Shanafelt, 2021).

Furthermore, daily functioning, including tasks such as remembering appointments, following instructions, and organizing personal belongings, can become challenging for individuals diagnosed with ED, as suggested by previous literature (Ellbin et al., 2021). However, when investigating daily functioning within other conditions such as SCD, research has often failed to reveal a differentiation in symptom severity between healthy individuals and those diagnosed with SCD (Jessen et al., 2014). Therefore, while individuals with ED may encounter difficulties in their daily activities and functioning, existing research suggests that these challenges may not be significant enough to differentiate them from healthy individuals, as previous studies have found no discernible differences in everyday activities between patients and controls (Ellbin et al., 2021).

It has been suggested that performing cognitive tasks may require a greater investment of effort from individuals with ED, potentially exacerbating their symptoms and the severity of their exhaustion (Oosterholt et al., 2014). As a result, the ability to independently carry out everyday activities may be compromised, leading to increased reliance on others for assistance and support which has an impact on individuals' autonomy, self-esteem, and overall quality of life (Ellbin et al., 2021). Additionally, patients with ED often report a substantial burden of symptoms related to their daily functioning. These challenges not only affect the individual's well-being but also pose difficulties for the healthcare system, social insurance system, and workplace.

Therefore, understanding the interplay between cognitive function, self-perception, and daily life activities is crucial for providing comprehensive care and support to individuals suffering from stress-related difficulties (Ellbin et al., 2021). However, it is paramount to delineate the nuanced distinction between the constructs of *DLA* and *activities of daily living* (ADL). While *ADL* pertains specifically to tasks oriented towards self-care, encompassing fundamental activities essential for survival and well-being such as bathing, toileting, dressing, and eating (AOTA, 2014), the concept of *DLA*, as used in this study, is not part of a theoretical construct but encapsulates a broader spectrum of routine tasks, extending beyond mere self-care to encompass occupational, recreational, domestic, and social engagements. It is crucial to discern that the measure of *DLA* utilized in this investigation, does not directly evaluate an individual's capacity to execute rudimentary self-care activities. Rather, it sought to capture the range of activities typically undertaken by individuals, according to their self-reports.

Aim

The first aim of this study was to investigate the relationship between subjective and objective cognitive function (SCF, OCF) in patients previously diagnosed with ED. The secondary aim was to investigate the relationship between participants' SCF and their self-reported depressive and anxiety symptoms. The third aim was to investigate the relationship between patients' SCF and their self-reported daily life activities (*DLA*). Based on previous literature, it is known that there is often a weak relationship between self-reported and objective measurements (Glise et al., 2020; Oosterholt et al., 2012). Hence, our hypothesis for the first aim is that our results will exhibit a weak relationship between SCF and OCF. Regarding our secondary aim, it is known that patients with ED commonly can exhibit the symptomatology of anxiety and depression, *e.g.*, a perceived state of anxiety and depression (Glise et al., 2012; Zigmond & Snaith, 1983). Given that negatively held beliefs are a well-known aspect of affective syndromes, it is plausible to hypothesize that the impact of these symptoms influences how patients perceive and report their cognitive function. Here we hypothesize SCF can predict for an outcome of a perceived state of both anxiety and/or depression, respectively. Regarding the third aim, given that most daily life activities are, to some extent, dependent upon cognitive function (Jekel et al., 2015), and that it is plausible that self-reported levels of functioning will affect level of activity engagement, we hypothesize that there will be a discernible positive relationship between patients' SCF and their daily life activities. Thus, SCF can predict the outcome of daily life activities.

Methods

Measurements

SASCI-Q

The Sahlgrenska Academy Self-Reported Cognitive Impairment Questionnaire (SASCI-Q) is a self-assessment tool designed to appraise subjective cognitive decline. The questionnaire consists of 57 questions, segmented into different parts, where 29 questions regard cognitive function, 8 questions regarding ‘Current and previous functioning’ and, 19 questions regard general questions and everyday activities. The internal consistency for items in SASCI-Q for current functioning and cognitive decline has a Cronbach’s α of 0.96 and 0.95 (Eckerstrom et al., 2013).

The SASCI-Q is an extension of a questionnaire originally developed to assess self-reported cognitive difficulties in everyday life among cancer survivors (Skoogh et al., 2012). The generated items were developed through qualitative interviews with the aim of capturing behaviors and everyday obstacles that may depend on cognitive function. In the quantitative phase of the questionnaire development, the goal was to identify questions that showed differences between persons seeking help for cognitive impairment (and displaying no objective cognitive impairment), i.e. SCD, and healthy controls (Eckerstrom et al., 2013).

The content in parts of the questionnaire overlap with previous questionnaires assessing cognitive function such as the MANS (Multidimensional Assessment of Neurodegenerative Symptoms Questionnaire) (Locke et al., 2009) and the PROCOG (Patient-Reported Outcomes in Cognitive Impairment) (Frank et al., 2006). The SASCI-Q instrument has not yet been clinically validated as a diagnostic tool for exhaustion disorder. Nevertheless, it holds value for mapping experienced symptoms and providing complementary insights alongside objective measurements (Eckerstrom et al., 2013).

For this study, the subdomains’ *cognitive function* (CF) and *daily life activities* (DLA) has been utilized. For the subdomain *CF*, the maximum score was 29 affirmative responses across various questions. Responses were categorized into three Likert-scales, each with four to six answer options, depending on how the questions was asked. For the subdomain *DLA*, response options were based on the frequency with which participants engaged in the activity in question (Questions can be found in Appendix).

HAD

The Hospital Anxiety and Depression scale (HAD-scale) was developed in order for clinicians to utilize a validated and practical tool upon identification and quantification of depression and anxiety (Zigmond & Snaith, 1983). The scale is dimensional and is used for identifying general hospital patients who may require additional psychiatric evaluation and assistance (Herrmann, 1997). The HAD-scale is frequently employed as part of the diagnostic procedure for evaluating exhaustion disorder, given that many patients self-report symptoms of depression and anxiety (Glise et al., 2012).

The scale comprises 14 statements rated on a 4-point Likert scale ranging from 0 to 3, reflecting the degree to which each statement corresponds to the patient's state of mind over the past week. Half of these statements assess depressive symptoms, while the other half evaluate symptoms of anxiety. The total score is the sum of all 14 items, while for each subscale, the score is the sum of the respective seven items, with scores ranging from 0 to 21. Notably, the scale excludes items related to somatic aspects of depression, such as insomnia and weight loss. Chronbach’s α for HAD is 0.83 for the anxiety domain and 0.82 for the

depression domain (Zigmond & Snaith, 1983). A score exceeding 8 on the scale is considered indicative of a potential case of depression or anxiety.

Neuropsychological tests

The test battery utilized in this study covered a comprehensive range of cognitive domains that may be affected in various conditions characterized by cognitive dysfunction - including speed, attention, working memory, learning and episodic memory, executive function, visuospatial abilities, and language function. The tests were selected based on recommendations by the American Academy of Neurology (Neurology, 1996). The testing procedure lasted for 40 minutes without interruption and was conducted under the supervision of a senior psychologist. This study incorporated a test battery including ten neuropsychological tests (Table 3).

The Boston Naming Test assesses the verbal function of confrontation naming by prompting patients to name objects depicted in simple pictures, aiming to identify naming impairments. The maximum score is 60, where a high score suggest better performance (Kaplan & Weintraub, 1983). The Token Test evaluates language comprehension and syntactic understanding where it serves as a semantic attention test. The total score is 36, where a high scores suggests better performance (Bandera et al., 1985). Visuospatial function was evaluated using a subtest of the *Visual Object and Space Perception test battery* (VOSP), where patients are asked to identify silhouettes depicting everyday objects and animals. The maximum score is 20 and higher scores indicate better performance (Rappport et al., 1998). Assessments for executive functioning comprised the Stroop Test and *Parallel Serial Mental Operations* (PaSMO). Scores on these tests are based on time to complete, thus lower scores on both tests suggest better performance. The Stroop test is commonly employed to assess several cognitive functions, including selective attention, and response inhibition, which are commonly seen as executive functions. It tasks individuals with reading color-words printed in ink different from the color the word represent (Regard, 1981).

The PaSMO test measures mental control and tracking, requiring participants to recite the alphabet along with its numerical position within a set time frame. The time it takes for participants to complete the task is their score on the test (Lezak, 2004). Digit symbol tests evaluate cognitive speed and processing velocity, focusing on an individual's ability to efficiently shift attention between various symbols and digits and included in the WAIS-R (Wechsler, 1981). Digit span test, included in WAIS-IV evaluate attention and working memory capabilities by first asking patients to accurately repeat a sequence of digits and then challenging them to reproduce the digits in reverse order, thereby further assessing their working memory capacity (Wechsler, 1987). Both digit span and digit symbol tests were initially included in the *Wechsler Adult Intelligence Scale* (WAIS). Higher scores on these assessments indicate better performance (Wechsler, 1981, 1987).

Study design and diagnostic procedure

This investigation formed a segment of a longitudinal clinical study conducted at the *Institute of Stress Medicine* (ISM) in Gothenburg, Sweden, focusing on stress, health, and occupational environments. Patients exhibiting symptoms indicative of ED were referred from primary care units or occupational health care centers to ISM for diagnostic assessment between the years 2004 and 2008. A senior physician administered a diagnostic procedure, preceded by patients completing a one-page DSM-IV instrument (PRIME-MD) questionnaire to screen for potential comorbid depression or anxiety disorders, given that these diagnoses must be established prior to diagnosing ED (Glise et al., 2012). The *Primary Care Evaluation*

of Mental Disorders (PRIME-MD) is a standardized and validated patient self-report diagnostic tool, utilized to assess somatic and mental symptoms, including the diagnosis of depression and anxiety, prior to consultation with a physician (Spitzer et al., 1994).

Subsequently, affirmative responses elicited during a physician-led interview with the patients were evaluated according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Revision (DSM-IV) criteria for depression and anxiety disorder diagnosis. This diagnostic process involved an extensive patient history (anamnesis) and physical examination. Collaboratively, the physician and patient identified one or more stressors contributing to the development of ED symptoms. A crucial aspect was ensuring that patient's symptoms encompassed exhaustion as profound fatigue, where minimal relief, such as brief rest, failed to alleviate symptoms. Patients were then offered multimodal treatment lasting approximately 18 months under the auspices of ISM. Treatment modalities encompassed physician consultations, physical activity regimens, stress management programs, and educational sessions on stress and its ramifications for both patients and their families. Additional interventions included cognitive behavioral group therapy sessions and consultations with a psychologist. Patients were also provided with medication as needed, facilitated communication with the Social Insurance Office, and assisted in liaising with their employers (Glise et al., 2012).

Following completion of treatment, patients who had elapsed at least 7 years since their initial clinic visit were invited to participate in a follow-up clinical assessment. During this follow-up evaluation, patients underwent a battery of cognitive tests. Additionally, patients also completed SASCI-Q, and HAD. For this thesis, we analyzed this follow-up data from ISM, cross-sectionally. Our (HT and JJ's) role in this study was to conduct statistical analyses by using the pre-existing data, analyzing the outcomes of the results and write a comprehensive report summarizing the findings.

Inclusion and Exclusion criteria

Inclusion criteria in the baseline study stipulated that patients must have met the diagnostic criteria for ED during their initial assessment, adhering to the guidelines outlined by the National Board of Health and Welfare (2005) (as outlined in Table 1). Accordingly, individuals diagnosed with alternative conditions potentially explaining their symptoms, such as underlying somatic diseases, were excluded from the study. Patients exhibiting concurrent symptoms of anxiety or depression as diagnosed by PRIME-MD and HAD were included, contingent upon these symptoms being exclusively secondary diagnoses alongside their primary diagnosis of exhaustion disorder. Moreover, individuals with a history of alcohol or substance abuse were deemed ineligible for inclusion. Additionally, it was imperative that patients had not been on sick leave exceeding six months to qualify for participation.

The inclusion criteria for the follow-up study stipulated those patients who had elapsed at least seven years since their initial clinical visit, were eligible for participation. These individuals were invited to take part in the study until a total of 50 participants had been reached. Patients excluded from the follow-up study were those exhibiting difficulties in understanding the Swedish language and those who had reported any form of brain injury, alcohol overconsumption or were taking medications that could potentially influence the interpretation of the results. Furthermore, individuals who had developed untreated systemic diseases such as diabetes or thyroid disease, or other conditions apart from ED that could account for their symptoms of exhaustion, were excluded from participation.

Participants

A total of 163 participants provided informed consent for involvement in the seven-year follow-up phase of the study. Although, 13 individuals were subsequently excluded from

the analysis due to the onset of concurrent medical conditions. Out of the initial cohort of 150 patients, neuropsychological follow-up testing was limited to 50 individuals, due to resource constraints. Fifty-one individuals accepted the invitation, although two individuals were excluded from the population due to development of other somatic symptoms. Hence, 49 subjects underwent neuropsychological evaluation and completed requisite questionnaires. The final study cohort of this study comprised of 39 female, and 10 male participants with a mean age of 50.3 years, and an average educational attainment of 15.6 years. There were 16 individuals of this population that fulfilled the criteria for ED upon follow-up assessment. The median score of depressive symptoms on the HAD scale was 4, with an interquartile range (IQR) of 6. The median score for anxiety on the HAD scale was 6, with an IQR of 6. The scores for the population on the HAD scale indicates that patients did not exceed the threshold value of 8, that would indicate on possible anxiety, or depression. Results for patients' performance on each neuropsychological test and the subdomains of SASCI-Q are summarized in Table 2.

Table 2

Results on neuropsychological tests, subdomain CF and DLA of SASCI-Q, and HAD-scale

	<i>n</i>	\bar{x}	<i>SD</i>	<i>Median</i>
Neuropsychological tests				
<i>BNT</i>	49	50.6	4.9	55
<i>VLMRI</i>	49	25.84	6.5	26
<i>KOD</i>	49	57.8	11.8	56
<i>DSTF</i>	49	7.5	2.1	7
<i>DSTB</i>	49	6.3	1.7	6
<i>TOK</i>	49	19.7	1.9	20
<i>VOSP</i>	49	22	3.5	22
<i>Stroop</i>	49	24	7.9	22
<i>PaSMO</i>	46	70	21.2	65.5
<i>VLMRD</i>	49	22.9	6.9	23
SASCI-Q				
<i>CF</i>	49	7.63	7	5
<i>DLA</i>	49	2.8	0.4	2.7

Note: *n* = frequency, \bar{x} = mean value, *SD* = standard deviation, *BNT* = Boston Naming Test, *VLMRI* = Immediate Recall of Wechsler's Logical Memory, *KOD* = Digit Symbol Test, *DSTF* = Digit Span Test Forward, *DSTB* = Digit Span Test Backwards, *TOK* = Token Test, *VOSP* = Visual Object and Space Perception test battery, *Stroop* = Stroop Test, *PaSMO* = Parallel Serial Mental Operations, *VLMRD* = Delayed Recall of Wechsler's Logical Memory, *HADanx* = Hospital Anxiety and Depression scale subdomain anxiety, *HADdep* = Hospital Anxiety and Depression Scale subdomain depression, *CF* = cognitive function subdomain, *DLA* = Daily Life Activities.

Data handling and statistical analysis

The primary alpha level of significance chosen for this study was set at 0.05. All statistical analyses were conducted by usage of IBM SPSS Statistics version 29. To characterize the study population, descriptive statistics were used. Continuous variables were summarized using mean and standard deviations. Ordinal data, such as scores for the HAD scale and all ten neuropsychological tests, were analyzed by calculating median, standard deviation and mean values.

The measure of subjective cognitive function (SCF) was operationalized by summarizing affirmative responses on the SASCI-Q items pertaining to cognitive functioning, acting as the subdomain cognitive function (CF). The scoring range was 0-29 points, with higher scores indicating greater reported subjective cognitive difficulties. Cronbach's alpha for these items was .925. The measures of objective cognitive function (OCF) and symptoms of *anxiety* and *depression* (HADanx and HADdep) were based on participants' raw scores on each of the ten neuropsychological tests and the HAD scale, respectively. The Cronbach's alpha for *HADanx* and *HADdep* was .786. The measure of daily life activities (DLA) was operationalized by constructing an index variable, DLA, consisting of the mean of the 11 items concerning daily life activities in the SASCI-Q (item 45-56) with a Cronbach's alpha of .141.

The relationships between CF scores and, neuropsychological test scores, HADanx scores, HADdep scores, and DLA scores, were analyzed using correlation analysis. Most of the variables tested in this study did not satisfy the assumptions of normality and multicollinearity required for Pearson correlation. Therefore, due to the non-parametric data, Spearman's rank-order correlation was utilized for all analyses to test the relationships among variables. If any of the performed correlation analyses was to prove statistically significant, appropriate regression models were to be implemented containing respective significant variables, to determine the ability of variables to produce a given outcome for the hypothesis in question.

Upon assessment of the assumptions required for linear regression used in the second aim, test results indicated that the assumptions (linearity, independence of residuals, homoscedasticity, multicollinearity) were acceptably met. However, normality of residuals was not met by satisfaction. The variables for this aim were tested with both parametric tests and non-parametric tests. However, for easier interpretation of data, we choose to proceed with a linear regression as the results was similar for both choices of tests. Furthermore, the choice of including the adjusted R-square value was to account for the number of degrees of freedom.

Ethics

Participants gave their written informed consent before entering the study. This study was performed in accordance with the Declaration of Helsinki and was approved by the Regional Ethical Review Board in Gothenburg, Sweden, which is a part of the Swedish national committee for ethical approval (Dnr: 668-15).

Results

The relationship between subjective and objective cognitive function

The first aim, and main objective, of this study was to investigate the relationship between subjective and objective cognitive function (SCF, OCF) in patients previously diagnosed with ED. A Spearman's rank-order correlation analysis was conducted to evaluate this relationship, between each neuropsychological test ($n = 10$) assessing OCF and the subdomain CF (SASCI-Q) assessing SCF.

No statistically significant relationship, between any of the ten neuropsychological tests and the subdomain CF, was found (Table 3). Moreover, per these results not showing statistical significance, proceeding with regression analyses were thus not appropriate.

Table 3

Spearman's rank-order correlation for each neuropsychological test against SASCI-Q CF

<i>Variable</i>	<i>n</i>	<i>rho</i>	<i>p</i>
BNT	49	.19	.20
VLMRI	49	-.02	.89
KOD	49	-.03	.85
DSTF	49	.12	.42
DSTB	49	.22	.13
TOK	49	.08	.57
VOSP	49	-.03	.84
Stroop	49	.10	.48
PaSMO	46	-.04	.80
VLMRD	49	-.02	.91

Note: *rho* = Spearman's correlation coefficient, *BNT* = Boston Naming Test, *VLMRI* = Immediate Recall of Wechsler's Logical Memory, *KOD* = Digit Symbol Test, *DSTF* = Digit Span Test Forward, *DSTB* = Digit Span Test Backwards, *TOK* = Token Test, *VOSP* = Visual Object and Space Perception test battery, *Stroop* = Stroop Test, *PaSMO* = Parallel Serial Mental Operations, *VLMRD* = Delayed Recall of Wechsler's Logical Memory, *SASCI-Q CF* = Sahlgrenska Academy Self-Reported Cognitive Impairment Questionnaire subdomain cognitive function

Subjective cognitive function and its relationship with symptoms of anxiety and depression

For the study's second aim – assessing the relationship between subjective cognitive function (SCF) and self-reported symptoms of anxiety and depression (HADanx, HADdep), a Spearman's rank-order correlation analysis was first conducted to evaluate this relationship. SCF was found to be strongly and significantly correlated with both HADanx and HADdep, indicating a positive relationship between participants' self-rated cognitive function and self-reported symptoms of anxiety and depression (Table 4). The relationship between the variables HADanx and HADdep exhibited a statistical significant correlation ($r(47) = .645, p = <.001$).

Table 4

Spearman's rank-order correlation for HADanx and HADdep against SASCI-Q CF

<i>Variable</i>	<i>n</i>	<i>rho</i>	<i>p</i>
HADanx	49	.40**	.004
HADdep	49	.66**	<.001

Note: rho = Spearman's correlation coefficient, HADanx = Hospital Anxiety and Depression scale subdomain anxiety, HADdep = Hospital Anxiety and Depression Scale subdomain depression, SASCI-Q CF = Sahlgrenska Academy Self-Reported Cognitive Impairment Questionnaire subdomain cognitive function

** . Correlation is significant at the 0.01 level (2-tailed)

Moreover, due to these results, further regression analyses were performed appropriately to predict participants total score of CF, reflecting SCF in participants (dependent) from HADanx (predictor) and HADdep (predictor). One simple linear regression model for each predictor was conducted, along with a multiple regression model including both predictors. In both simple linear regression models, HADanx and HADdep emerged as statistically significant predictors (Table 5).

Table 5

Simple linear regression for HADanx, HADdep, and SASCI-Q CF^a

<i>Variable</i>	<i>Ajdusted R²</i>	<i>Std. Error of the estimate</i>	<i>p</i>	<i>Std. β</i>	<i>β</i>
HADanx ^b	.37	5.57	<.001	0.62	1.01
HADdep ^c	6.58	.38	.007	0.38	0.75

a. Dependent variable

b. Predictor

c. Predictor

Note: HADanx = Hospital Anxiety and Depression scale subdomain anxiety, HADdep = Hospital Anxiety and Depression Scale subdomain depression, SASCI-Q CF = Sahlgrenska Academy Self-Reported Cognitive Impairment Questionnaire subdomain cognitive function

Additionally, a multiple linear regression was conducted for investigating whether there were any interactional effects between HADanx and HADdep. Scores from both subscales of HAD (HADanx, HADdep), were simultaneously included in the model against the subdomain in SASCI-Q pertaining cognitive function. However, only HADanx was found to be statistically significant, while HADdep was not statistically significant (Table 6). The interpretation of this result suggests that there may be multicollinearity between the closely

related anxiety and depression variables, which could mask or distort the individual effects of these variables on SASCI-Q affirmative responses that was statistically significant in the simple linear regressions. In other words, the presence of high correlation between anxiety and depression scores may make it difficult to distinguish the unique contribution of each variable to the outcome.

Furthermore, this finding implies that symptoms of anxiety, as measured through the HAD scale, may have a more prominent influence on subjective perceptions of cognitive difficulties compared to depressive symptoms.

Table 6

Multiple linear regression for results on HAD^{bc} and SASCI-Q CF^a

<i>Variable</i>	<i>Adjusted R²</i>	<i>Std. Error of the Estimate</i>	<i>p</i>	<i>Std. β</i>	<i>β</i>
	0.36	5.62			
HADanx ^b			<.001	0.66	1.074
HADdep ^c			.72	-0,056	-.112

a. Dependent variable

b. Predictor

c. Predictor

Note: HADanx = Hospital Anxiety and Depression scale subdomain anxiety, HADdep = Hospital Anxiety and Depression Scale subdomain depression, SASCI-Q CF = Sahlgrenska Academy Self-Reported Cognitive Impairment Questionnaire subdomain cognitive function

Daily life activities, subjective cognitive function and HAD scale

The third aim in this study was to examine the relationship between – participants subjective cognitive function and their daily life activities (DLA). To assess this relationship, a Spearman’s rank order correlation was carried out. However, no statistically significant correlation was to be found between SCF and DLA, $r(47) = -.11, p = .45$.

Furthermore, it was investigated if affective symptoms exhibited any correlation with DLA. However, neither correlation appeared statistically significant (HADdep: $r(47) = .095, p = .52$; HADanx: $r(47) = -.056, p = .70$). Moreover, per this result not showing statistical significance, proceeding with regression analysis was thus not appropriate.

Discussion

In this study, we investigated the relationship between subjective cognitive function, objective cognitive function, symptoms of anxiety and depression, as well as engagement in everyday activities, among participants 7-12 years after a diagnosis of Exhaustion Disorder (ED). Firstly, we found no correlation between participants' score on subdomain CF and any of the neuropsychological tests. This does support our hypothesis regarding our first aim, thus SCF cannot predict OCF in this patient population.

Additionally, self-reported symptoms of both anxiety and depression, were initially identified as significant predictors of subjective cognitive function. Further analysis revealed that anxiety symptoms may have a more pronounced influence on these perceptions compared to depressive symptoms. This finding supports our hypothesis where we expected to find a relationship between SCF and affective symptoms of ED.

Furthermore, our investigation into the relationship between subjective cognitive function and engagement in DLA showed, contrary to our hypothesis, no significant associations between these variables, suggesting that experiencing cognitive difficulties did not significantly impact individuals' tendency to engage in DLA, in this sample. Neither did affective symptoms of anxiety and depression correlate with DLA.

Overall, these findings underscore the importance of further research to elucidate the mechanisms underlying the symptoms associated with the long-term outcome of ED.

The discrepancy between subjective cognitive function and performance

The results from our first aim revealed no relationship, and thus a discrepancy between SCF and OCF. This result supports previous findings suggesting that individuals' self-reported experiences of cognitive difficulties may not always align with their actual cognitive performance (Oosterholt et al., 2012). Thus, further explanatory variables need to be considered for the discussion regarding this relationship.

The consequences of stress extend beyond mere physiological and cognitive responses; they can profoundly influence an individual's concept of self and their perception of cognitive performance (Maslach et al., 2001). For instance, in a study by Kristina Glise and colleagues (2020), former patients diagnosed with ED reported residual symptoms, particularly related to reduced stress tolerance. This finding underscores the enduring impact of stress on individuals' well-being. Stress appraisals, particularly those indicating harm or loss, trigger emotions that profoundly affect a person's evaluation of their personal significance. For example, experiencing harm or loss may evoke emotions such as anger and sadness, which can in turn influence one's perception of self (Folkman, 2013). These emotional responses, intertwined with stress appraisals, may contribute to feelings of exhaustion, social withdrawal, depersonalization, and diminished personal accomplishment (Maslach et al., 2001). In essence, the relationship between stress and self-perception is complex and multifaceted. It is essential to recognize the connection of this when considering the broader impact of stress on individuals' cognitive functioning and overall well-being, especially through the perspective regarding how individuals evaluate their cognition and other abilities.

Furthermore, patients' perceptions may be influenced by other factors which could further be explanatory for the discrepancy observed in our results, e.g. coping. Coping refers to the thoughts and actions people use to manage distress, manage the problem causing the distress or sustain their everyday lives (Folkman & Moskowitz, 2000). Patients diagnosed with ED may negotiate, drawing on previous experience and seek for advice regarding their

condition and include strategies, where their goals and beliefs affect their self-perception and performance. As coping is influenced by the situation (Folkman, 2013), one could hypothesize that patients reporting worse cognition may utilize coping upon situations where their performance is tested and hence, compensate for their perceived cognition. However, the coping will degenerate onto other concerns such as symptoms of cognitive fatigue which has been observed amongst patients with ED performing neuropsychological tests (Jonsdottir et al., 2013). Glise et al. (2020) has also discussed the potential impact of higher socioeconomic status and educational level, which provides plausible resources of e.g. coping for the individuals, may affect the recovery of former ED patients and thus lead to a higher burden on their health and negatively influenced self-perception.

The long-lasting effects on SCF experienced by patients with ED may be attributed to continued exposure to severe stress, even several years after seeking initial care (Glise et al., 2020). It has also been discussed whether personal traits such as overcommitment and/or perfectionism would affect the recovery of former patients, if these individuals were still experiencing a social, and cognitive load (Avanzi et al., 2014).

Therefore, the result of this study supports that further research is required to explore additional factors that could contribute to this observed discrepancy. It is still of importance through a clinical perspective to consider both subjective and objective measurements in the assessment of cognitive function, as each provides valuable information that can broaden the understanding regarding an individual's cognitive health. Furthermore, the interplay between ED and other psychological factors underscores the multifaceted nature of SCF. Beyond OCF, factors such as mood fluctuations, coping strategies, and self-perception play significant roles in shaping individuals' perceptions of their cognitive abilities. Therefore, a comprehensive understanding of these complex interactions is essential for accurately assessing and addressing cognitive difficulties in individuals with ED.

The relationship between ED, anxiety, and depression

According to our results for the second aim, individuals with higher levels of anxiety and depression are more likely to perceive and report cognitive difficulties. Furthermore, individuals with higher levels of anxiety were more likely to report cognitive difficulties, even if their depressive symptoms were not as pronounced. Thus, these results highlight a potential differential impact of anxiety and depression on subjective cognitive perceptions. Psychologically, it underscores the interplay between emotional well-being and cognitive functioning, highlighting the importance of addressing mental health concerns in the assessment and management of perceived cognitive decline. This complexity has been addressed through studies indicating that patients diagnosed with comorbid symptoms alongside ED often report more somatic symptoms (Glise et al., 2014).

However, it is crucial to recognize that the observed discrepancy may also stem from the comorbidity between ED and psychopathological symptoms such as those related to anxiety and depression, which has previously been reported (Glise et al., 2012), and may potentially impact individuals' subjective evaluations of their cognitive performance. This influence extends beyond factors such as mood, coping strategies, and self-perception, which may play critical roles in the overall relationship between SCF and OCF. The recognition of ED and its affective symptoms, such as anxiety and depression, is particularly important given the significant co-morbidity observed between self-reported symptoms of anxiety and depression in conjunction with ED and clinical diagnosis (Glise et al., 2012, 2014). The finding from those studies underscores the need for further investigation into the complex interplay between these conditions and their impact on cognitive function. Understanding this

association can inform clinical practice by highlighting the importance of assessing and addressing these co-morbid symptoms in individuals with ED who report cognitive difficulties.

Generally, patients with ED commonly face a significant burden of mental symptoms, which can persist for several months even after treatment, as investigated by Glise et al. (2012). Persons with ED often require an extended period to recover from the symptoms of exhaustion, which applies for both sexes and all ages (Glise et al., 2012). It has been suggested that the comorbidity between ED and depression and anxiety can account for variations in the illness course compared to conditions lacking complicating comorbid psychiatric factors. Consequently, recovery timelines may differ significantly among individuals, with recovery duration partly influenced by the severity of mental health symptoms (Glise et al., 2012).

Studies have observed that self-rated symptoms may inadequately reflect the presence of psychopathological conditions. For instance, Glise et al. (2012) discovered that 19% of participants who fulfilled criteria for clinical depression did not score above the cutoff of 7 on the Hospital Anxiety and Depression (HAD) scale. This underscores the complexity of assessing mental health symptoms and highlights the need for comprehensive diagnostic approaches in clinical practice. However, other studies have observed that patients scoring above 8 on the HAD scale demonstrate significantly poorer performance on test batteries assessing executive functions. Although, there is no discernible difference in performance on other neuropsychological tests among these patients (Jonsdottir et al., 2013). Therefore, upon investigating self-reported symptoms of ED and its covariant affective symptoms, it is important to underscore that it is not always a causal relationship of action. It is plausible that the affective symptoms co-vary with cognitive symptoms within ED patients. Moreover, the presence of anxiety and depression can exacerbate feelings of exhaustion and impair coping mechanisms, further complicating the interpretation of subjective evaluations of cognitive function (Glise et al., 2014).

This bidirectional influence suggests a cyclical relationship where cognitive and emotional symptoms influence each other, complicating the patient's condition and recovery. The dilemma is determining the primary cause of symptoms. Identifying whether cognitive or affective symptoms drive the other is likely essential for effective treatment. If affective symptoms are primary, targeting anxiety and depression may alleviate cognitive complaints. If cognitive symptoms are primary, cognitive rehabilitation may improve affective outcomes. Given the significant co-morbidity of anxiety and depression with ED, future research should focus on disentangling these relationships. Longitudinal studies and combined neuropsychological and self-report assessments can clarify these interactions. Understanding this interplay is crucial for accurate diagnosis and effective treatment of ED, where both cognitive and affective symptoms are prominent.

Everyday activities and its relationship with subjective cognition

Based on the finding for our third aim, there is no correlation between DLA and SCF among patients previously diagnosed with ED. However, previous research has shown a lasting impact of ED on both cognitive function and DLA, significantly influencing patients' lives (Ellbin et al., 2021). Although, the interrelationship between various subdomains (CF, DLA) in SASCI-Q has not been explored in previous studies. Therefore, it would be of great value to investigate whether similar patterns are observed in other patient populations, compared to those with ED as examined in this study.

To explore additional factors that may contribute to the answers within the DLA subdomain, the decision to incorporate its correlation to HAD was made. This was motivated by the understanding that conditions such as depression, in particular, can disrupt the ability to carry out everyday activities in a habitual and automated manner, and hinder smooth integration into collective practices (Hänninen & Valkonen, 2019). However, the lack of significant correlations between these variables challenges conventional assumptions regarding the relationship between affective symptoms and daily functioning. It could therefore be discussed that even if individuals with ED may experience significant psychological distress, this may not necessarily translate into observable impairments in their ability to engage in daily life activities. It is imperative to underscore the potential influence of diverse factors, such as coping mechanisms, and environmental determinants, on the low correlation observed in our study. These factors may serve as critical determinants shaping the heterogeneity of experiences and outcomes within this cohort.

Consequently, the absence of a discernible correlation between DLA and SCF should not be misconstrued as indicative of an incapacity to fulfill essential self-care duties. Particularly noteworthy is the fact that most former ED patients are not currently on sick leave (Ellbin et al., 2021). Hence, there is an expectation for them to function normally in their professional roles and engage in routine daily activities. This expectation arises due to the considerable time elapsed since they initially sought care for their condition (Ellbin et al., 2021). Moreover, patients diagnosed with ED are typically in the middle of their lives, and it is essential to consider that the concept of everyday activities may vary for individuals in their mid-50s compared to older individuals. The SASCI-Q questionnaire, designed to investigate pre-stages of memory problems related to Alzheimer's and dementia, is primarily tailored for older individuals affected by neurodegenerative diseases (Eckerstrom et al., 2013). Therefore, the domain of DLA in SASCI-Q may not precisely align with the experiences of younger populations who are in the middle of their lives. It is evident to recognize individual differences and patients' life situations before assessing a questionnaire on their everyday activities.

The findings of this study, pertaining to daily life activities, underscore the imperative for a nuanced comprehension of the functional capabilities and adaptive mechanisms utilized by affected individuals in negotiating the inflexibilities of daily life amid the persistent complications of their condition. Alternatively, the absence of a relationship might imply the existence of unexamined factors that wield greater influence over DLA but were not accounted for in the present investigation. This circumstance prompts crucial inquiries into the efficacy of rehabilitation efforts, workplace accommodations, and societal support structures in facilitating the reintegration of ED patients into occupational and social spheres. Moreover, it underscores the imperative for interventions tailored to address the unique challenges faced by this population, encompassing strategies to enhance resilience, optimize coping mechanisms, and foster sustainable work-life balance.

Limitations

The primary strength of this study lies in its unique study population, having been followed 7-12 years post-diagnosis. Furthermore, the incorporation of both subjective and objective measurements regarding cognition ensures that the study has captured a broad range of factors that are important upon measuring the cognitive domain.

However, several limitations must be acknowledged, tempering the interpretation of the results. The study's retrospective design and reliance on self-reported measures introduce the possibility of recall bias and subjective interpretation of symptoms. Additionally, the

small sample size may restrict the generalizability of findings to broader populations of ED patients. Moreover, the cross-sectional nature of our analyses, due to lack of cognitive measurements at baseline, prevents the establishment of causal relationships between variables, necessitating further longitudinal research to unravel the complex dynamics between subjective evaluations, cognitive performance, and daily functioning over time among individuals with ED.

Particularly, the observed lack of correlation, notably for the OCF and SCF, limits the investigation regarding its relationship. However, given the prevalent use of the test battery and SASCI-Q for MCI patients, there is a pressing need for more precise neuropsychological tests tailored to ED symptomatology.

Additionally, the creation of the new variable DLA may have resulted in some loss of specificity within individual item responses. Furthermore, the items comprising this variable demonstrated low correlation, potentially contributing to its overall low reliability. This highlights the need for future studies to employ more appropriate measurements and variables to accurately capture the multifaceted concept of DLA within ED patients.

Conclusion

The conclusion drawn from this study is that, among patients with Exhaustion Disorder 7-12 years post-diagnosis, there exists a lack of correlation between subjective and objective cognitive function. However, affective symptoms of depression and anxiety are found to be significant factors when considering subjective cognitive function, with anxiety in these results playing a more prominent role. Notably, the engagement in daily life activities among patients with Exhaustion Disorder demonstrates no significant correlation with their subjective cognitive function, and neither perceived states of anxiety nor depression emerge as predictors in this model.

Furthermore, the study underscores the need for further research to investigate the discrepancy between objective and subjective cognition. It emphasizes the importance of considering the comorbidity between ED, anxiety and depression disorders, suggesting the necessity for more comprehensive studies to elucidate the interplay and symptomatology among these disorders. In terms of daily life activities, DLA, the study highlights the need for further investigation to enhance understanding of its influence and dynamics in patients with Exhaustion Disorder.

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Appendix

SASCI-Q © Eckerström Marie, Skoogh Johanna, Steineck Gunnar, Johansson Boo, Wallin Anders; Sahlgrenska Academy, Gothenburg University, 2013.

Before you begin...

The following questions are about cognitive difficulties that some people may experience in their everyday lives.

Please indicate your answer to each question by placing an X, using a pen, in the box beside the most appropriate answer.

Please answer the questions on your own without help from anyone else.

Sometimes it is difficult to find the perfect response alternative. We appreciate if you nonetheless choose an alternative that is as close to your opinion as possible.

If you want to change a given answer, draw a line over the previous answer and place an X in the new box.

Please answer each question according to your experiences *in the last month*, whether or not this month is representative for your usual way of life.

Questions on current cognitive functioning

1. In the last month, have you had difficulties finding words that you usually know?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day
- Yes, several times a day

2. In the last month, have you had difficulties completing your sentences?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day
- Yes, several times a day

3. In the last month, have you "lost the thread" while talking?

- No
- Yes, on single occasions
- Yes, but in less than half of all conversations
- Yes, in about half of all conversations
- Yes, in more than half of all conversations
- Yes, on every occasion

4. In the last month, have you felt mentally slow?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

5. In the last month, have you had difficulties remembering people's names?
- No
 - Yes, but less often than once a week
 - Yes, at least once a week
 - Yes, at least three times a week
 - Yes, at least once a day
6. In the last month, did someone else say that you said something you can't remember saying?
- No
 - Yes, on 1 occasion
 - Yes, on 2-3 occasions
 - Yes, on 4-5 occasions
 - Yes, on 6 occasions or more
7. In the last month, did someone else say that you did something you can't remember doing?
- No
 - Yes, on 1 occasion
 - Yes, on 2-3 occasions
 - Yes, on 4-5 occasions
 - Yes, on 6 occasions or more
8. In the last month, have you felt uncertain about what you have said or not said?
- No
 - Yes, but less often than once a week
 - Yes, at least once a week
 - Yes, at least three times a week
 - Yes, at least once a day
9. In the last month, have you felt uncertain about what others have said or not said?
- No
 - Yes, but less often than once a week
 - Yes, at least once a week
 - Yes, at least three times a week
 - Yes, at least once a day
10. In the last month, have you had difficulties remembering what you have read?
- No
 - Yes, on single occasions
 - Yes, but on less than half of all occasions
 - Yes, on about half of all occasions
 - Yes, on more than half of all occasions
 - Yes, on every occasion
11. Some people have difficulties remembering episodes of last week's TV-shows. How did that apply to you, in the last month?
- Not applicable, I have not watched TV or TV-shows*

- Not at all
- Slightly
- Moderately
- Completely

12. In the last month, have you forgotten to buy any grocery even when using a shopping list?

- Not applicable, I have not bought groceries in the last month*
- Not applicable, I have not used a shopping list in the last month*
- No
- Yes, on a few occasions
- Yes, but on less than half of all occasions
- Yes, on about half of all occasions
- Yes, on more than half of all occasions
- Yes, on every occasion

13. In the last month, have you been looking for something you have misplaced?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day
- Yes, several times a day

14. Some people have difficulties learning new things - even things that they find interesting. How did that apply to you, in the last month?

- Not at all
- Slightly
- Moderately
- Completely

15. Some people have difficulties learning phone numbers by heart. How did that apply to you, in the last month?

- Not at all
- Slightly
- Moderately
- Completely

16. In the last month, have you experienced memory problems?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

17. In the last month, did someone else say or imply that you have a poor memory?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week

Yes, at least once a day

18. In the last month, have you worried about your memory functions?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

19. In the last month, have you been mistaken about what day of the week it is?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

20. In the last month, have you sometimes had the feeling that you had planned to do something without remembering what it was?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

21. In the last month, have you had difficulties remembering facts that you usually know?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

22. In the last month, have you used memory notes at work?

- Not applicable, I am not working*
- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

23. In the last month, have you used memory notes at home?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

24. Some people feel dependent on memory notes to remember things. How did that apply to you, in the last month?

- Not at all Slightly
- Moderately
- Completely

25. In the last month, did someone else remind you about something?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

26. Some people have difficulties “collecting their thoughts”. How did that apply to you, in the last month?

- Not at all
- Slightly
- Moderately
- Completely

27. Some people have difficulties multitasking. How did that apply to you, in the last month?

- Not at all
- Slightly
- Moderately
- Completely

28. Some people have difficulties with problem solving. How did that apply to you, in the last month?

- Not at all
- Slightly
- Moderately
- Completely

29. Some people have difficulties concentrating. How did that apply to you, in the last month?

- Not at all
- Slightly
- Moderately
- Completely

Current and previous functioning

Some of the following questions may resemble questions you have already encountered in this questionnaire. This part is about your current functioning (in the last month) compared to previously in life. When answering, please compare with the average functioning of your peers (based on your own opinion). Place a circle around the number matching the most appropriate answer. **Please do not put circles or x:es between numbers.**

30.1 Compared to peers, how would you assess your functioning **in the last month** regarding **recalling recent events**?

1-----2-----3-----4-----5-----6-----7
Very poor

Very good

30.2 Compared to peers, how would you assess your functioning **10 years ago** regarding **recalling recent events**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

30.3 Compared to peers, how would you assess your functioning **when you were 25 years old** regarding **recalling recent events**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

31.1 Compared to peers, how would you assess your functioning **in the last month** regarding **finding words that you usually know**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

31.2 Compared to peers, how would you assess your functioning **10 years ago** regarding **finding words that you usually know**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

31.3 Compared to peers, how would you assess your functioning **when you were 25 years old** regarding **finding words that you usually know**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

32.1 Compared to peers, how would you assess your functioning **in the last month** regarding **following maps or patterns**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

32.2 Compared to peers, how would you assess your functioning **10 years ago** regarding **following maps or patterns**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

32.3 Compared to peers, how would you assess your functioning **when you were 25 years old** regarding **following maps or patterns**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

33.1 Compared to peers, how would you assess your functioning **in the last month** regarding **planning and completing tasks**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

33.2 Compared to peers, how would you assess your functioning **10 years ago** regarding **planning and completing tasks**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

33.3 Compared to peers, how would you assess your functioning **when you were 25 years old** regarding **planning and completing tasks**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

34.1 Compared to peers, how would you assess your functioning **in the last month** regarding **your ability to concentrate (e.g. while watching TV, reading or conversing)**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

34.2 Compared to peers, how would you assess your functioning **10 years ago** regarding **your ability to concentrate (e.g. while watching TV, reading or conversing)**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

34.3 Compared to peers, how would you assess your functioning **when you were 25 years old** regarding your ability to concentrate (e.g. while watching TV, reading or conversing)?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

35.1 Compared to peers, how would you assess your functioning **in the last month** regarding your ability to carry out tasks rapidly?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

35.2 Compared to peers, how would you assess your functioning **10 years ago** regarding your ability to carry out tasks rapidly?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

35.3 Compared to peers, how would you assess your functioning **when you were 25 years old** regarding your ability to carry out tasks rapidly?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

36.1 Compared to peers, how would you assess your global memory functioning **in the last month**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

36.2 Compared to peers, how would you assess your global memory functioning **10 years ago**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

36.3 Compared to peers, how would you assess your global memory functioning **when you were 25 years old**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

37.1 Compared to peers, how would you assess your global cognitive functioning **in the last month**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

37.2 Compared to peers, how would you assess your global cognitive functioning **10 years ago**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

37.3 Compared to peers, how would you assess your global cognitive functioning **when you were 25 years old**?

1-----2-----3-----4-----5-----6-----7
Very poor Very good

General questions and everyday activities

38. What year were you born? Year: _____

39. Are you

Female

Male

40. How many years of education have you had (total)? Years: _____

41. Have you been ill, in the last month?

- No
- Yes, 1 day
- Yes, 2-3 days
- Yes, 4-6 days
- Yes, 6 days or more

If yes, please describe your illness: _____

42. Have you experienced strain or stress, in the last month?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

43. Have you felt tired during the day, in the last month?

- Never
- Yes, on single occasions
- Yes, but less than half of all days
- Yes, in about half of all days
- Yes, in more than half of all days
- Yes, every day

44. On average, how many hours have you slept per night, in the last month?

- Less than 4 hours
- 5-6 hours
- 7-8 hours
- 9-10 hours
- 11 hours or more

45. In the last month, have you been walking for at least 15 minutes (on a single occasion)?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

46. In the last month, have you engaged in any demanding physical activity?

- No
- Yes, but less often than once a week
- Yes, at least once a week
- Yes, at least three times a week
- Yes, at least once a day

If yes, please give one or more examples:

47. In the last month, have you met with friends, acquaintances or relatives?
- No
 - Yes, but less often than once a week
 - Yes, at least once a week
 - Yes, at least three times a week
 - Yes, at least once a day
48. On average, how many times per week have you engaged in any form of leisure activity outside your home, in the last month?
- None
 - 1 time/week
 - 2-3 times/week
 - 4-5 times/week
 - 6 or more times/week
49. On average, how much time per day have you spent on any form of reading, in the last month?
- No time
 - 0 to 30 minutes
 - 30 to 60 minutes 1-3 hours
 - More than 3 hours
50. Have you done crossword puzzles or sudoku (number puzzle), in the last month?
- No
 - Yes, but less often than once a week
 - Yes, at least once a week
 - Yes, at least three times a week
 - Yes, at least once a day
51. On average, how much time per day have you spent watching TV, in the last month?
- No time
 - Up to 1 hour/day
 - 2-3 hours/day
 - 4-5 hours/day
 - 6 hours or more/day
52. Have you gone to the movies, theatre, musical concerts, sport events or similar kinds of events, in the last month?
- No
 - Yes, but less often than once a week
 - Yes, at least once a week
 - Yes, at least three times a week
 - Yes, every day
53. Out of everything you had planned to do in the last month, approximately how much did you carry through?
- Nothing at all
 - Almost nothing
 - Less than half
 - About half
 - More than half

- Almost everything
- Everything

54. In the last month, have you cancelled activities because of lack of energy?

- No
- Yes, 1 time
- Yes, 2-3 times
- Yes, 4-5 times
- Yes, 6 times or more

55. Some people have difficulties to get going to activities (outside-the-home), even when it comes to activities they like. How did that apply to you, in the last month?

- Not at all
- Slightly
- Moderately
- Completely

56. If any, which of the following difficulties has affected your sense of well-being the most, in the last month? **Please choose only one alternative.**

- Not applicable, I have not experienced any of the listed difficulties*
- Not applicable, none of the listed difficulties has affected my sense of well-being*
- Difficulties finding words or other verbal difficulties
- Difficulties concentrating
- Feeling "slow"
- Memory difficulties
- Difficulties with orientation
- Looking for things
- Difficulties activating myself
- A lack of energy

57. Approximately, how much time did you spend completing this questionnaire?

It took me approximately _____ minutes to complete this questionnaire.