

Who profits from concentrated exposure treatment for Obsessive-Compulsive Disorder (OCD)?

A quality assurance project from the OCD-team in Bergen

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Scientific environment

The work in the current thesis has been conducted at the OCD-team at Haukeland University Hospital in Bergen, Norway. My main supervisor has been Professor Stian Solem at the Norwegian University of Science and Technology (NTNU; also associated with the OCD-team in Bergen). Gerd Kvale, professor at the University of Bergen (UoB) and director of Bergen Center for Brain Plasticity at Haukeland University Hospital and Bjarne Hansen, professor at the Center for Crisis Psychology have been my co-supervisors. I have been enrolled at the Graduate School of Clinical and Developmental Psychology at UoB during my PhD.



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Abbreviations

BAI	Beck Anxiety Inventory
BDI-II	Beck Depression Inventory-II
CBT	Cognitive Behavioral Therapy
DRS-15-R	Dispositional Resilience Scale 15-Revised
EBP	Evidence-Based Practice Implementation
ERP	Exposure and Response Prevention
GAD-7	Generalized Anxiety Disorder-7
HSPS	Highly Sensitive Person Scale
MBQI	Measurement-Based Quality Improvement
NCS-R	National Comorbidity Survey Replication
OCD	Obsessive-Compulsive Disorder
OCI-R	Obsessive-Compulsive Inventory – Revised
OR	Odds Ratio
PD	Personality Disorder
PHQ-9	Patient Health Questionnaire-9
PTSD	Post-traumatic stress disorder
READ	Resilience Scale for Adolescents
REK	Regional Ethical Committee
SPS	Sensory Processing Sensitivity
SSRI	Selective Serotonin Reuptake Inhibitors
Y-BOCS	Yale–Brown Obsessive Compulsive Scale
5-HTTLPR	Serotonin (5HT)-transporter-linked polymorph region

List of papers

- I Holm, S. E. H., Hansen, B., Kvale, G., Eilertsen, T., Johnsen, B. H., Hystad, S. W., & Solem, S. (2019). Dispositional resilience in treatment-seeking patients with obsessive-compulsive disorder and its association with treatment outcome. *Scandinavian Journal of Psychology* 60(3), 243-251. doi: 10.1111/sjop.12531
- II Holm, S. E. H., Hansen, B., Kvale, G., Eilertsen, T., Hagen, K., & Solem, S. (2019). Is sensory processing sensitivity related to treatment outcome in concentrated exposure and response prevention treatment for obsessive-compulsive disorder? *Journal of Obsessive-Compulsive and Related Disorders*, 23, 100486. doi: 10.1016/j.jocrd.2019.100486
- III Holm, S. E. H., Hansen, B., Kvale, G., Eilertsen, T., Grøtte, T., & Solem, S. (2018). Post-treatment predictors of follow-up status for obsessive-compulsive disorder treated with concentrated exposure therapy. *Cogent Psychology*, 5(1), 1461542. doi: 10.1080/23311908.2018.1461542

Abstract

Obsessive-Compulsive Disorder (OCD) is a debilitating psychological disorder characterized by bothersome and intrusive thoughts (obsessions) associated with anxiety and distress that the patient tries to reduce or control through compulsive behavior. The main recommended treatment for OCD is Cognitive behavioral therapy (CBT), including exposure and response prevention (ERP). At the OCD-team in Bergen, Norway, ERP is offered in a concentrated treatment format across four consecutive days. However, not all patients profit from ERP treatment, and it is an important task to establish which patients respond to this treatment and who does not. This thesis set out to investigate whether the concentrated treatment works for patients with certain characteristics. In paper I, we examined the relationship between treatment outcome and hardiness or resilience; a personality trait regarding sense of meaning and commitment, locus of control, and preferences for challenges. In paper II, we explored the relationship between treatment outcome and the personality trait sensory processing sensitivity. In the paper III, we investigated whether post-treatment levels of depression, anxiety and OCD were related to treatment outcome. We report on data from a quality assurance database at an outpatient OCD-clinic in Bergen, Norway. The quality assurance database was established during the national implementation of publicly available ERP treatment in Norway in order to monitor the treatment delivered by specialized OCD-teams. Symptoms were measured pre- and post-treatment, and at 3-6 month follow-up. The concentrated treatment was found to be highly effective, and the majority of patients had a clinically significant and lasting improvement in OCD symptoms. No adverse effects were detected. Results showed that the treatment was equally efficient for patients scoring high and low on resilience and sensory processing sensitivity. This is an important finding, as research suggest that therapists might be reluctant to offer exposure treatment to patients considered too “fragile” or “sensitive” for exposure tasks. However, the combination of subclinical levels of depression, anxiety, and OCD symptoms at post-treatment was associated with higher levels of OCD-symptoms at follow-up. This is in line with previous research, and points to the importance of full recovery post-treatment. We recommend clinicians to pay attention to patients with residual symptoms to reduce risk of relapse.

We also recommend clinicians to offer evidence based ERP treatment to patients regardless of scores on sensitivity and resilience. Important limitations in the current thesis include the reliance on self-report data, whether our results can be generalized to other treatment formats, and the lack of other possibly relevant predictor variables. We recommend future studies to investigate whether our findings hold true in other samples and treatment formats. We argue that quality assurance as an integrated part of treatment provides safety for the patients and a unique opportunity for improvements and continued development of evidence based treatments.

Sammendrag (Norwegian abstract)

Tvangslidelse, eller OCD, er en psykisk lidelse karakterisert ved tvangstanker og tvangshandlinger. Kognitiv atferdsterapi, inkludert eksponering med responsprevensjon (ERP) er den behandlingsformen som har best dokumentert effekt ved tvangslidelse. Ved OCD-teamet i Bergen tilbys pasientene konsentrert behandling over fire dager. Ikke alle pasienter blir friske av ERP-behandling, og en viktig oppgave i klinikken er å forsøke å identifisere hvilke pasienter som profiterer på behandlingen og hvem som ikke gjør det. Hovedmålet med dette kvalitetssikringsprosjektet var å finne ut om ulike skårer på resiliens, høysensitivitet eller restsymptomer ved avslutning påvirket om pasientene nyttiggjorde seg behandlingen. I den første artikkelen undersøkte vi personlighetstrekket hardførhet – et konsept som består av faktorene opplevd mening, forpliktelse og opplevelse av kontroll. I artikkel 2 undersøkte vi personlighetstrekket høysensitivitet. I den tredje artikkelen undersøkte vi hvorvidt subklinisk nivå av depresjon, angst og OCD etter endt behandling forklarte tilbakefall ved oppfølging. Data ble hentet ut fra en kvalitetssikringsdatabase ved OCD-teamet i Helse Bergen. Kvalitetssikringsdatabasen ble opprettet forut for etableringen av spesialiserte OCD team. Pasientenes symptomer ble målt før og etter behandling, samt 3 og 6 måneder etter endt behandling. Det konsentrerte behandlingsformatet ga gode resultater og majoriteten av pasientene fikk en signifikant og klinisk relevant bedring gjennom behandlingen. Det ble ikke funnet negative effekter av behandlingen. Resultatene viste at hverken resiliens eller høysensitivitet sto i veien for pasientenes nytte av behandlingen. Dette er et viktig funn, ettersom forskning tyder på at terapeuter kan være tilbakeholdne med å tilby eksponeringsterapi til pasienter de anser som «skjøre» eller «sensitive». Resultatene viste at pasienter som hadde restsymptomer på angst, depresjon og OCD etter endt behandling hadde dårligere utfall ved oppfølging 3-6 måneder etter behandling. Dette stemmer godt overens med tidligere forskning som peker på viktigheten av at pasientene oppnår betydelig bedring før avslutning av forløpet. Ettersom resultatene våre viste at forhøyede skårer på angst, depresjon og OCD etter behandling hang sammen med dårligere utfall, anbefaler vi at klinikere følger ekstra godt med på denne pasientgruppen i perioden etter behandling for å unngå tilbakefall. Vi anbefaler videre

at klinikere tilbyr evidensbasert eksponeringsterapi til pasienter uavhengig av resiliens- og sensitivitetsskårer. Viktige begrensninger i dette prosjektet inkluderer at det i stor grad er brukt selvrappordata, spørsmål om funnene kan generaliseres til andre behandlingsformat enn det foreliggende 4-dagers formatet, samt at vi har utelatt andre faktorer som kan være relevante for behandlingsutfall. Vi anbefaler videre studier å undersøke om funnene våre kan generaliseres til andre behandlingsformat og utvalg. Vi argumenterer også for at kvalitetssikring som en integrert del av behandlingen gir trygghet for pasientene og en unik mulighet til å fortsette å videreutvikle og forbedre evidensbasert behandling.

Introduction

1.1 Introduction to Obsessive-Compulsive Disorder

1.1.1 Diagnostic criteria and demographics of OCD

Obsessive-Compulsive Disorder (OCD) is a psychiatric disorder which consists of obsessions and compulsions. Obsessions are intrusive thoughts or images that raises anxiety in the patient. Compulsions are physical or mental acts or rituals which the patient uses to try to reduce the distress caused by the intrusions (American Psychiatric Association, 2013). Typical obsessions can include fear of contamination, fear of forgetfulness (e.g. fear of not having turned off the stove) or fear that one will act on an inappropriate impulse (e.g. aggressive or sexual impulses). Typical compulsions may be excessive washing, monitoring one's own behavior or repetitive checking. To fulfill the diagnostic criteria for OCD, the obsessions and/or compulsions have to be time-consuming or lead to significant distress and/or functional impairment, and should not be caused by drug use, a medical condition or another psychological disorder (American Psychiatric Association, 2013). Prevalence estimates vary, but it is assumed that OCD has a lifetime prevalence of 1-3% (e.g. Karno, Golding, Sorenson & Burnam, 1988; Ruscio, Stein, Chiu & Kessler, 2010). However, one large representative epidemiologic study of adults in the US found that more than a quarter of the participants reported some kind of obsessions or compulsions throughout their lives, which indicates that obsessions and compulsions could be quite common (Ruscio et al., 2010).

Patients with OCD have been found to have a high degree of comorbidity. Figures from the National Comorbidity Survey Replication (NCS-R; $n = 2073$) showed that 90% of the respondents with OCD also met the lifetime criteria of at least one additional mental disorder (Ruscio et al., 2010). The most common comorbid disorders in the NCS-R were anxiety disorders (75.8%). This was followed by mood disorders (63.3%), impulse-control disorders (55.9%) and substance use disorders (38.6%). All the same, a recent patient-level mega-analysis of eight different sites of

cognitive and behavioral therapies for OCD found that comorbidity did not predict nor moderate OCD treatment outcome (Steketee, Siev, Yovel, Lit, & Wilhelm, 2019).

1.1.2 Subtypes and dimensions of OCD

As obsessions and compulsions take many shapes and forms, there is a great heterogeneity considering clinical presentation of OCD, and several different subtypes have been suggested (Mataix-Cols, Rosario-Campos & Leckman, 2005; McKay et al., 2004). For example, Hoehn-Saric and Barksdale (1983), suggested poor vs. good impulse control subtypes of OCD, while Nestadt and colleagues (2003) suggested subtyping based on comorbidity patterns. A review by McKay and colleagues (2004) concluded that the subtypes of contamination/washing, checking, hoarding and symmetry/ordering have been consistently identified, and could be presumed to be reliable and valid subtypes. They further found mixed empirical support for the subtypes of pure obsessional, sexual/religious obsessions and harming obsessions. A review of factor analytic studies of OCD from 2005 found similar results with consistent extractions of the dimensions symmetry/ordering, hoarding, contamination/cleaning, and obsessions/checking (Mataix-Cols et al., 2005). Hoarding has since been classified as an OCD-related disorder, and not as OCD (American Psychiatric Association, 2013; Mataix-Cols et al., 2010).

There has been a debate in the literature as to whether OCD should be classified into subtypes, or whether it's best understood as a dimensional phenomenon (Mataix-Cols et al., 2005; McKay et al., 2004). Mataix-Cols and colleagues (2005) argued that the dimensional approach presents a more complete picture for researchers and clinicians, as each OCD patient rarely presents only one type of symptom, and a dimensional approach can yield information about nuanced scores on different axes (as opposed to placing the patient in one strict category). Symptom dimensions may predict treatment outcome, but so far studies of symptom dimensions have several shortcomings, including small sample sizes and inconsistent definitions, and there are few randomized controlled trials (Thorsen, Kvale, Hansen & van den Heuvel, 2018).

Subtyping of OCD is still under investigation. For example, studies using network analyses have started investigating the etiology of OCD subtypes. A large multivariate twin study found no single latent factor that could explain the heterogeneity in OCD symptoms in their sample. Their model suggest that a combination of different shared and unique genetic and environmental factors contribute to the different symptom dimensions of checking, hoarding, obsessing, ordering and washing (Iervolino, Rijdsdijk, Cherkas, Fullana & Mataix-Cols, 2011). The challenge of categorization of OCD is also evident at a higher classification level in the debate over the placement of OCD in the diagnostic system, as an anxiety disorder or as a separate diagnostic group (Stein et al., 2010).

1.1.3 Sex differences in OCD

In adults, OCD has been found to be more frequent in females than in males (Ruscio et al., 2010; Weissman, 1998), while in children, clinically referred OCD has been found to be slightly more common in boys (Last & Strauss, 1989). Typical age of onset for OCD has been reported to be early adolescence to young adulthood, but males tend to have earlier onset than females (Lochner et al., 2004; Ruscio et al., 2010). The literature on sex differences in OCD symptomatology is inconsistent, but some differences have been reported. A review from 2003 stated that obsessions considering symmetry, exactness, numbers and sexual content were more common among males, while cleaning and aggressive symptoms were more common among females (Lochner & Stein, 2003). Males also had more touching rituals and primary obsessive slowness. Furthermore, males with OCD have been found to have more tics (Lochner et al., 2004) and more neurological soft signs (Stein et al., 1994). Some, but not all studies, indicate OCD can have a worse course in males (Lochner & Stein, 2003). Some females with OCD report changes in symptoms in (pre-) menstrual periods, during pregnancy, and during menopause (Lochner et al., 2004).

Sex differences have also been reported for comorbidity patterns. While it has been reported that females with OCD have a higher comorbidity rate for eating disorder, depression, panic disorder, borderline personality disorder (PD) and

dependent PD, males with OCD have been found to have a higher comorbidity rate of substance-use, social phobia, hypomanic episodes and schizotypal PD (Lochner & Stein, 2003). These differences in comorbidity mirror the pattern of sex differences observed in other psychiatric disorders.

There is some uncertainty as to whether gender is related to treatment outcome in treatment for OCD. One meta-analysis of studies of cognitive behavioral therapy (CBT) found significantly lower treatment effects in studies with more women ($z = -2.05$; Öst, Havnen, Hansen & Kvale, 2015). However, two other meta-analyses have not found a significant relation between sex and treatment outcome in cognitive and behavioral therapies for OCD (Olatunji, Davis, Powers & Smits, 2013; Rosa-Alcázar, Sánchez-Meca, Gómez-Conesa & Marín-Martínez, 2008). This might be due to differences in inclusion criteria of studies, but Öst et al. (2015) concluded that it is difficult to explain why proportion of females was related to effect size in their study, and not in the others.

1.1.4 OCD and quality of life

Spending hours each day dealing with obsessions and compulsions have been found to severely affect quality of life. Impairment in quality of life for patients with OCD has been found across several different countries and cultures, including Spain (Bobes, Gonzalez, Arango, Saiz & Bousoño, 2001), Germany (Stengler-Wenzke, Kroll, Matschinger & Angermeyer, 2006), Denmark (Sørensen, Kirkeby & Thomsen, 2004), Singapore (Subramaniam, Abidin, Vaingankar, & Chong, 2012), South Africa (Stein, Roberts, Hollander, Rowland & Serebro, 1996) and USA (Eisen et al., 2006; Ruscio et al., 2010). One large study from the US found OCD to impair both home management, work, relationships and social life for the affected individuals, with the most severe impairment seen in home management (Ruscio et al., 2010). OCD has also been linked to reduced subjective sense of wellbeing and lower ability to enjoy leisure activities (Eisen et al., 2006). Another study found lower employment rate in patients with OCD compared to patients with other anxiety disorders (Steketee, Grayson & Foa, 1987). OCD has also been linked to lower physical well-being (Moritz et al., 2005), and

higher risk of suicide attempts and death by suicide (de la Cruz et al., 2017). Lower quality of life has been found to predict worse treatment outcome in ERP and CBT treatments for OCD (Maher et al., 2010). Furthermore, OCD tends to become chronic when untreated (Eisen et al., 2006).

1.1.5 OCD and genetics

The etiology of OCD is largely unknown (Mataix-Cols et al., 2020). However, there are several findings linking OCD to biological correlates. Perinatal factors might play a role. One large Swedish study found a range of perinatal risk factors for developing OCD, including smoking during pregnancy, delivery by cesarean section and preterm birth (Arnold et al., 2018). Research suggest OCD is partly heritable, and it has been estimated that differences in genes account for 50% of the differences in familial risk for OCD (Mataix-Cols et al., 2013). Although genetic studies have discovered several candidate genes that might be relevant for the development of OCD, there is still a long way to go to establish a causal model for OCD (Nestadt, Grados & Samuels, 2010). Genes related to the serotonergic (Taylor, 2013), and glutamatergic (e.g. Alonso et al., 2012) systems in the brain have been linked to OCD. Research has also indicated that genetic variants related to the serotonergic and glutamatergic systems could be related to treatment outcome for pharmacologic treatments of OCD (Zai, Brandl, Müller, Richter & Kennedy, 2014).

There seems to be considerable overlap between genetic risk factors for developing OCD and other psychiatric disorders, including anorexia nervosa, depression, bipolar disorder, schizophrenia and Tourette syndrome (Brainstorm Consortium, 2018). Further, OCD has been found to have considerable genetic overlap with the personality trait neuroticism (Brain Consortium, 2018). In sum, OCD seems to be partly heritable and covariate with several other psychiatric disorders. This is in line with the findings that OCD has a high degree of comorbidity. More research is needed to better understand the genetic markers linked to OCD, investigate whether genetic factors influence treatment outcome and whether epigenetic markers change as

a result of treatment or not. Currently, a large-scale study is being conducted in Scandinavia investigating genetic components in OCD (Mataix-Cols et al., 2020).

1.1.6 Neuroanatomic differences and brain activation in OCD

Brain imaging techniques have been used to improve our understanding of how OCD symptoms develop and are maintained, and to what extent they can be considered traits or states. OCD has been related to differences in structures and activation in different circuits of the brain when compared to healthy controls (Stein et al., 2019). More specifically, OCD has been related to thinner cortices in some areas of the brain (Boedhoe et al., 2018), smaller hippocampal volume and larger pallidum volume (Boedhoe et al., 2017). The differences in volume seem to vary with age and medication, indicating the structural neurobiological correlates of OCD could change throughout the lifespan (Boedhoe et al., 2017). It has also been reported that structure and volume of putamen, thalamus and amygdala correlate with genetic risk factors for OCD (Hibar et al., 2018).

A recent meta-analysis indicate that patients with OCD show increased activation in amygdala, orbitofrontal cortex, putamen and visual cortex when shown pictures that evoke discomfort, fear or disgust. These structures probably support the process of becoming aware of triggers for obsessions followed by compulsions and/or avoidance (Thorsen et al., 2018a). Early studies indicate that structures and functions of the brain can change through effective treatment for OCD (Brooks & Stein, 2015; Thorsen, van den Heuvel, Hansen & Kvale, 2015). Additionally, more recent studies indicate that CBT for OCD lead to strong structural connections between several brain areas (Zhong et al., 2019), less cross connections between limbic (i.e. emotional) and fronto-parietal (i.e. executive) networks (Thorsen et al., 2020), and stronger connections between cerebellum and caudate putamen, and between cerebellum and prefrontal cortex (Moody et al., 2017). Studies with small samples possibly indicate that activation in specific brain regions in patients with OCD is related to treatment

outcome for pharmacological treatment (Kim et al., 2019; Sanematsu et al., 2010) and exposure and response prevention (Pagliaccio et al., 2019).

In sum, brain imaging has revealed differences between OCD patients and healthy controls. Some findings seem to reflect genetic risk, others the practice and maintenance of the disorder, where the latter might change through effective treatment. Other studies have found a link between activation in specific brain regions and treatment outcome. The findings however have low effect sizes. Furthermore, medication, comorbidity and duration of disorder are plausible confounders.

1.2 Evidence based treatments for OCD

1.2.1 Pharmacological treatments

Treatment guidelines from National Institute for Health and Care Excellence (2015) recommend SSRI (selective serotonin reuptake inhibitors) as the first choice for pharmacological treatment for OCD, and low dose of antipsychotic medication in addition if the patient does not profit from SSRI alone. A recent meta-analysis found a mean reduction of symptoms (assessed with the Yale–Brown Obsessive Compulsive Scale; Y-BOCS) of 3.5 points when patients were treated with SSRI, and no difference between different SSRIs (Skapinakis et al., 2016). Two recent meta-analyses comparing CBT/ERP and SSRI in children and adults conclude that CBT/ERP was significantly better than SSRI, that pharmacological treatment had higher drop-out rates than CBT/ERP, and that SSRI did not increase the effect of CBT/ERP (Öst et al., 2015; Öst, Riise, Wergeland, Hansen & Kvale, 2016). One study also found that adding CBT/ERP to continued SSRI treatment lead to more symptom reduction than adding an atypical antipsychotic (Simpson et al., 2013). As mentioned previously, studies indicate that effects of treatment with SSRIs might be moderated by genetic and neurophysiological factors (Kim et al., 2019; Sanematsu et al., 2010; Zai et al., 2014).

1.2.2 CBT and ERP for OCD

Cognitive behavioral therapy (CBT) and exposure and response prevention (ERP) are the psychological treatments for OCD with the most solid evidence base (Abramowitz, 2006; Abramowitz, Taylor & McKay, 2009; Öst et al., 2015). The cognitive model of OCD proposes that obsessions and compulsions stem from certain types of dysfunctional beliefs. This theory suggest that most people experience unwanted intrusive thoughts or images and that these intrusive thoughts turn to obsessions when the thoughts are experienced as unacceptable, personally important or posing a threat. The model further suggests that rituals or compulsions stem from the patient's efforts to neutralize thoughts or deal with potential harmful consequences of their thoughts (Rachman, 1998a; Rachman, 1998b). Cognitive behavioral therapy with exposure and response prevention will typically aim at helping the patients correct their beliefs about obsessive thoughts and compulsory behavior. The treatment involves systematic encounters with feared stimuli while the patient refrains from performing compulsive rituals. The goal is for the patient to learn that their fear will not last indefinitely, and that their compulsive rituals are unnecessary to prevent the feared consequences (Abramowitz et al., 2009).

Studies of CBT for OCD have found very large effect sizes compared with wait-list and placebo controls, both for children and adults (Öst et al., 2015; Öst et al., 2016). Furthermore, research has found CBT and ERP to be equally efficient for treating OCD (Öst et al., 2015; Whittal, Thordarson & McLean, 2005). Different criteria have been used to define response and remission CBT and ERP, so exact numbers of response and remission rates vary. Meta-analyses indicate that CBT and ERP yield clinical significant effects for about 50-70% of patients (Eddy, Dutra, Bradley & Westen, 2004; Öst et al., 2015). A recent meta-analysis indicated that as many as 80% of patients report some symptoms of OCD (including mild symptomatology) after completing psychological treatment for OCD (Fisher, Cherry, Stuart, Rigby & Temple, 2020). Hence, it is important to identify which patients benefit from treatment, and for whom the treatment must be further tailored in order to

achieve satisfactory treatment response, helping more patients recover, and ultimately improving treatment practice.

1.2.3 Concentrated ERP-treatment delivered in a group setting

Studies strongly indicate that CBT and ERP for OCD are robust treatments that can be delivered in different treatment formats, including regular and intensive treatment formats (Jónsson, Kristensen & Arendt, 2015; Öst et al., 2015), as well as individual and group treatment (Jónsson & Hougaard, 2009; Olatunji et al., 2013). Data in the current thesis was drawn from a quality assurance database at the OCD-team in Bergen, Norway. We extracted data for patients that had completed the concentrated treatment format offered in the clinic. This concentrated treatment format was developed at the OCD-team in Bergen (e.g., Hansen, Hagen, Öst, Solem & Kvale, 2018; Hansen, Kvale, Hagen, Havnen & Öst, 2018; Havnen, Hansen, Öst, & Kvale, 2014; 2017; Launes et al., 2019a). The treatment is firmly rooted in evidence-based treatment and uses CBT, ERP, cognitive restructuring and model learning as its main ingredients.

The current concentrated ERP format has been labeled “individual treatment in a group setting” as the treatment is delivered to 3-6 patients in groups, with the same number of therapists, and is therefore both individual as well as group treatment. This allows for the group participants to learn from each other and offer support. At the same time the therapist can provide individually tailored treatment for each patient. In the Norwegian public health care system, concentrated ERP format has become the routine treatment for patients with a principal diagnosis of OCD. Assessment of symptoms and monitoring of treatment outcome are integrated parts of the treatment, and all papers in the current thesis have drawn data from the Bergen quality assurance database. Quality assessment provides a mean for improving health services, and allows, among other things, for identifying patient groups who might need more treatment or extra interventions.

The current concentrated treatment format has been reported to be well tolerated by patients with low decline and drop-out rates (Havnen, Hansen, Haug,

Prescott & Kvale, 2013). Early studies showed good results for this concentrated ERP format, with 77% being classified as in remission post-treatment (defined as a Y-BOCS score of 14 or less and at least a 10 point reduction in Y-BOCS score), and 66% being classified as in remission at 6-month follow-up (Havnen et al., 2014). Newer reports have found that nearly 90% of the patients respond to the concentrated treatment, and 70% are recovered at 12 month post-treatment (Hansen et al., 2018a) and four years post-treatment (Hansen et al., 2018b). A recent study found that results could be replicated to a new setting. Launes and colleagues (2019b) reported a treatment response rate (defined as a 35% reduction in Y-BOCS score) of 94% at post-treatment, and 80% at follow-up at Sørlandet Hospital. The same authors reported that 74% of patients were in remission at post-treatment and 68% were in remission at follow-up. The patients described high satisfaction with the treatment format, and only one patient dropped out of treatment. Similar results were obtained in Oslo (Norway), even when a substantial portion of therapists (68%) delivered the treatment format for the first time (Kvale et al., 2018). Furthermore, a study comparing this concentrated ERP format to self-help and wait list control in a randomized controlled study, replicated these findings (Launes et al., 2019a).

1.3 Quality assurance in mental health care

Quality assurance in the mental health care system is a widespread idea that has gained popularity in the literature since the 1970s (Rodriguez, 2013). The definition of quality assurance differs widely, and research indicates that there is a broad range in how professionals working with quality assurance in the mental health services describe their work (McMillen, Zayas, Books & Lee, 2008). However, literature on quality assurance generally agree that the ultimate goal is to ensure the highest possible level of optimal care for patients (Rodriguez, 2013). Modern quality assurance projects in the mental health care field focus among other things on identifying areas that could be improved in the services, implementing changes, as well as monitoring and learning from these changes (McMillen et al., 2008). Quality assurance plays an important part in Norwegian health policies (e.g. Regjeringen,

2020) as well as in international policies for improving health care services (e.g. Institute of Medicine (US), 2006).

Two main broad approaches to quality assurance have been described in the literature; Evidence-Based Practice Implementation (EBP) and Measurement-Based Quality Improvement (MBQI). EBP involves implementing treatment that has proven to improve treatment results into ordinary clinical care, while MBQI involves incorporating structured measurements into routine clinical care to identify processes and outcomes of treatment in order to identify underlying causes of quality problems and improve services (Hermann, Chan, Zazzali & Lerner, 2006). The implementation of concentrated ERP treatment in the Norwegian health care system can be described as a combined EPB and MBQI project, as it implements evidence-based treatment in routine clinical care, at the same time as different structured measurements are used to identify processes of change and outcome in order to try to improve services.

1.4 What works for whom?

During the last three decades there has been numerous studies trying to identify whether CBT and ERP for OCD works better or worse for specific groups of patients, or patients with certain characteristics, in order to adapt and improve treatment. However, few consistent factors that affect treatment outcome have been identified, and there are several methodological challenges in the studies that have been conducted. A review from 2008 found symptom severity, symptom subtype, severe depression, the presence of comorbid personality disorders, family dysfunction, and the therapeutic alliance to be related to treatment outcome in CBT for OCD (Keeley, Storch, Merlo & Geffken, 2008). A more recent review of predictors from 2013 by Knopp and colleagues found an association between worse treatment outcome for OCD and pre-treatment symptom severity (5 out of 16 included studies found a significant relation), and for certain OCD symptom subtypes: Cleaning/contamination (1 of 2 studies found a significant relation), sexual/religious (1 of 1 study), ordering/symmetry (1 of 1 study), and obsessive–compulsive slowness (1 of 1 study),

as well as unemployment (2 of 7 studies), and being single/not married (2 of 7 studies). One of the most widely investigated predictors, comorbid depression, was only found to be related to treatment outcome in 2 out of 18 studies (Knopp, Knowles, Bee, Lovell & Bower, 2013). As demonstrated in the findings from this last review, the results are very inconsistent. Knopp and colleagues (2013) point to several limitations in the current predictor literature, including suboptimal quality of predictor analyses, small sample sizes and few studies utilizing the same design (i.e. different assessment of predictors, outcome and different interventions), making it difficult to compare different predictor studies.

Three of the most commonly suggested predictors for treatment outcome are comorbid depression, comorbid anxiety, and OCD symptom severity. Comorbid depression has been suggested to predict treatment outcome for OCD, but findings so far are inconsistent on the role of depression as an independent predictor of OCD treatment outcome. The review from 2008 reported that severe depression, as opposed to mild or moderate depression, was related to treatment outcome (Keeley et al., 2008). As mentioned above, Knopp and colleagues (2013) identified 18 studies that reported the effect of baseline depression on treatment outcome, and concluded findings were inconsistent; only 2 out of the 18 studies included in the review (i.e. 11%) reported a significant relation. A meta-analysis on CBT for OCD by Olatunji and colleagues (2013) did not find a significant relation between comorbid depression and effect size. In summary, it seems baseline depression in general is a poor predictor of treatment outcome, but there might be a negative relation between severe depression and treatment outcome as opposed to mild and moderate depression.

A second candidate predictor is symptoms of anxiety. The review by Knopp et al. (2013), reported that one third of the relevant trials found a significant relation between anxiety and treatment outcome, but 2/3 did not, so again findings are inconsistent. A third candidate predictor suggested in the literature is OCD-symptoms. The review from 2013 found one third of their included studies to report a significant relation between baseline OCD severity and treatment outcome (Knopp et al., 2013).

The lack of consistency in predictor studies might be positive news, as it implies many different patients have a more equal chance of getting better through

treatment. However, there are still several factors that are not thoroughly investigated in the literature that still might have an impact on treatment outcome. This includes, among others, the personality characteristics of resiliency and sensitivity. As treatment for OCD involves challenging exposure work, some might assume that patients who are high on sensitivity and low on resiliency could have poorer treatment outcomes. Furthermore, the literature has mainly focused on pre-treatment predictors, one at a time. We wanted to investigate whether a combination of several symptoms post-treatment (i.e. patients that had not fully recovered from OCD, anxiety and depression) could have poorer prognosis.

1.5 Resilience and OCD

It is commonly accepted that resilience, or personal resources, is important in coping with challenges and maintaining a good psychological health (Zimmer-Gembeck & Skinner, 2016). Resilience, or resiliency is defined as “the capacity to recover quickly from difficulties; toughness” (Oxford University Press, 2019). Resilience has also been described as “the ability to recognize and adapt to handle unanticipated perturbations that call into question the model of competence, and demand a shift of processes, strategies and coordination” (Woods, 2006, p. 22). In other words, resilience is the ability to cope in stressful or challenging environments. One line of research which has investigated individual resiliency, is research on the hardiness trait (Kobasa, 1979). Through a series of studies, Kobasa and her colleagues identified three distinct characteristics which together formed the personality trait of hardiness; *commitment*, *control* and *challenge* (Kobasa, 1979; Kobasa, Maddi & Kahn, 1982; Kobasa, Maddi & Zola, 1983). The commitment facet refers to a tendency to be engaged in several different domains in life, such as family, work or social life. The control facet is the sense of an inner locus of control; the belief that one is able to control what happens in one’s life, and being able to influence outcomes rather than sinking into passiveness. Finally, the challenge facet taps into whether the person views difficult situations as a challenge rather than a threat; a tendency to view new situations as positive

opportunities to grow and learn (Eschleman, Bowling & Alarcon, 2010; Kobasa, 1979; Maddi, 2002).

Higher scores on resiliency has been linked to better health outcomes, both physically and psychologically. For example, higher scores on the hardiness trait has been linked to better cardiovascular health in adults (Bartone, Valdes & Sandvik, 2016), better sport achievements and higher psychological well-being in athletes (Nezhad & Besharat, 2010), and better physical performance in military trainees (Lo Bue et al., 2018). A balanced hardiness profile has been linked to a more healthy neuroendocrine and immunological reaction to stress (Sandvik et al., 2013). In army combat medics, resiliency, and in particular the commitment facet, has been linked to lower scores on depression, PTSD and aggression (Krauss et al., 2019). Furthermore, higher scores of hardiness has been linked to lower scores on depression, both in caregivers of disabled older adults (Clark, 2002), in institutionalized elderly people (Cataldo, 1994), and in military and governmental personnel (Maddi, Brow, Khoshaba & Vaitkus, 2006). In sum, there are several studies indicating a positive link between hardiness and good health outcomes.

Research on the relation between resiliency and OCD is scarce. Two studies have looked at the relation between OCD-symptoms and resiliency. However, both studies were conducted on non-clinical populations of youths, and with different measures of resiliency than the one used in the current project (Hjemdal, Vogel, Solem, Hagen, & Stiles, 2011; Sun, Li, Buys, Storch, & Wang, 2014). Hjemdal et al. (2011) reported overall resilience to correlate negatively ($r = -.29$) with their measure of OCD (i.e. higher resilience scores were related to lower OCD symptom scores). Sun et al. (2014) found resiliency defined as achievement motivation (Odds Ratio (OR) 325.12), flexibility (OR 15.45), self-esteem (OR 5.28), and peer relationships (OR 3.37) to be negatively related to obsessive-compulsive symptoms. However, no studies have investigated the relation between resilience and treatment outcome in a clinical sample of OCD patients. As the results of the aforementioned research suggest a link between resilience and OCD, between resilience and several health factors, as well as the potential “toughness” required to conduct exposure therapy, we decided to include

a measure of resilience in the quality assurance project as this might be related to treatment outcome.

1.6 Sensory processing sensitivity and OCD

Sensory Processing Sensitivity (SPS) is proposed as a personality characteristic involving an ability to detect subtle sensory stimuli and a tendency to be overstimulated by external stimuli (Aron & Aron, 1997; Benham, 2006). Since ERP treatment involves exposure to anxiety-provoking stimuli and situations, we argue that it is highly relevant to explore - in patients routinely treated in the public mental health care - whether those who report high scores on SPS show reduced effects of ERP treatment.

It remains unclear how SPS is related to psychological disorders, but high levels of SPS have been related to higher levels of reported anxiety and depression. More specifically, Liss, Timmel, Baxley & Killingsworth (2005), using a sample of college students found a strong positive relationship between scores on the Highly Sensitive Person Scale (HSPS) and heightened levels of depression and anxiety, even after controlling for parental experiences. They suggested sensitivity might be an independent temperamental risk factor for developing mental disorders. Another study investigated the relationship between social anxiety disorder and SPS (Hofmann & Bitran, 2007), and found that SPS was related to the generalized subtype of social anxiety disorder and agoraphobic avoidance.

Sensory processing sensitivity has been linked to OCD in children both in a case series study (Hazen et al., 2008), and in a study of 4-6 year old children (Dar, Kahn & Carmeli, 2012). Sensory processing sensitivity has also been related to obsessive-compulsive symptoms in adults (Dar et al., 2012; Rieke & Anderson, 2009). However, none of the studies used the HSPS to measure sensitivity. Rieke and Anderson (2009) applied the Adolescent/Adult Sensory Profile while Dar and colleagues (2012) used a version of the Oral and Tactile Hypersensitivity Scale. We argue this should be investigated using the Highly Sensitive Person Scale (HSPS)

developed by Aron and Aron (1997) as much of the sensitivity literature is based on their work. Furthermore, there is a good basis for comparison with the general population when using HSPS, as several studies have investigated scores on the HSPS in the general population (e.g., Aron & Aron, 1997; Benham, 2006; Konrad & Herzberg, 2017). Although one German study (Konrad and Herzberg, 2017) reported a significant correlation ($r = .52$) between HSPS and obsessive-compulsive symptoms, they did not recruit a clinical sample.

The personality characteristic of high sensitivity involves heightened reactivity to emotional and physical stimuli. Hence, patients scoring high on sensitivity might react stronger to, or be more reluctant to conduct, exposure treatment. In line with this, one might assume that patients scoring high on SPS do not tolerate exposure treatment to the same degree as patients scoring low on this trait. On the other hand, it has also been suggested that people scoring high on the HSPS process cognitive stimuli more deeply (Aron & Aron, 1997), thus sensitive patients could learn *more* from CBT and ERP treatment than patients scoring low on SPS.

1.7. What happens to patients who do not recover fully from treatment?

Most predictor studies for OCD have focused on pre-treatment predictors of post-treatment outcome (Keeley et al., 2008; Knopp et al., 2013). Very few studies have investigated how post-treatment factors might influence follow-up status. Some studies have pointed to the importance of full recovery (as opposed to continued presence of subsyndromal residual symptoms) for bipolar disorder and depression (Judd et al., 2008; Kiosses & Alexopoulos, 2013). To our knowledge, only two studies have looked at full recovery versus residual symptoms for OCD. The first study reported partial remission (as opposed to full remission), increased the risk of relapse (70% vs. 45% relapse rate; Eisen et al., 2013). The second study found that long term stability for treatment gains was largely influenced by whether the patient reached remission after completing CBT treatment for OCD (OR 8.8; Elsner et al., 2020). Together these findings indicate that evaluating post-treatment levels of symptoms could be important

to ensure that as many patients as possible do not have a relapse. Another issue concerning pre-treatment symptom predictors (such as baseline levels of depression and anxiety) is that often issues of depression and anxiety are addressed during treatment of OCD, and one would expect these aspects to change as a result of treatment. One would expect less change of these clinical aspects to happen after treatment termination, and hence post-treatment levels might give a better indicator of follow-up status than pre-treatment symptom levels. In light of this, we included post-treatment measures of symptoms as part of the quality assurance project. More specifically, we wanted to investigate post-treatment levels of depression, anxiety and OCD as these have all been suggested to play a role in treatment outcome (Keeley et al., 2008; Knopp et al., 2013).

The stress-vulnerability model or diathesis–stress model states that mental illness stems from an interaction between inherited vulnerabilities and stressors (e.g., Zubin & Spring, 1977). This model has been used to understand the onset and maintenance of several psychological disorders (Goh & Agius, 2010). It has also been suggested that stress might play an important role in the development, persistence or expression of OCD (Adams et al., 2018). Resilience research has suggested a cumulative stress model, assuming that higher stress levels increase the risk for development and maintenance of psychological problems (Rutter, 2001). All of the three abovementioned mental illnesses (depression, anxiety and OCD) have been found to be tightly linked to increased stress levels and life impairment (Eisen et al., 2006; Hammen, 2005; Mendlowicz, & Stein, 2000). Based on these models and findings, we wanted to investigate a cumulative model adding not only one, but several factors, to explore whether a combined vulnerability of several symptom clusters (i.e. depression, anxiety and OCD) could be related to treatment outcome.

1.8 The current thesis: Main goals.

The main aim of the current thesis was to explore whether patients with OCD, treated with a concentrated ERP-format in the public mental health care, had different clinical

responses in relation to potential vulnerability factors. Our aim was to identify patients at risk of non-response and relapse in order to improve the treatment. We argue this is important, as very few reliable predictors have been reported in the literature, while there are still patients who do not respond optimally to evidence based treatment for OCD. In the first paper we aimed to investigate whether dispositional resilience, or hardiness, was related to treatment outcome in the concentrated ERP format. Similarly, in paper two, we investigated whether treatment outcome in the concentrated ERP format was related to level of sensory processing sensitivity. In the third paper we aimed to investigate the combined burden of heightened levels of anxiety, depression and OCD after completing the concentrated ERP format and how this related to treatment outcome.

Previous research indicate that higher levels of resilience could be related to better treatment outcome. Consequently we wanted to see if high levels of commitment, an inner locus of control and a preference for challenges could be positively related to involvement in exposure therapy. Considering sensitivity, patients scoring high on the HSPS might profit less from treatment because they might feel overwhelmed facing exposure treatment. However, as it has been suggested highly sensitive people process cognitive stimuli more deeply, it was more of an open question whether patients scoring high on the HSPS could actually profit more from treatment than the less sensitive patients. Finally, based on the stress-vulnerability model and previous research on post-treatment predictors, we investigated whether patients scoring above a set subclinical cut-off score on depression, anxiety and OCD post-treatment profited less from treatment when measured at follow-up compared to patients scoring lower on these parameters.

Methods

2.1 Participants and procedure

In Norway, patients with OCD have the right to treatment delivered by local specialist OCD-teams (Kvale & Hansen, 2014; see also <https://helsenorge.no/sykdom/psykiske-lidelser/angst/tvangslidelser#Behandling-av-tvangslidelser>). Since 2012, 30 OCD teams have been established in Norway. All papers in the current project are part of a local medical quality registry study at the OCD team in Helse Bergen. Patients are referred to their local psychiatric outpatient clinic by their general practitioner. Patients who are judged likely to have an OCD diagnosis are offered referral to their local OCD-team. At the OCD-team, patients are screened and offered treatment if they have an OCD-diagnosis and are motivated for treatment. Most patients are offered the concentrated ERP format, but some are instead offered individual treatment if they have special needs. Patients are not offered group treatment if they are non-fluent in Norwegian language, have an active psychosis, ongoing suicidal intention, ongoing mania or depression in a bipolar disorder, ongoing drug abuse or an eating disorder with a body mass index too low to participate in psychological treatment. The patients are encouraged not to use anxiolytics during treatment.

In paper 1 (the dispositional resilience paper), we used three samples; a sample of patients with OCD, a sample of students from the University of Bergen, and a sample of army soldiers. The OCD sample consisted of 89 patients whom had all completed the concentrated ERP format. The student sample consisted of 354 students (73.7% female, mean age 21.68 years) who participated in an introductory psychology class at the Psychological Faculty at the University of Bergen. The military sample consisted of 222 privates serving in the Norwegian army as part of their mandatory military service. Exact age and sex was not recorded for the military group due to anonymity restrictions, but the group consisted almost exclusively of men, and age ranged from approximately 18 to 23 years.

In paper 2 (the sensory processing sensitivity paper), the sample consisted of 104 patients with OCD. The sample in Paper 3 (post treatment predictors paper) was

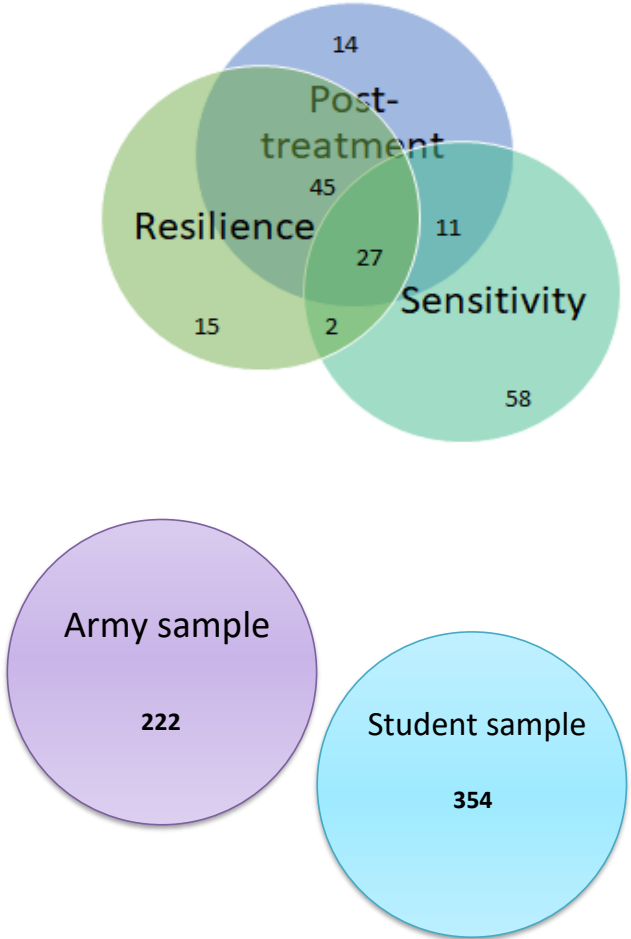
97 patients with OCD. Table 1 displays characteristics for patients in all three papers. There is an overlap between the samples for the different papers, displayed in Figure 1. The samples do not completely overlap because the different measures were implemented as part of the medical quality assurance register at different points in time.

Table 1: Characteristics of patients with OCD in all three papers

	<i>n</i>	% Female	Mean age (SD)	Comorbidity
Paper I (resilience)	89	70.8	31.69 (10.65)	Depression (13%), GAD (13%), social phobia (7%)
Paper II (sensitivity)	104	73.1	30.31 (11.06)	Depression (28%), GAD (23%), panic disorder (12%)
Paper III (post-treatment predictors)	97	72.2	31.45 (10.38)	Depression (12%), GAD (10%), social phobia (5%)

Note: GAD = General anxiety disorder.

Figure 1: Venn diagram representing overlap in participants for the three papers.



2.2 The concentrated ERP treatment format

All patients included in this thesis received the concentrated ERP treatment format as described in the introduction. Patients are diagnosed and screened for comorbid disorders and are then prepared for treatment. Preparation includes psychoeducation about treatment and helping the patient get ready for individualized

exposure tasks. The patients are encouraged to choose exposure tasks that “the OCD would like the least”. Patients are offered treatment at the first available 4-day slot. The treatment is delivered over four consecutive days in groups of three to six patients with the same number of therapists. Each group has a designated group leader who is experienced in the four-day treatment format and will ensure all therapists and patients receive supervision and assistance when needed. During the first day of treatment patients receive psychoeducation and plan their individual exposure tasks in detail. The first day lasts for approximately three hours. The two next days are dedicated to therapist assisted exposure training, and last for approximately 8-10 hours each. These days can be considered a prolonged one-session treatment, and exposure is conducted in as many relevant situations as possible.

The group leader assign therapists to patients as he/she considers appropriate as the therapy moves on, and hence the patients do not have one designated therapist each, but might instead switch therapist several times. For instance, the group leader might typically assign an experienced therapist to patients whom are struggling with their tasks. In the beginning of therapy, the therapist will work closely with the patient, and then gradually hand over more of the responsibility to the client. During the exposure tasks, the main focus is to approach what triggers anxiety and/or discomfort for the patient, and teach him/her to “LEan into The anxiety” (called the LET-technique), rather than trying to control their anxiety with compulsions. The patient learns how to recognize the temptation of controlling their discomfort and choosing instead to do something that goes against their OCD. The patient group have a short meeting in the morning, at lunchtime and in the afternoon to share experiences. The patients will continue with exposure tasks at home during the evening and report back to their therapist by phone or SMS. On the third day, relatives of the patients are invited to a session of psychoeducation about OCD, enabling them to support and encourage the patient in a beneficial way after termination of treatment. The final day of the treatment is reserved for discussing the “lessons learned”, addressing relapse prevention and prepare the patients to integrate new learning into normal everyday living. Thereafter, the patients conducts three weeks of self-exposure tasks to implement changes in their everyday life. The patients are encouraged to report back

to the clinic on their work during these three weeks. Although therapists read these reports, the patients are not contacted by the clinic during this period.

2.3 Therapists

All therapists in the current papers worked at the OCD team in Helse Bergen, Norway. Therapists had to undergo a thorough training in order to be qualified to deliver the concentrated ERP format. The training consists of hands-on supervised clinical training and a multiple-choice exam. The therapists who treated the patients in our papers were clinical psychologists or psychiatrists with clinical experience with OCD treatment ranging from less than 1 and up to 30 years.

2.4 Ethics

The medical quality assurance database was consented by the Norwegian Data Protection Official [NSD/ Personvernombudet], May 5th 2012. The quality assurance database was created as an integrated part of the OCD-team in Bergen, prior to starting ERP treatment. Quality assurance in Norway is defined as projects, investigations, and evaluations where the main target is to control that diagnostics and treatment provides the intended results (Helse og omsorgsdepartementet, 2010). It is designed so that data from quality assurance databases can be used to improve the health service given to patients. The measures included in the database were therefore carefully selected to involve areas that might be related to treatment outcome. The quality assurance project was conducted in accordance with the general laws in the public health service in Norway, and the diagnostic procedures and treatment did not involve any risk or burden for the patients beyond what is expected in a standard ERP treatment procedure. We limited our investigative questions to ones aimed at improving clinical practice. The project did not test new methods, was not a randomized study and did not use a control group. Based on these criteria, the project was considered a quality assurance project, and not “research”, and therefore application of approval was sent to NSD rather than Regional Ethical Committee (REK) in accordance with REKs

guidelines for the difference between quality assurance and research (Fellesorganet for REK, 2011).

2.5 Instruments

2.5.1 Screening and main outcome measure across all three papers

All patients were diagnosed and screened for comorbid diagnoses using the MINI interview (Sheehan et al., 1998), either at the local outpatient clinic, or at the OCD-team. OCD symptoms were measured using the Y-BOCS interview (Yale–Brown Obsessive Compulsive Scale; Goodman et al., 1989a; Goodman et al., 1989b), which is considered to be the “gold standard” for measuring OCD (Deacon & Abramowitz, 2005). The interview was administered pre-treatment by a therapist at the clinic in Bergen, while post- and follow-up interviews at 3- and 6-month post-treatment were assessed by an independent rater by phone. The Y-BOCS consists of 10 items rated on a scale from zero (“none”) to four (“extreme”). Scores between 0-7 are considered non-clinical, 8-15 mild symptoms, 16-23 moderate severity, 24-31 severe and 32-40 are considered extreme scores (Wootton & Tolin, 2016).

2.5.2 Measures in paper I – Resilience paper

Dispositional resilience was measured using the Dispositional Resilience Scale 15-Revised (DRS-15-R; Hystad, Eid, Johnsen, Laberg & Bartone, 2010). This self-report questionnaire consists of 15 items which are rated on a scale from 0 (not at all true) to 3 (completely true). The questionnaire intends to measure all of the three main aspects of dispositional resilience or hardiness as suggested by Kobasa (1979); *commitment*, *control* and *challenge*, and five items tap into each of these three dimensions.

Psychometric properties have been reported to be good, both for the original English version (Bartone, 2007) and for the Norwegian translated version (Hystad et al., 2010). We chose the DRS-15-R both because it taps into central theoretical facets of resiliency, but also because it is widely used in research on dispositional resilience in

Norway (see for example Bartone et al., 2016; Sandvik et al., 2013; Sandvik, Hansen, Hystad, Johnsen & Bartone, 2015), so we had ample opportunity to compare results obtained from our sample with results obtained from different samples in the same country.

2.5.3 Measures in paper 2 – Sensitivity paper

Sensitivity was measured using the self-report questionnaire Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997). The questionnaire consists of 27 items considering sensory processing sensitivity, where the patient rates every question on a scale from 1 (“not at all”) to 7 (“extremely”). We chose this instrument because several previous studies have used this specific scale to measure SPS in the general population, so we had a good foundation for comparison with a healthy population (Aron & Aron, 1997; Benham, 2006, Konrad & Herzenberg, 2017). Furthermore, validity and reliability have been reported to be adequate for the HSPS (Aron & Aron, 1997; Smolewska, McCabe & Woody, 2006). There is some uncertainty as to whether the scale measures one sensitivity factor or whether there are several factors. Some studies (Evans & Rothbart, 2008; Meyer, Ajchenbrenner, & Bowles, 2005; Smolewska et al., 2006) have reported sub-factors within the HSPS that possibly measure different facets of sensitivity, or at least point to two sub-factors. One study suggested a three-factor solution (Ease of Excitation, EOE; Aesthetic Sensitivity, AES; and Low Sensory Threshold, LSL; Smolewska et al., 2006). In our study we used the total score of the HSPS as a measure of sensitivity.

In paper 2, we also included a self-report measure of OCD symptoms; the Obsessive-Compulsive Inventory – Revised (OCI-R; Foa et al., 2002). In this questionnaire, patients rate their symptoms of obsessions and compulsions on a scale from 0 (labeled “not at all”) to 4 (labeled “extremely”), and higher scores indicate more severe symptoms. The scale measures six subtypes of OCD; washing, hoarding, obsessing, ordering, checking and neutralization (Foa et al., 2002). Psychometric properties of the Norwegian version of OCI-R have been reported to be adequate (Solem, Hjemdal, Vogel & Stiles, 2010). In the analyses we controlled for anxiety,

measured with the Generalized Anxiety Disorder 7-item scale (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006), and depression, measured with the Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer & Williams, 2001; Spitzer, Kroenke & Williams, 1999). The GAD-7 is a self-report seven-item scale that measures general anxiety. Each item is rated by the patient on a scale from 0 (“not at all”) to 3 (“almost every day”). Scores from 5-9 are considered mild anxiety, 10-14 moderate, and 15-21 are considered as severe anxiety. Reliability and validity have been reported to be good for GAD-7 (Spitzer et al., 1999). The PHQ-9 is a self-report nine-item questionnaire that measures depressive symptoms. The patient rates every item on a scale from 0 (labeled “not at all”) to 3 (labeled “almost every day”). Scores from 5-9 are considered mild symptoms of depression, 10-14 are considered moderate, 15-19 quite severe, and 20-27 severe symptoms of depression. Psychometric properties of the PHQ-9 have been reported to be good (Kroenke et al., 2001).

2.5.4 Measures in paper 3 – Post-treatment predictors paper

Post-treatment scores of OCD, anxiety and depression made up the main measures in Paper 3. OCD was measured with the Y-BOCS as described above. We replaced instruments for measurement of anxiety and depression with shorter screening instruments about halfway through the time frame for data collection for paper 3. For approximately half of the patients, anxiety was measured using the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). For the second half, anxiety was measured using the GAD-7. Similarly, for approximately half of the patients, depression was measured using the Beck Depression Inventory, revised version (BDI-II; Beck, Steer, & Brown, 1996), while the rest of the patients filled out the PHQ-9.

For all measures, we decided to compare a “high risk” vs. a “low-risk” group on all variables, and hence decided cut-off points for each scale placing patients with none or very mild symptoms in one group and patients with mild to severe symptoms in the other. The cut-off criteria were set to 9 for GAD-7 and BAI, 12 for PHQ-9, 13 for BDI-II and 11 on Y-BOCS. Patients were defined as “high risk” if they scored

above cut-off on all three variables post-treatment and “low risk” if they scored below cut-off on either of the measures.

2.6 Statistical analyses

2.6.1 Statistical analyses in paper 1 - Resilience paper

The main analyses in paper 1 were as follows: We conducted one-way ANOVAs with post hoc tests to compare resiliency between the OCD sample and the two reference groups (students and soldiers). Logistic regression analyses were conducted to investigate the relation between dispositional resilience and treatment outcome. We controlled for age and sex based on the findings that there might be a negative relation between high age and female sex to treatment outcome for OCD (Öst et al., 2015). We also controlled for pre-treatment-levels of OCD and comorbidity. Finally, we investigated the effect of the three facets of resilience (commitment, control and challenge) separately.

2.6.2 Statistical analyses in paper 2– Sensitivity paper

To investigate the relation between sensitivity and OCD, we first conducted partial correlations, controlling for level of depression (measured with PHQ-9) and level of anxiety (measured with GAD-7). To investigate the relation between pre-treatment level of sensitivity and treatment outcome, we used hierarchical regression analyses. We conducted the analysis both with a self-report measure (OCI-R) and a therapist-conducted interview (Y-BOCS) as outcome variables. We controlled for pre-treatment levels of OCD, depression and anxiety as the partial correlations showed significant correlations between sensitivity, depression and anxiety. HSPS score was weakly related to age ($r = -.23, p < .05$), as younger patients tended to rate themselves as somewhat more sensitive. HSPS was not significantly related to sex ($r_{pb} = -.17, p = .09$). We decided not to control for age and sex in these analyses as sex was not significantly related to sensitivity scores, while age was only weakly related to sensitivity. We also conducted the hierarchical regression analysis comparing the 25%

highest scoring patients and the 75% lowest scoring patients on the HSPS, as it has been suggested that about a quarter of the population can be considered highly sensitive (Aron & Aron, 1997).

2.6.3 Statistical analyses in paper 3 – Post-treatment predictors paper

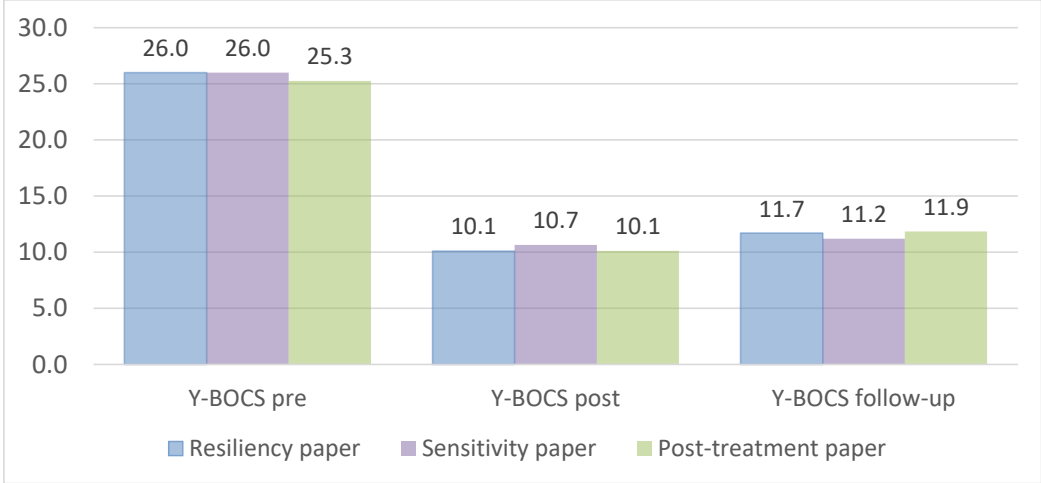
As described above, patients were defined as having a “high” or “low” risk based on their scores above or below cut-off for depression, anxiety and OCD post-treatment. Thereafter, we conducted chi-square tests to investigate the relation between these scores and remission status at follow-up (Y-BOCS score above or at/below 12). We chose logic regression analysis as the main analysis in paper 3. Three logistic regression analyses were conducted to investigate the relation between post-treatment scores on OCD, anxiety and depression and Y-BOCS score at follow-up. In the first logistic regression analysis, all risk factors were entered separately as predictors. In the second, the “high risk” group” (i.e., scoring high on all three measures) was plotted against the “low risk” group (i.e., scoring below cut-off on at least one measure). In the final analysis, we repeated the second analysis, but removed patients who had recovered post-treatment. We controlled for age and sex in the logistic regression analyses.

Results

3.1 Treatment results

In all three papers, the patients started out with severe symptoms of OCD (as measured with the Y-BOCS). Symptoms were reduced substantially in all OCD samples from pre- to post-treatment, and the improvement was stable at 3-6 month follow-up. Figure 2 displays Y-BOCS scores for all three papers at pre- and post-treatment and at follow-up. Note the overlap in samples (displayed in Figure 1). Clinical meaningful change was measured using the criteria suggested by Mataix-Cols, de la Cruz, Nordsletten, Lenhard, Isomura and Simpson (2016) for all three papers. These criteria state that a patient should be considered in remission with a Y-BOCS score of 12 points or less. In the resiliency paper 73% of the patients were in remission post-treatment. The corresponding number for the sensitivity paper was 70.1%, and for the post-treatment paper 74.2%. At follow-up 3-6 months post-treatment, 59.6% of the patients in the resilience paper were in remission. In the sensitivity paper 67.4% of the patients were in remission at follow-up, while in the post-treatment paper, 56.7% were in remission at follow-up.

Figure 2: Y-BOCS scores in the three papers at pre-treatment, post-treatment and follow-up.



Note: Y-BOCS = Yale–Brown Obsessive Compulsive Scale. Minimum score = 0. Maximum score = 40.

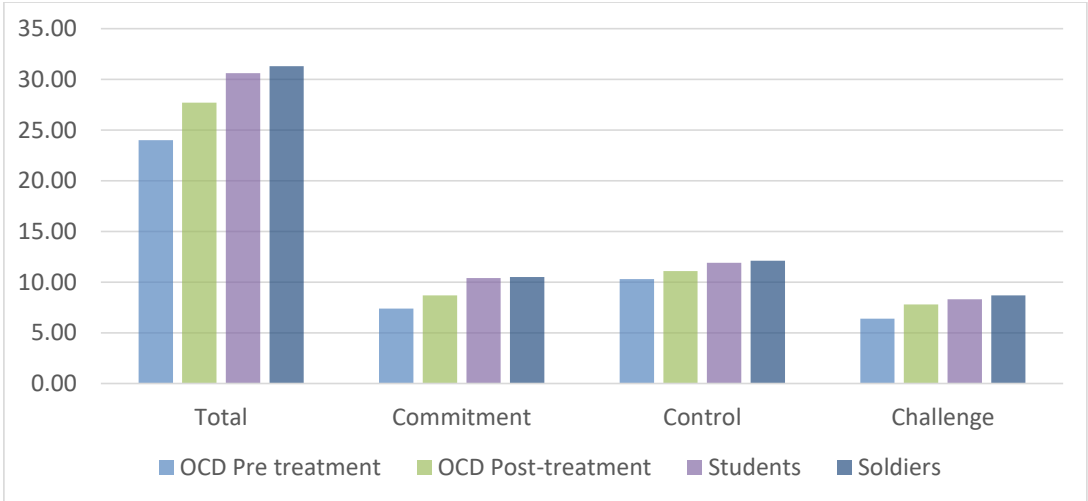
3.2 Results on resilience and OCD

The one-way ANOVA displayed significant differences between soldiers, students and patients with OCD on the DRS-15-R ($F(2, 662) = 83.36, p < 0.001$). Patients with OCD scored significantly lower on the DRS-15-R than both students and soldiers. Games-Howell post-hoc tests revealed that the largest difference between OCD patients and the two reference groups was found in the commitment facet, which is supposed to measure engagement and sense of meaning or purpose, with OCD patients scoring significantly lower than the two reference groups.

In the first logistic regression analysis we used Y-BOCS post-treatment as outcome variable, and this analysis was not significant. The second logistic regression analysis, using Y-BOCS follow-up as outcome variable was significant. ($\chi^2(4, N = 89) = 10.45, p < 0.05$). However, the odds ratio (OR) for DRS-15-R was 1.11, indicating a

minimal difference between patients scoring high and patients scoring low on resiliency. Comorbidity was not found to significantly contribute to the model, and neither were the three facets commitment, control nor challenge. Finally, in paper 1 we found that OCD patients scored significantly higher on the DRS-15-R after treatment than they did pre-treatment ($n = 33$; se Figure 3).

Figure 3: Scores on DRS-15-R for students, soldiers, as well as patients with OCD pre- and post-treatment.



Note: DRS-15-R = Dispositional Resilience Scale 15-Revised. Minimum score = 0. Maximum score = 45.

3.3 Results on Sensory Processing Sensitivity and OCD

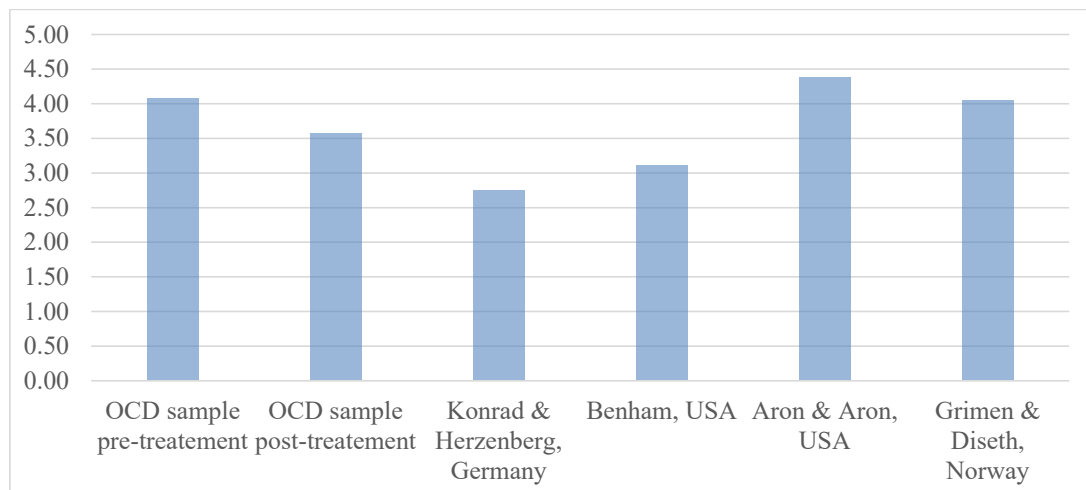
Self-reported OCD-symptoms pre-treatment (measured with the OCI-R) was significantly related to HSPS-scores ($r = .24, p < .05$). The only subscale in the OCI-R that was significantly related to sensitivity was the *obsessing* subscale ($r = .31, p < .01$). Sensitivity scores were most strongly related, however, to generalized anxiety score

pre-treatment (measured with GAD-7; $r = .40, p < .01$). This also held true when controlling for depression (measured with PHQ-9; $r = .25, p < .05$).

We found a weak relation between HSPS scores pre-treatment and Y-BOCS scores post-treatment ($r = .24, p < .05$) and Y-BOCS scores at follow-up ($r = .23, p < .05$), as well as between HSPS scores pre-treatment and OCI-R scores at follow-up ($r = .21, p < .05$). Though, when controlling for pre-treatment levels of anxiety and depression, the partial correlation was not significant.

The main finding in paper 2 was that there was no significant relation between sensory processing sensitivity and treatment outcome. The hierarchical regression analysis (controlling for anxiety, depression and OCD), revealed no significant relation between pre-treatment levels of sensitivity and follow-up levels of OCD, neither when measured with the OCI-R, nor when measured with the Y-BOCS. The complete regression model with all predictors included significantly predicted OCI-R at follow-up, but HSPS was not a significant predictor. The results were mirrored in the analysis where we compared the top scoring 25% on the HSPS with the lowest scoring 75%; the model significantly predicted OCI-R at follow up, but not Y-BOCS, and sensitivity was not a significant predictor in either of the analyses. Interestingly, we found a substantial decrease in scores on HSPS from pre- to post-treatment ($d = 1.22$; see Figure 4).

Figure 4: Scores on HSPS pre- and post-treatment compared with scores from other papers on HSPS.



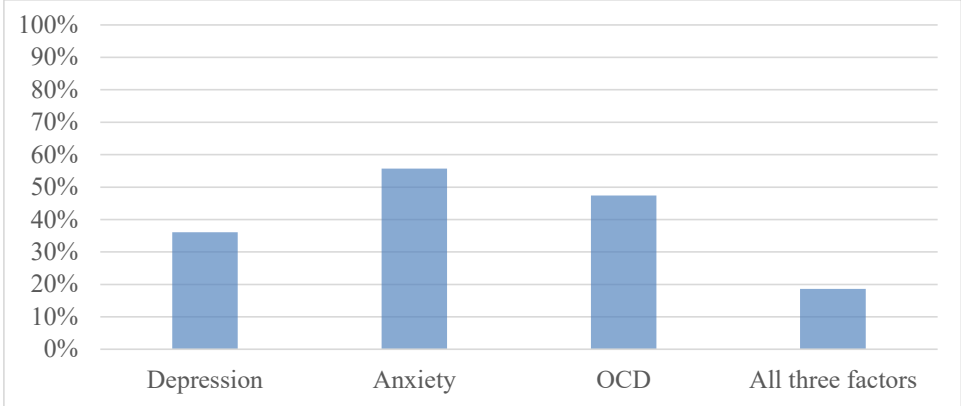
Note: HSPS = Highly Sensitive Person Scale. Minimum score = 0. Maximum score = 7. References: Konrad & Herzenberg (2017), Benham (2006), Aron & Aron (1997), Grimen & Diseth (2016). All of the comparison samples were non-clinical samples.

3.4 Results on post-treatment predictors of treatment outcome

In our paper on post-treatment predictors we discovered a significant relationship between remission at follow-up and scoring above cut-off on depression ($\chi^2 (1, N = 97) = 8.53, p < .01$), anxiety ($\chi^2 (1, N = 97) = 5.37, p < .05$) and OCD ($\chi^2 (1, N = 97) = 6.23, p < .05$) post-treatment. The main result in this paper was that patients in the “high risk” group, i.e. patients with mild to moderate symptoms of OCD, depression and anxiety post-treatment, had more than two times the risk (risk ratio 2.5; odds ratio 10.1) of having OCD at follow-up compared with the “low risk” group ($p < .01$).

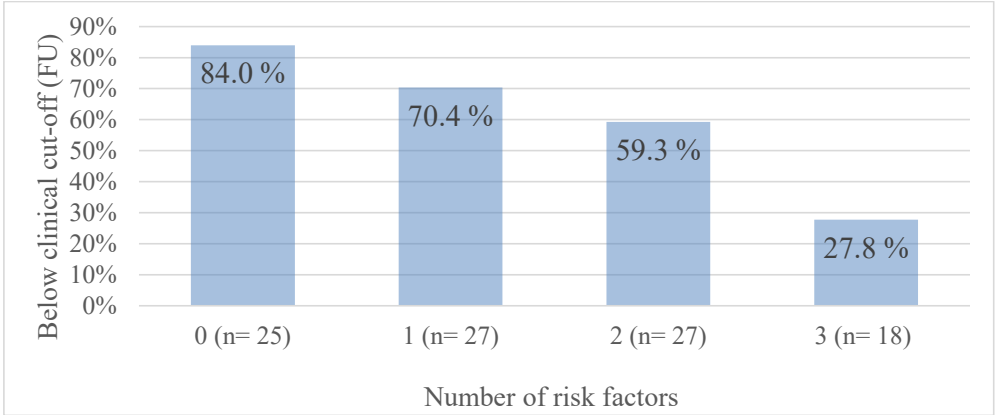
Figure 5 displays percentage of patients scoring above cut-off on each risk factor. Each additional risk factor appeared to add additional risk for reduced treatment outcome (see Figure 6). Even after removing non-recovered patients ($n = 25$) and repeating the analysis, the findings were replicated (odds ratio of 8.71). Depression, anxiety and OCD pre-treatment were not related to OCD score at follow-up ($F(5,58) = .97, p = .45$).

Figure 5: Bar graph displaying percentage of patients scoring above our set subclinical cut-off on the three factors depression, anxiety, and OCD at post-treatment.



Note: Total N = 97. Cut-off criteria are described in the methods section.

Figure 6: Bar graph displaying the relation between number of risk factors and percentage of patients scoring below clinical cut-off on the Y-BOCS (≤ 12) at follow-up.



Note: Risk factors = scores above a set clinical cut-off on depression, anxiety and OCD post-treatment.

Discussion

4.1. Discussion of main findings

The main focus for this thesis was to investigate whether a concentrated ERP treatment format could work for patients whom might have a vulnerability or disadvantage implying they might benefit less from treatment, and therapists could in turn improve treatment if necessary. The concentrated ERP-treatment was found to be effective; 70-73% of patients were in remission post-treatment. Our results revealed that highly sensitive and low-hardy patients profited from the treatment to the same degree as patients scoring low on sensitivity and high on resilience. Our results did, nonetheless, show that the combined burden of having residual symptoms of OCD, depression, and anxiety at post-treatment was related to worse treatment outcome at follow-up. We recommend that clinicians should pay extra attention to patients with residual symptoms post-treatment.

The results in the current thesis replicate the findings from previous studies that the concentrated ERP treatment format yields very good treatment outcome both post-treatment and at follow-up (Hansen et al., 2018a; 2018b; Launes et al., 2019a). The concentrated treatment format yielded at least equally effective results as standard CBT and ERP treatment (Öst et al., 2015). Our results further expands on this by indicating that sensitive and non-hardy individuals also profit from the concentrated ERP treatment format to the same degree as their hardier or less sensitive peers. This is an important finding, as research indicate therapists might be reluctant to offer evidence based exposure therapy to patients (Deacon et al., 2013). This might especially be so for patients who report themselves to be sensitive, as there are several studies indicating an intolerance of stress and strains for people scoring high on the SPS. For example, it has been suggested that people scoring high on SPS should have lower demands at work to reduce emotional exhaustion (Vander Elst et al., 2019). Some have also suggested screening programs for dental students and young dentist professionals to identify highly sensitive individuals for participation in a burnout prevention program (Meyerson, Gelkopf, Eli & Uziel, 2020). One study from the Netherlands suggest several ways a stress management program for high-scorers of

SPS should be framed, for example finding some quiet using muscular relaxation, meditation, yoga, trying to boost self-efficacy, etc. All of these studies indicate an attitude towards sensitive people as fragile people who should not be exposed to too much stimuli. One could therefore assume sensitive or low-hardy patients with OCD should not be offered intensive exposure treatment. However, our results does not support this notion, and indicate that scores on the dispositional resilience trait and SPS noes not hinder treatment response to a large degree.

One of our main findings was that patients with residual symptoms of OCD, depression and anxiety post-treatment had higher scores on OCD-symptoms at follow-up than patients without residual symptoms. Patients with none of these three risk factors had a large chance of success; 84% were in remission at follow-up; a very substantial amount compared with the results usually obtained for ERP and CBT for OCD (Öst et al., 2015). Patients with one or two risk factors also did quite well; 70.4% and 59.3% respectively were in remission at follow-up. For patients with three risk factors, however, only about a third of the patients (27.8%) were in remission at follow-up. Patients scoring above our set cut-off on all three factors had more than twofold the risk of meeting the criteria for OCD at follow-up compared with patients in the “low risk” group. This implies a substantial risk factor, and suggests patients are more vulnerable for relapse when struggling with several symptoms rather than just some at the end of treatment. It might also reflect that patients with some symptoms of anxiety, OCD and depression post-treatment have not completely understood the main take-home messages from ERP treatment (e.g. strategies for emotional regulation or cognitive beliefs about ones thoughts and actions), and hence are less likely to implement positive changes in their everyday life. Our results suggest therapists should pay attention to patients who have residual symptoms of OCD, depression and anxiety post-treatment as they might need boosting sessions or similar interventions in order to prevent relapse. At the same time we do not know whether more treatment would help these patients. Although research indicate that a stepped care model might be useful for both children and adults with OCD (Diefenbach & Tolin, 2013; Melin et al., 2020), more research is needed to shed light on patients with residual symptoms post-treatment and which interventions might be useful for them.

4.2 Discussion of resilience and OCD

4.2.1 OCD and resiliency – discussion of main findings

Our results showed that pre-treatment resiliency scores was not significantly related to OCD symptom severity pre-treatment nor remission status post-treatment. Resiliency was weakly related to follow-up remission status and weakly related to OCD symptom severity at follow-up. This is in line with previous predictor studies which have concluded that it's difficult to identify single predictors of treatment outcome (Keeley et al., 2008; Knopp et al., 2013). Our results diverge from previous findings of a negative correlation between OCD symptoms and resiliency in non-clinical samples (Hjemdal et al., 2011; Sun et al., 2014). Accordingly, there might be differences in the relationship between resiliency and OCD symptoms in non-clinical versus clinical samples. However, another reason could be that we used a different definition of resiliency. Sun et al. (2014) reported a significant relationship between high achievement motivation, low flexibility and low self-esteem and higher scores on OCD symptoms. These aspects might be related to commitment (achievement motivation), control (flexibility) and daring to take challenges (self-esteem), but one can also argue the aforementioned aspects differ in several ways and portrays different aspects of resiliency. The same goes for the study by Hjemdal et al. (2011) who found a relation between higher scores on OCD and lower scores on Resilience Scale for Adolescents (READ). READ measures five subscales; personal competence, social competence, structured style, family cohesion and social resources. Our project did not include measures of environmental resilience (e.g., social factors, family factors). Furthermore, there might be restriction of range for OCD symptoms in non-clinical samples, making comparisons difficult. More research is needed to shed light on how different aspects of resiliency might contribute to prevent or facilitate OCD development.

4.2.2 *Is resiliency a stable personality characteristic?*

One important question raised by our results is whether dispositional resilience is a stable personality characteristic, or whether it's influenced by the environment. Our results revealed an average drop of three points in DRS-15-R scores from pre- to post-treatment. With a Cohens *d* of 0.65, this indicates a moderate effect size and possibly a normalization of scores post-treatment. While some research indicate that dispositional resilience might be a fairly stable trait (Bartone, 2007), there are also studies which indicate that resilient attitudes might be improved through training (Maddi, 2002; Maddi, Kahn & Maddi, 1998). Based on their research, Drs. Maddi and Khoshaba have founded the Hardiness Institute which offers self-help books and organizational programs aimed at hardiness training, claiming it's possible to train hardy attitudes and skills over time (Khoshaba & Maddi, 1999a; 1999b; Maddi, 2002). To our knowledge, few studies have been conducted outside of the Khoshaba/Maddi group to investigate whether dispositional resilience could change through training. It might be that changes in resilience scores in our sample reflect the general drop in scores of psychiatric symptoms from pre- to post-treatment, in line with research finding that depressive mood affected response styles on questionnaires (e.g., Heene, De Raedt, Buysse & Van Oost, 2007). The heightened level of resiliency post-treatment could also indicate that patients experience themselves as somewhat more tough or resilient after challenging themselves during treatment and experiencing a sense of achievement.

4.2.3 *The three facets of dispositional resilience and their relation to OCD*

Research on the hardiness concept has claimed that it is the combined effect of the personality characteristics *commitment*, *control* and *challenge* that constitutes the resilient personality profile (Kobasa, 1979; Kobasa et al., 1982; Kobasa et al., 1983). However, our results revealed that *challenge* was the only facet in the DRS-15-R significantly related to treatment outcome. This facet measures a tendency to adopt a positive view towards new situations; as an opportunity to learn something new. This

facet might be particularly important facing psychotherapy or ERP more specifically, as therapy requires patients to learn new skills and face their fears. Our results indicate that the three different facets might be somewhat independent of each other and might play different roles in affecting psychological health. This is in line with previous research on personality profiles based on the DRS-15-R on Norwegian soldiers, linking different combinations of the three facets (commitment, control and challenge) to different health challenges (Johnsen, Hystad, Bartone, Laberg & Eid, 2014). These findings challenge the view of hardiness as a unified construct and indicate that using profiles of scores might be even more useful than merely describing participants as “high” or “low” on hardiness.

4.2.4 Critique of the resilience concept

The resilience concept has received critique from several sources. One recent review summarized the literature of resiliency in relation to mental and physical health in police officers (Janssens, van der Velden, Taris & van Veldhoven, 2018). The review revealed only a weak to moderate relation between resiliency (measured with the DRS-15-R and similar measurements) and health variables, and the authors concluded that the popularity of the hardiness concept does not match the research results. Some researchers have even pointed at a “dark side” of emphasizing resilience (Adler, 2013; Britt, Shen, Sinclair, Grossman & Klieger, 2016). These critical voices warn against emphasizing individual resiliency to a large degree and ignoring external factors that contribute to psychological health problems. If one overestimates the effect of personality characteristics, one might end up blaming the victims of psychological disorders. This might also be important for OCD, as research has shown that not only internal, but also external factors like family dysfunction and family accommodation contribute to the development of and recovery from OCD (Keeley et al., 2008; Storch et al., 2007). “Victim blaming” is potentially a very harmful way of treating patients as they might be less willing to seek treatment when facing public stigma (Chasson, Guy, Bates & Corrigan, 2018).

Another critique of the resilience literature is the considerable variation in how resilience is defined and measured (e.g., Britt et al., 2016; Meredith et al., 2011). The hardiness construct as described by Kobasa (1979) might only represent a fraction of the factors constituting resilience. Several studies support the idea of a more complex set of resilience factors. For example, a big longitudinal study of Kauai Islanders from Hawaii conducted over 32 years investigated the immensely complex network of protective factors over the lifespan of more than 600 people born in the 1950s. In addition to findings similar to what Kobasa and colleagues obtained, this study identified several other individual resilience factors, including activity level, sociability and having at least average intelligence (Werner, 1989). In addition, Werner (1989) identified several resilience factors related to the environment of the individual, including affectional ties within the family and external support systems (e.g., school, work or church) which were all found to protect children at risk from later abnormal development. The complexity of resilience has been explored thoroughly in the literature (e.g., Folke et al., 2010; Rutter, 1993), describing individual resiliency as only one piece of the puzzle. Future and bigger studies might be able to reveal some of the more complex relations between development, persistence and recovery from OCD and its relation to resilience factors.

4.3 Discussion of Sensory Processing Sensitivity and OCD

4.3.1 OCD and SPS – discussion of main findings.

We did not find a significant relation between pre-treatment levels of self-reported sensory processing sensitivity and post-treatment scores on OCD. Patients who reported high sensory processing sensitivity benefitted from the treatment. Again, this is in line with previous failed efforts to identify treatment outcome predictors (Keeley et al., 2008; Knopp et al., 2013). Our results are somewhat conflicting with previous studies linking sensitivity to OCD (Dar et al., 2012; Konrad & Herzberg, 2017), as HSPS scores were only weakly related to OCI-R scores, and not at all with Y-BOCS scores pre-treatment in our OCD-sample. However, our findings do not rule out the

suggestion by Dar and colleagues (2012) that, at least for a subset of patients, sensory integration deficiencies, need for control, ritualizing and OCD symptoms might be related, as we did find a weak relation in our sample. It is possible that the relation between SPS and ritualistic behavior mainly applies to non-clinical samples, as the studies by Dar et al. (2012) and Konrad and Herzenberg (2017) both used non-clinical samples.

4.3.2 Is sensory processing sensitivity one unified construct?

Originally, Aron & Aron (1997) described sensory processing sensitivity as a unidimensional construct. All the same, there is some uncertainty as to whether the HSP scale measures one sensitivity factor or whether there are several factors (Evans & Rothbart, 2008; Grimen & Diseth, 2016; Meyer et al., 2005; Smolewska et al., 2006). Two of the factors previously described is Ease of Excitation – or how excited/overwhelmed people feel in response to sensory stimuli, and Aesthetic Sensitivity – sensitivity to input such as art and music (Grimen & Diseth, 2016), as well as Low Sensory Threshold – how easily sensory input is detected (Smolewska et al., 2006). Differentiation into subscales might be important, as different subscales of HSPS have been linked to different mental health issues. In one study, Ease of Excitation and Low Sensory Threshold were related to symptoms of autism, alexithymia, anxiety and depression, whereas Aesthetic Sensitivity was related to anxiety, but not to depression (Liss, Mailloux, & Erchull, 2008). This could also be relevant for OCD. For example, one could theoretically assume that Ease of Excitation is more closely related to OCD than Low Sensory Threshold, as research has linked specific sensory sensitivity to OCD symptoms (Dar et al., 2012). It would be interesting if future research investigated this link closer.

4.3.3 *Is sensory processing sensitivity a stable personality characteristic?*

Aron and Aron (1997) have proposed the theory that “there is an underlying differentiating characteristic regarding how some individuals process stimuli, involving a greater sensory-processing sensitivity, reflectivity, and arousability,” (p. 362). They suggest SPS as a part of human personality or temperament (Aron, Aron & Jagiellowicz, 2012). One would therefore assume SPS is a stable personality characteristic. In agreement with this, validation of the HSP Scale indicated satisfactory test-retest reliability, i.e. stability over time (Konrad & Herzenberg, 2017). Furthermore, in preliminary studies, SPS has been linked to neurological markers in fMRI scanning (Acevedo et al., 2014; Jagiellowicz et al., 2011) and a specific genotype (serotonin transporter 5-HTTLPR short/short genotype; Licht, Mortensen & Knudsen, 2011), supporting the idea of a stable biological underpinning of the SPS trait. However, our results revealed that HSPS scores decreased substantially following treatment for OCD, with a large effect size. This might indicate that SPS is not a stable underlying characteristic and that responses might be affected by psychological disorders and/ or psychological treatment. This idea is supported by the strong link found in our data between scores on generalized anxiety and SPS scores. This would also be in line with findings from Liss and colleagues (2005) who found a link between anxiety, depression and SPS. But still and all, as with resiliency, responses might have been affected by levels of OCD, anxiety or depressive symptoms, and the drop in sensitivity score might be a reflection of psychological distress decreasing after treatment. Patients might feel depressed pre-treatment and hence over-report, and feel very optimistic after successfully completing treatment and hence under-report. More research is needed into the stability of SPS, especially how it relates to, and might be affected by psychological disorders.

4.3.4 *Critique of the sensitivity concept*

There is some uncertainty as to whether SPS represent a concept distinctly different from the personality characteristic of *neuroticism* (e.g., Costa & McCrae, 1992;

Eysenck, 1963). Aron & Aron (1997) has argued from early on that SPS is not identical to neuroticism. However, the link between anxiety and SPS mentioned previously has been suggested to be mediated through neuroticism (Gearhart, 2014; Grimen & Diseth, 2016). This is an important topic, as neuroticism has been found to be an important risk factor for common mental disorders (Ormel et al., 2013). A recent meta-analysis concluded that SPS is related to neuroticism, but at the same time unique in several ways, and that the two concepts only partly overlap (Lionetti et al., 2019). Hence, one important task for future research could be to more closely investigate the possible link between mental disorders, SPS and neuroticism.

Another important limitation in the literature on SPS is that much of the research has been conducted with students as participants (e.g., Aron & Aron, 1997; Benham, 2006; Gearhart, 2014; Grimen & Diseth, 2016) or with participants from the general population without known psychiatric disorders (e.g., Konrad & Herzberg, 2017). As there is very little research conducted on SPS with patients with mental disorders, it is too early to conclude whether it affects the development, persistence or treatment outcome for mental disorders.

4.4 Discussion of post-treatment predictors of treatment outcome

4.4.1 Post-treatment predictors paper – discussion of main findings

Our results supported previous findings that full recovery (as contrasted with residual symptoms) seems important for long term recovery (Eisen et al., 2013; Elsner et al., 2020; Judd et al., 2008; Kiosses & Alexopoulos, 2013). Results from the final paper further alluded that this is not restricted to the psychiatric disorder treated, but also for relevant comorbid symptoms (in our case symptoms of depression and anxiety). Our findings are also in line with the diathesis-stress model (e.g., Zubin & Spring, 1977), supporting the idea that additional risk factors (i.e. heightened levels of symptoms) increase the risk of not recovering from a psychiatric disorder. This finding might also partly explain the lack of consistency in predictor studies (Keeley et al., 2008; Knopp

et al., 2013), as our findings indicate recovery is not a simple question about a single predictor, but rather a combination of several negatively influencing factors.

4.4.2. Advantages and challenges when using post-treatment predictors

The current project support an advantage of a post-treatment-design with several predictors over a single-predictor-pre-treatment design. This might be one approach to meet the challenge of finding stable and good treatment predictors previously shown in the literature, as results from the current project and similar studies (e.g., Judd et al., 2008; Kiosses & Alexopoulos, 2013) show promising results. This approach does not exclude patients before they have tried therapy, but rather try to identify patients who might need extension of treatment. One can argue this is a more optimistic, fair and ethical way of treating patients, as one does not look for preexisting exclusion criteria, but rather look at patients in need of extra care after treatment completion.

Still, this design also presents several challenges. Firstly, in a clinical setting, one would ideally identify patients at risk of not responding to treatment *before* initiating treatment, as this would potentially be more cost-efficient and save both valuable therapist and patient resources. We therefore recommend future research to continue the search for predictors, for instance looking at several predictors measured both pre and post-treatment, or investigating what kind of treatment tailoring works best for which patients. Secondly, psychological disorders are vastly complex and therefore the choice of predictors is almost endless. We chose post-treatment levels of OCD, anxiety and depression as research has indicated a possible connection between these and treatment outcome, though not consistently (Keeley et al., 2008; Knopp et al., 2013). Future studies should look into other combinations of predictors on treatment outcome for multiple disorders.

Moreover, when one takes into account the vast complexity of people's lives, this entails further intricacy when investigating treatment predictors in general, which implies there might be many low-frequency predictors. Consider for instance, the possibility of one patient not being able to recover fully due to a huge family conflict

distracting the patient from their therapeutic work, another patient too afraid to lean into the exposure treatment due to extreme fear and lack of trust in their therapist, and a third patient with learning disabilities who has not really grabbed the essential learning points of the treatment. All of these patients might not recover fully, but for very different reasons. It is possible that some predictors are not prevalent enough to be detectable in smaller studies. There is need of larger samples which can detect more low frequent predictors, possibly larger multicenter studies that expands over several national or international clinics.

4.5 Strengths and limitations

4.5.1 Strengths

One of the main strengths in the current papers is the use of quality assurance data from the public health care, strengthening the ecological validity of our samples and being able to ensure a safe and high quality implementation of evidence based treatment in the public health care. Another strength is the thorough training of therapists, assumedly reducing therapist effects. A third strength is the use of the concentrated ERP treatment format, as we assume less impact of other life events on patients' symptom severity during the treatment due to short duration of the therapy. The concentrated treatment format where the therapists provide long sessions and work closely with their patients might also help tailoring the treatment to each patient. We also argue that our third paper displays an advantage of the post-treatment design using several predictors as this approach showed a much stronger potential to identify patients at risk of relapse than single pre-treatment predictor designs. Furthermore, this approach is consistent with modern theories of OCD as a complex and multifaceted disorder with several potential risk factors (e.g., Abramowitz et al., 2009). This approach also fits well with the diathesis–stress model highlighting the struggle of having several burdens at the same time. A final strength of the current thesis is the investigation of factors previously little investigated in the OCD literature; dispositional resilience and sensory processing sensitivity.

4.5.2 Limitations

One limitation of the current papers is the exclusion of some predictor variables that have been found to be related to treatment outcome. For example, Knopp et al. (2013) found some symptom subtypes, unemployment and being single to be related to treatment outcome. In addition to this, Keeley et al. (2008) reported family dysfunction and therapeutic alliance to be related to treatment outcome. Also, several studies link socioeconomic status to treatment outcome and drop-out rates for psychotherapy (e.g., de Haan, Boon, Vermeiren, Hoeve & de Jong, 2015; Falconnier, 2009). All of these factors could potentially have been interesting to investigate in the frame of the concentrated ERP treatment format, and future studies will perhaps take a closer look at those variables. As this thesis is part of a quality assurance study, the main goal was to investigate patient characteristics and factors theoretically thought to affect treatment outcome in the concentrated treatment format (i.e. sensitivity, lack of hardiness and remaining symptoms post-treatment). In future studies it might be interesting to broaden the search of predictors.

Another limitation in the current thesis concerns generalizability of our findings. As we used samples from the concentrated ERP treatment format for all three papers and there is considerable overlap between the samples in our papers, we do not know whether our findings generalize to other patient populations or treatment formats. However, as mentioned above, the goal of the current study was to ensure quality in the public health care for patients with OCD, which in itself leads to less generalizability to outside our national borders as other clinics or different national health programs may employ other therapy structures. It would be interesting if future research investigated whether our findings also hold true in other treatment formats.

The use of self-report data is another limitation in the current thesis. All three papers rely heavily on self-report data (i.e., results from HSPS, DRS-15-R, PHQ-9, BDI, GAD-7, BAI and OCI-R). Although all the aforementioned questionnaires have been reported to have adequate validity and reliability, future studies should also include more clinician based ratings of symptom level and personality characteristics. It might also be interesting to investigate family rated symptom levels.

Another limitation concerns sample sizes, increasing the risk of committing type II-errors. Especially for the post-treatment design the number of predictors we could look at is limited by sample size. Future studies should investigate several predictors in larger groups of patients with OCD. Missing data is also a concern in the current papers, especially for follow-up data. Several patients did not fill out questionnaires on SPS and resiliency post-treatment or at follow-up, making the sample size quite small for the analyses of change in SPS and resilience scores. Hence, those results should be interpreted with caution.

Considering design, all three papers utilized data from the quality assurance database. A randomized controlled trial was beyond the scope of this project, but could have highlighted important aspects, for example investigating whether it is useful to offer more treatment to patients who are not fully recovered post-treatment, or investigating whether our results are specific to the concentrated ERP treatment format. Since one cannot manipulate the variables most interesting to our studies however (i.e. patient sensitivity, resilience, depression, OCD and anxiety), we argue the current design was the most appropriate for the main questions we sought to investigate.

Another important limitation concerns how treatment seeking could be related to personality characteristics, and hence lead to a selection bias in our sample. We do not know the sensitivity nor resilience score of patients refusing treatment or not seeking treatment in the first place. It might be the case that more sensitive or less hardy patients do not seek treatment. At the same time, our results showed a substantial proportion of people scoring high on sensitivity and low on resiliency, compared to studies on people without known psychiatric disorders (e.g., Aron & Aron, 1997; Hystad, Eid, Laberg, Johnsen & Bartone, 2009; Konrad & Herzenberg, 2017).

In terms of statistical analyses, this thesis relies heavily on basic regression models (mostly logistic and multiple regression analyses). As assumptions were met to conduct these analyses, we argue they are appropriate for the different papers. Factor analyses or structural equation models could have provided an even deeper understanding of the structures of the concepts investigated here, especially sensitivity

and dispositional resilience, as these two concepts have been reported to consist of several factors as described earlier. However, our data was drawn from a quality assurance database, which limits the use of the data to study questions aimed at improving clinical practice in general.

4.6 Implications for future research

This thesis is an example of how one can assist implementation of evidence based treatment formats in the regular health care system with quality assurance data. As highlighted by Knopp and colleagues (2013), integrating quality assurance studies in routine practice might help speed up the integration of tailor made treatment for each patient in the public health care. We strongly recommend other clinics to integrate quality assurance studies when implementing evidence based treatments, as this could add valuable information to the existing literature. There is a need for more research on predictors of treatment outcome in the routine clinical health care, as this provides strong ecological validity.

Another interesting feature for future research to investigate is the use of resilience measures in clinical studies. Hardiness, or dispositional resilience, was developed within the frame of existential psychotherapy (Maddi, 2002), and to our knowledge, there is little literature on dispositional resilience in a cognitive behavioral therapy setting. However, there are several reasons why the facets *commitment*, *control* and *challenge* could be useful to investigate further in CBT treatment. Maddi (2002) described the combined attitude of commitment, control and challenge as a kind of existential courage; a courage and motivation to do new and difficult things. As CBT and ERP treatments most definitely requires from the patients that they explore new and difficult situations, it might be interesting for future research to investigate the relation between dispositional resilience and treatment outcome for other psychological disorders, such as depression and anxiety disorders.

A third suggestion for future research is to use new analyses, methods and design. It has been suggested that one of the reasons for the lack of consistent

predictors in the OCD literature is methodological weaknesses (Kopp et al., 2013). A recent study of internet based CBT for youths with OCD suggest an advantage of machine learning techniques over traditional statistical methods for identifying reliable predictors of treatment outcome (Lenhard et al., 2018). This might be a more viable road for future predictor studies, although this also presents several unique challenges, among other things the interpretation of the findings (Cabitza, Rasoini, & Gensini, 2017). It might also be useful to combine data from different sites in order to do research on bigger samples. We recommend future research to continue to look at different predictors, such as symptom subtypes, unemployment, relationship status, family dysfunction, therapeutic alliance and socioeconomic status in combination as all of these have been linked to worse treatment outcome (de Haan et al., 2015; Falconnier, 2009; Keeley et al., 2008; Kopp et al., 2013). Other interesting factors that deserves further attention considering predictive effects are the way exposure treatment is delivered, therapy specific factors, genetic factors and neurological factors.

Our results lend support to a focus on the combined burden of several strains experienced post-treatment over a single pre-treatment predictor model. The post-treatment predictor paper indicates that several burdens at the same time might influence each other negatively, hence predicting worse treatment outcome. Future studies should look into the possibility of such domino effects, investigating how different predictors might interact with each other in a positive or negative way. Future studies should also investigate whether it is possible to reduce relapse through addressing patients with subclinical levels of OCD, anxiety and depression post-treatment and providing them with additional interventions. One recent study suggested that added concentrated exposure treatment might be the solution to recovery for a substantial proportion of difficult-to-treat OCD (Kvale et al., 2020). It remains to be explored whether this also holds true for patients with residual symptoms of OCD, anxiety and depression. Finally, we argue that research is needed to shed light on therapist attitudes towards exposure therapy, and encourage therapists to provide exposure treatment to patient groups considered “sensitive” or “less

resilient”, as our results indicate these patients tolerate exposure therapy and can profit from it to the same degree as low-sensitive or high-hardy individuals.

Conclusion

The current thesis investigated the relationship between sensitivity, resilience, and post-treatment residual symptoms and treatment outcome in a concentrated ERP treatment format, using data from a quality assurance database. We argue that quality assurance as an integrated part of treatment ensures a safe way of implementing evidence based treatment and could help to improve health services. The concentrated treatment format gave a significant and clinically relevant improvement for the majority of the patients that lasted at follow-up, and none of the patients got worse during treatment. Our results showed that neither low resilience nor high sensitivity hindered treatment outcome. The results indicate that concentrated exposure treatment is a safe and efficient treatment format for patients with OCD with different personality traits whom can reclaim their lives following treatment. We did, however, find that the combined burden of having remaining symptoms of depression, anxiety and OCD post-treatment, was related to worse treatment outcome at follow-up. Our results indicated an advantage of using several post-treatment predictors over using single pre-treatment ones. In addition, our findings indicated that patients receiving the concentrated ERP format who displays residual symptoms of depression, anxiety and OCD post-treatment should be considered for relapse prevention interventions. Finally, we argue that patients should be offered evidence based treatment with exposure and response prevention regardless of scores on sensitivity and dispositional resilience.

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Papers I-III

Health and Disability

Dispositional resilience in treatment-seeking patients with obsessive-compulsive disorder and its association with treatment outcome

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There is a lack of research on the relation between obsessive-compulsive disorder (OCD) and resilience. Dispositional resilience, as described and defined in literature on hardiness, consists of three facets, namely beliefs about having *control* in everyday living, having a sense of purpose or *commitment*, and a positive attitude toward *challenges*. This study explores associations between dispositional resilience (measured with the Dispositional Resilience Scale (DRS-15-R)), symptom severity, and treatment outcome in a sample of 89 patients treated with concentrated exposure therapy (cET), and compares the findings with scores from two reference groups (students and soldiers). The patient group had significantly lower resilience scores than the two reference groups. Weak correlations were observed between dispositional resilience and OCD symptoms. Differences in dispositional resilience were weakly related to remission status at follow-up (odds ratio of 1.11). Furthermore, resilience improved from pre- to post-treatment (Cohen's *d* of 0.65). Our results imply that patients' initial resilience score does not hinder nor facilitate treatment effects to a great extent in this format of ERP treatment.

Key words: Concentrated treatment, dispositional resilience, hardiness, obsessive-compulsive disorder, predictor, treatment outcome.

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INTRODUCTION

Obsessive-compulsive disorder (OCD) is a severe psychiatric disorder characterized by recurrent thoughts and images (obsessions) associated with anxiety and discomfort that the patient tries to minimize or control with repetitive behaviors or mental rituals (compulsions; American Psychiatric Association, 2013). The disorder tends to be chronic when untreated, and research suggests that quality of life is severely impaired by the illness (Eisen *et al.*, 2006). About 50–70% of the OCD patients can expect clinically significant change following cognitive behavioral therapy (CBT), including exposure with response prevention (ERP; Öst, Havnen, Hansen & Kvale, 2015; Öst, Riise, Wergeland, Hansen & Kvale, 2016; Skapinakis, Caldwell, Hollingworth *et al.*, 2016). Identifying predictors of treatment outcome is important in order to be able to provide better care for the remaining 30%–50% of the patients. However, identifying consistent predictors of treatment outcome have proven difficult (Keeley, Storch, Merlo & Geffken, 2008; Knopp, Knowles, Bee, Lovell & Bower, 2013; Olatunji, Davis, Powers & Smits, 2013).

Personal resources or resilience is believed to strongly influence psychopathology and coping (Zimmer-Gembeck & Skinner, 2016). One line of research investigating individual differences in resilience is on the hardiness trait. Kobasa (1979) identified distinctive feelings of *control*, as well as desirability of *challenge*, and sense of *commitment* in participants who handled stress well, and suggested these three facets as key components of hardiness, a construct intended to measure individual resiliency (hence forth just referred to as resiliency). The control facet includes beliefs that the person is able to exercise control over their environment and pursue their own interests, as opposed to

being controlled by external factors. The challenge facet consists of an understanding that changes in the environment are to be expected, and a source to growth and development as opposed to a threat that one should avoid. Finally, the commitment facet has been described as a propensity to engage oneself in the things one does and having a sense of purpose (as opposed to feelings of alienation; Eschleman, Bowling & Alarcon, 2010; Kobasa, 1979).

Control aspects have been proposed to be a core component of OCD. A review of control related beliefs in OCD by Moulding and Kyrios (2006) reported a negative relation between *sense of control*, that is, the belief that one's action matters for outcomes in the real world, and OCD symptoms. Similarly, a study from 2007 found higher *desire of control* and lower *sense of control* in individuals with higher levels of OCD-related beliefs and symptoms (Moulding & Kyrios, 2007), and the finding has also been extended to patients with a clinical diagnosis of OCD (Moulding, Doron, Kyrios & Nedeljkovic, 2008). Hence, it could be relevant to explore whether sense of control (i.e., the control facet in resilience) is related to treatment outcome for OCD patients.

Intolerance of uncertainty has been proposed to be another core component of OCD (Tolin, Abramowitz, Brigidi & Foa, 2003), and OCD patients have been found to report lower scores on novelty seeking than controls (Kusunoki *et al.*, 2000). Grayson (2010) claims intolerance of uncertainty must be understood and targeted by clinicians in order to succeed with ERP treatment for OCD. Kashdan and Silvia (2009, p. 371) argue that curiosity and novelty seeking should be included in studies of psychological disorders, as "people suffering from psychological disorders, intrusive thoughts and anhedonic processes can blunt the

experience and expression of appetitive activity". Evidence-based psychological treatments for OCD require the patient to face uncertainty by approaching anxiety and discomfort eliciting triggers and at the same time let go of the controlling rituals (Abramowitz, 1996). Consequently, it would be relevant to investigate preference for stability vs. challenges and change in OCD patients (i.e., the challenge facet of resiliency), and its relation to treatment outcome.

Research has indicated a negative association between a sense of purpose/meaning and psychopathology or low psychological well-being (Harlow, Newcomb & Bentler, 1986; Shek, 1992; Zika & Chamberlain, 1992). Having a sense of purpose in life has been related to better treatment outcome for alcohol and cocaine abuse (Martin, MacKinnon, Johnson & Rohsenow, 2011; Waisberg & Porter, 1994). It has been suggested that intrinsic values or sense of purpose is important to motivate behavior and action towards desired outcomes (Wagner & Sanchez, 2002). To our knowledge, this relation has not been investigated for OCD. Hence, it might be relevant to investigate whether a sense of purpose (i.e., the commitment facet of resiliency) is important for symptom severity and treatment outcome in OCD.

As reviewed above, research on resilience and OCD could be important, but little research has been conducted on their relation. A comprehensive review from 2010 found that resiliency was positively related to social support, active coping and performance (Eschleman *et al.*, 2010). They also reported a positive relation between resiliency and personality traits associated with good stress management (e.g., self-esteem, optimism and sense of coherence) and a negative relation with personality traits associated with worse stress coping (e.g., neuroticism, negative affectivity and trait anger; Eschleman *et al.*, 2010). In addition, higher scores on the resiliency trait has been related to less health complaints (Johnsen, Hystad, Bartone, Laberg & Eid, 2014) and better neuro-immunological response to stress (Sandvik, Bartone, Hystad, Phillips, Thayer & Johnsen, 2013). These aspects might also be relevant for OCD patients as they experience substantial amounts of stress and anxiety as discussed previously.

Studies based on Cloninger's (1998) psychobiological model of temperament and character indicate an indirect link between resilience and OCD. The model consists of different personality aspects, linked with different vulnerabilities for mental disorders (Giakoumaki, Karagiannopoulou, Róza, Zourarakis, Karamaouna & Cloninger, 2016). More specifically, research has found an association between OCD and harm avoidance which is an important aspect in Cloninger's model (Ettelt, Grabe, Ruhmann *et al.*, 2008) and as a motivational core dimension especially for obsessional thoughts (Ecker & Gönner, 2008). People with high levels of harm avoidance are described as worriers with a pessimistic view of the future and easily fatigable. As negative relationships have been documented between resilience and harm avoidance (e.g., Eley, Cloninger, Walters, Laurence, Synnott & Wilkinson, 2013) one could expect a negative relation between OCD and resilience. Also, there are findings indicating a link between anxiety disorders and the personality trait persistence, a trait which might be related to the commitment aspect of resiliency (Cloninger, Zohar, Hirschmann & Dahan, 2012). Furthermore, it has been hypothesized that individual configurations in personality structures from Cloninger's model could

be used to match patient to therapy, for instance through matching interventions with the developmental step of the patient (Cloninger & Svrakic, 1997).

Two studies have directly examined the relation between OCD symptoms and resiliency. However, both studies were conducted on non-clinical samples of youths (Hjemdal, Vogel, Solem, Hagen & Stiles, 2011; Sun, Li, Buys, Storch & Wang, 2014). Both studies found resiliency to be related to OCD symptoms. Hjemdal *et al.* (2011) reported overall resilience as measured by the Resilience Scale for Adolescents (READ) to correlate negatively ($r = -0.29$) with their measure of OCD (Obsessive-Compulsive Inventory-Revised) in Norwegian high school students. Sun *et al.* (2014) found achievement motivation, flexibility, self-esteem, and peer relationships to be related to obsessive-compulsive symptoms as measured with the Structured Clinical Interview for DSM-IV Axis I Disorders and the Maudsley Obsessive-Compulsive inventory (MOCI). None of the studies used the Yale-Brown Obsessive Compulsive Scale (Y-BOCS; Goodman, Price, Rasmussen *et al.*, 1989a, Goodman, Price, Rasmussen *et al.*, 1989b), which is considered the gold standard for measuring OCD symptoms. Further, both studies investigated resiliency in adolescent samples (average age was 14.7 years in the Chinese study and 16.4 years in the Norwegian study). We argue it is relevant to investigate resiliency in an adult sample diagnosed with OCD as a clinical sample probably experience more strain and stress than a non-clinical sample and, as reviewed above, resilience is tightly linked to stress management. Also, the relation between resilience and OCD might differ between adolescents and adults. Furthermore, the Norwegian study used the READ to measure resiliency, a questionnaire designed for youths. The Chinese study used the California Psychological inventory, measuring concepts related to resilience, but not a questionnaire developed specifically to measure individual resilience. Hence, there is a lack of studies investigating the relation between OCD symptoms and resilience with a measurement specifically targeting individual resilience in the adult population.

There is also a lack of research on the relation between resilience and treatment outcome for OCD. Resiliency could be positively related to psychotherapy outcome. Studies have indicated a positive relation between multi-dimensional resilience scores and treatment outcome for pharmacological treatment of PTSD (Davidson, Stein, Rothbaum, Pedersen, Szumski & Baldwin, 2012) and depression (Camardese, Adamo, Mosca *et al.*, 2007). Hence, it could be hypothesized that resiliency might be a transdiagnostic factor affecting course, severity or treatment outcome in psychiatric illnesses. It is therefore also relevant to investigate whether resilience is related to treatment outcome for OCD patients.

In the current study, we aimed to investigate: (1) differences in resiliency scores between OCD patients and two reference groups (university students and soldiers); (2) the relation between resiliency and OCD symptom severity in patients with OCD; (3) the relation between resiliency and remission status at follow-up after completion of concentrated exposure therapy (cET); and (4) changes in resiliency scores after completing cET. As OCD is characterized by rigid obsessions and compulsions, while resiliency is related to cognitive flexibility (Kobasa, 1979), we

expected lower resiliency scores for the patients with OCD compared to the reference groups. Along the same lines, and considering previous findings in non-clinical populations (Hjemdal *et al.*, 2011; Sun *et al.*, 2014) we also expected a negative relation between symptom severity and resiliency. As common treatment (including cET) for OCD involves direct or imagined exposure to anxiety provoking objects or situations, patients scoring high on resiliency could view the challenges involved in treatment more positively and hence be more likely to engage in complete response prevention, and therefore benefit more from treatment. Research on resiliency and its relation to both symptom severity and treatment is important because it can help clinicians to individually tailor treatment and also guide future research on outcome predictors. To our knowledge, this is the first study to investigate dispositional resilience in a clinical population of OCD patients.

METHODS

Participants and procedure

OCD sample. The OCD-team in Helse Bergen covers a catchment area of 420,000, and is one of the 30 designed teams in Norway offering evidence-based psychological treatment for OCD (Kvale & Hansen, 2014). As part of a standard quality assurance procedure, OCD patients referred to this clinic are routinely screened with symptom specific and treatment-relevant instruments (consented by the Norwegian Data Protection Official (NSD/Personvernombudet), May 5, 2012). Data from these patients are subsequently stored in a clinical data registry. The current paper included patients from this registry who fulfilled all of the following criteria: (1) completed the Bergen concentrated exposure treatment (cET; Hansen, Hagen, Öst, Solem & Kvale, 2018; Hansen, Havnen, Hagen, Öst & Kvale, in press; Havnen, Hansen, Öst & Kvale, 2014, 2017). The Bergen 4-day OCD treatment delivered in a group setting: (1) 12-month follow-up.; (2) had filled out the Dispositional Resilience Scale (DRS-15-R) pre-treatment; and (3) completed Yale–Brown Obsessive Compulsive Scale (Y-BOCS) interviews before treatment, after treatment, and at follow-up. A total of 44 group treatments were conducted between July 2012 and November 2016, and data were drawn from this sample. cET has been labeled “individual treatment in a group setting”, since the treatment is delivered to groups of 3–6 patients by the same number of therapists. cET is administered over 4 consecutive days followed by 3 weeks of self-administered exposure tasks. During the 4 days, patients receive individually tailored and therapist-assisted treatment in as many OCD-relevant settings as possible. Day 1 is reserved for psychoeducation and planning exposure tasks. Day 2 and 3 involve therapist-assisted exposure. Day 4 is assigned to discussing “lessons learnt” and agreeing on self-exposure tasks for the 3 weeks to follow. Since the ratio of therapists to patients is 1:1, cET facilitates close individual tailoring of the treatment for each patient while at the same time taking advantage of the group format where patients can learn from each other and give each other support. In order to be qualified as a therapist for the cET treatment, therapists have to undergo a thorough training, which consists of hands-on clinical training under supervision of experienced cET therapists and a multiple-choice exam. Exclusion

criteria were non-fluency in Norwegian language, ongoing drug abuse, psychosis, and suicidal intention. In addition, therapists recommended patients to discontinue any use of anxiolytics before initiating treatment.

The OCD sample consisted of 89 patients (70.8% female) with a principal diagnosis of OCD, as assessed by trained clinicians using the Mini International Neuropsychiatric Interview (Sheehan, Lecrubier, Sheehan *et al.*, 1998). Mean age for the OCD sample was 31.69 ($SD = 10.65$). Most of the patients were full time workers ($n = 39$) or students ($n = 22$). Five were unemployed, nine were currently on sick leave, one was a pensioner, two lived off disability benefits, and 11 had other arrangements, such as part-time jobs, homemakers, or sheltered workshops. Several patients had university or college degrees ($n = 39$), 34 had finished high school, six had finished primary school, and the rest did not provide information about their education. Thirty-three patients had one or more comorbid diagnoses, of which the most common were depression ($n = 12$), general anxiety disorder ($n = 12$), social phobia ($n = 6$), unspecified anxiety disorder ($n = 5$) and panic disorder ($n = 4$).

Military sample. A group of Norwegian army soldiers also filled out the DRS-15-R. Parts of this data have been described and published by Johnsen and colleagues in a previous study (Johnsen, Bartone, Sandvik *et al.*, 2013). Due to anonymity restrictions, exact age and gender were not recorded for all participants in this subsample. The group consisted of 222 privates serving in the armed forces as part of their mandatory military service. Their age ranged from approximately 18–23 years, and the group consisted almost exclusively of men.

Student sample. University students attending introductory psychology courses at the University of Bergen in Norway also filled out the DRS-15-R. Parts of this data have been described and published by Hystad and colleagues in a previous study (Hystad, Eid, Laberg, Johnsen & Bartone, 2009). Students who agreed to participate completed questionnaires during class. All students participated voluntarily and did not receive course credits for doing so. This subsample consisted of 354 students (73.7% female) with a mean age of 21.68 ($SD = 4.38$).

Measures

OCD. Obsessive-compulsive disorder symptom severity was measured using the Yale–Brown Obsessive Compulsive Scale (Y-BOCS; Goodman *et al.*, 1989a,b). The Y-BOCS consists of 10 items which are rated on a scale from 0 to 4, yielding a total score of 0–40. Y-BOCS interviews were conducted by trained clinicians pre- and post-treatment and at 3- and 6-month follow-up. All post-treatment measures were administered within 1 week after the 4-day treatment. Follow-up measures were administered at 3- and 6-month post-treatment. A therapist at the clinic conducted pre-treatment interviews, while post- and follow-up interviews were conducted by an independent assessor by phone. The Y-BOCS has been reported to show good psychometric properties (Goodman *et al.*, 1989a,b).

Resiliency. The *Dispositional Resilience Scale 15-Revised* (DRS-15-R; Hystad, Eid, Johnsen, Laberg & Bartone, 2010) was filled

out pre-treatment for the OCD sample. A subsample of the OCD patients ($n = 33$) also answered the DRS-15-R post-treatment. The questionnaire consists of 15 items that are rated on a scale ranging from 0 (not at all true) to 3 (completely true). Six of the items are negatively phrased. The *commitment*, *control* and *challenge* facets are each measured by 5 items, for example, "I really look forward to my work" and "Most of my life gets spent doing things that are worthwhile" (*commitment*); "By working hard you can nearly always achieve your goals" and "How things go in my life depends on my own actions" (*control*); "Changes in routine are interesting to me" and "I enjoy the challenge when I have to do more than one thing at a time" (*challenge*). Psychometric properties have been reported to be good for the DRS-15-R (Bartone, 2007). Missing items were replaced with the average score on the questionnaire for the individual patient. Questionnaires with more than two missing items were not included in the analyses. A total of 9 items were replaced in the OCD sample (0.007% of total items), 12 items were replaced in the student sample (0.002% of total items) and no values were replaced in the military sample. One patient in the OCD sample had two missing values; the rest of the replacements were single missing values. Cronbach's alpha coefficients were calculated for our OCD sample and were 0.77 for the total dispositional resiliency score, and 0.76, 0.68, and 0.71 for the *commitment*, *control* and *challenge* facets respectively.

Statistical analyses

One-way ANOVAs with post hoc tests were conducted to compare scores on the DRS-15-R and facet scores on *commitment*, *control* and *challenge* between the OCD sample and the two reference groups. Effect sizes were calculated for differences between the OCD sample and the two reference groups using Cohens d with pooled standard deviations. An independent sample t -test was used to check for gender differences in DRS-15-R scores for the OCD and student samples. The relationship between age and resiliency was investigated using bivariate correlation. To investigate whether resiliency was related to OCD symptom severity, bivariate correlations were conducted using DRS-15-R scores, including all three facets, and Y-BOCS scores pre- and post-treatment and at follow-up. Bivariate correlations were also used to investigate relation between DRS-15-R scores and: (a) any comorbidity; (b) comorbid depression; and (c) comorbid anxiety (i.e., panic disorder, social phobia, general anxiety disorder or unspecified anxiety disorder).

Y-BOCS score post-treatment was used as an indicator of treatment response. When post-measure of Y-BOCS was not available ($n = 5$), the 3-month follow-up measure was used as an indicator of post-treatment status. Definition of follow-up was set to minimum three months post-treatment. Clinical meaningful change was investigated using the criteria suggested by Mataix-Cols, de la Cruz, Nordstletten, Lenhard, Isomura and Simpson (2016), which states that a change in Y-BOCS score of $\geq 35\%$ can be considered a meaningful treatment response, and that a patient can be considered in remission with a Y-BOCS score of ≤ 12 . In order to investigate the predictive effect of resiliency pre-treatment on treatment outcome, two logistic regression analyses were run to predict remission (Y-BOCS ≤ 12) post-

treatment and at follow-up from DRS-15-R score pre-treatment. We controlled for age and gender based on findings from a meta-analysis which suggest higher age and higher proportion of women to be negatively related to effect sizes in studies of CBT for OCD (Öst *et al.*, 2015). We also controlled for Y-BOCS score pre-treatment. To control for comorbidity we re-ran the last analysis three times, controlling for: (a) any comorbid diagnosis; (b) comorbid depression; and (c) comorbid anxiety disorder (panic disorder, social phobia, general anxiety disorder or unspecified anxiety disorder). A third logistic regression analysis was run to investigate the individual contribution of the facets *commitment*, *control* and *challenge* to predict remission at follow-up, as research has suggested different facets might be important for health and stress coping (Eschleman *et al.*, 2010; Johnsen *et al.*, 2014; Sandvik *et al.*, 2013). The main analyses were repeated with linear regression analyses to look for potential differences. A paired-sample t -test was conducted comparing DRS-15-R scores pre- and post-treatment to test whether resiliency changed after completing treatment ($n = 33$). Finally, two independent sample t -tests were run to investigate whether remission status post-treatment and at follow-up were related to changes in resiliency scores from pre- to post-treatment.

RESULTS

Preliminary data analysis

Skewness and kurtosis were investigated for the DRS-data to ensure correct usage in the following analyses. Skewness was found to be -0.53 ($SE = 0.10$). Kurtosis was found to be 1.32 ($SE = 0.19$). Both values were in acceptable range for conducting linear data analyses.

Group comparisons

There was a significant difference between the groups with respect to total scores on the DRS-15-R, $F(2, 662) = 83.36$, $p < 0.001$. As Levine's test was significant and the assumption about homogeneity of variance was violated, Games Howell post hoc tests were used. Although rather similar to Tukey's test in its formulation, the Games-Howell test does not assume equal variances and sample sizes. The post hoc tests showed that OCD patients had lower total DRS-15-R scores than both reference groups. There was no difference between the student and soldier groups ($p = 0.196$, mean difference = 0.69). Post hoc tests also revealed a significant difference between the OCD sample and the reference groups on all facets of the DRS-15-R ($p < 0.001$). The difference was largest for total DRS-15-R score ($d = 1.30$ for OCD vs. students; $d = 1.36$ for OCD vs. soldiers) followed by the facets *commitment* ($d = 1.10$ for OCD vs. students; $d = 1.10$ for OCD vs. soldiers), *challenge* ($d = 0.70$ for OCD vs. students; $d = 0.89$ for OCD vs. soldiers) and *control* ($d = 0.73$ for OCD vs. students; $d = 0.78$ for OCD vs. soldiers). In sum, OCD patients had considerable lower scores on resiliency compared to students and military soldiers pre-treatment. One-way ANOVAs with Games Howell post hoc tests also revealed that OCD patients still scored significantly lower than students' and soldiers' post-treatment on total DRS-15-R score and on the *commitment*

facet, but not on the two other facets. DRS-15-R scores and significant differences between samples are displayed in Table 1.

An independent sample t-test revealed no gender differences in DRS-15-R scores, $t(423) = 0.85$, $p = 0.40$. DRS-15-R scores were negatively though weakly correlated with age $r(434) = -0.25$, $p < 0.001$, as younger OCD patients and students tended to have somewhat higher resiliency scores.

OCD treatment effects

Mean Y-BOCS score was 26.0 pre-treatment ($SD = 4.63$), 10.1 post-treatment ($SD = 5.27$) and 11.7 at follow-up ($SD = 6.99$). Treatment was found to be effective, as 89.9% of the patients were classified as responders (i.e., a change in Y-BOCS of $\geq 35\%$), and 73% were in remission (i.e., Y-BOCS ≤ 12) post-treatment. The corresponding figures for follow-up status were 78.7% response, and 59.6% remission. Cohen's d_c was calculated for the change from pre-treatment to post and follow-up as suggested by Lakens (2013), correcting for correlation between Y-BOCS scores, and was found to be 2.46 for pre- to post-treatment and 1.80 for pre-treatment to follow-up, corresponding to large effect sizes.

Correlations between resiliency and psychiatric symptoms

DRS-15-R scores pre-treatment were neither significantly correlated with Y-BOCS scores pre-treatment, $r = -0.19$, $p = 0.075$ nor post-treatment, $r = -0.18$, $p = 0.09$. None of the facets were significantly related to Y-BOCS post-treatment. However, a weak to medium correlation existed with Y-BOCS scores at follow-up, $r = -0.32$, $p < 0.01$. The results revealed a weak negative relation between the *challenge* facet and Y-BOCS scores pre-treatment and at follow-up. Correlations between DRS-15-R, including all facets, and Y-BOCS scores pre- and post-treatment and at follow-up are displayed in Table 2. Some theories propose a u-shaped relationship between positive traits and outcome, so that both much and too little of a trait could be negative (Grant & Schwartz,

2011). A visual inspection of the data did not provide support for this hypothesis in our sample.

Having any comorbid diagnosis was significantly correlated with DRS-15-R scores pre-treatment, $r_s = -0.43$, $p < 0.001$. Both comorbid depression ($r_s = -0.28$, $p < 0.05$) and comorbid anxiety disorder ($r_s = -0.32$, $p < 0.01$) were significantly correlated with resiliency pre-treatment. Comorbid diagnoses were related to lower resiliency scores.

Resiliency as a predictor of treatment outcome

A logistic regression analysis was used to investigate predictive effects of age, gender, Y-BOCS score pre-treatment, and DRS-15-R scores pre-treatment for remission post-treatment. The model was not significant, $\chi^2(4, N = 89) = 5.08$, $p = 0.28$. Resiliency was not significantly related to post-treatment remission ($p = 0.26$).

The next logistic regression analysis was conducted to test whether age, gender, Y-BOCS pre-treatment and DRS-15-R scores pre-treatment predicted remission at follow-up. The model was significant, $\chi^2(4, N = 89) = 10.45$, $p < 0.05$. Whereas age, gender and Y-BOCS pre-treatment were not significantly contributing to the model, DRS-15-R score pre-treatment was significantly related to remission at follow-up. A one unit increase in DRS-15-R increased the odds by 1.11, indicating a minimal difference in follow-up status in favor of patients scoring higher on the DRS-15-R. We re-ran the analysis three times, controlling for: (1) any comorbid diagnosis; (2) comorbid depression; and (3) comorbid anxiety disorder. None of the comorbidities significantly contributed to the model (any comorbid disorder $p = 0.26$, comorbid depression $p = 0.08$, comorbid anxiety $p = 0.41$).

Linear regression analyses adding age, gender, Y-BOCS pre-treatment and DRS-15-R pre-treatment displayed similar results as the logistic regression analyses for both post-treatment scores on the Y-BOCS ($F(4, N = 89) = 1.62$, $p = 0.18$) and follow-up scores on Y-BOCS ($F(4, N = 89) = 3.65$, $p < 0.05$).

To closer investigate the effects of the facets *commitment*, *control* and *challenge* for remission at follow-up, one last logistic

Table 1. Means, standard deviations and comparisons of DRS-15-R for all three subsamples, including Pre- and Post-scores for OCD subsample

DRS-15-R	OCD pre-treatment		Students		Soldiers		Post hoc
	M	SD	M	SD	M	SD	
Total	24.0	5.8	30.6*	4.3	31.3*	4.9	OCD < St., Sold.
Commitment	7.4	3.3	10.4*	2.1	10.5*	2.3	OCD < St., Sold.
Control	10.3	2.6	11.9*	1.8	12.1*	2.1	OCD < St., Sold.
Challenge	6.4	2.9	8.3*	2.5	8.7*	2.4	OCD < St., Sold.
OCD post-treatment							
Total	27.7	6.6					OCD < St., Sold.**
Commitment	8.7	3.6					OCD < St., Sold.**
Control	11.1	2.5					No significant differences
Challenge	7.8	2.9					No significant differences

Note: DRS-15-R, Dispositional Resilience Scale 15-Revised. For the total sample, total DRS-15-R scores ranged from 8 to 45. Scores on *commitment* and *challenge* ranged from 0 to 15, and scores on *control* ranged from 3 to 15. Numbers for the soldier and student groups re-printed from Johnsen *et al.* (2013) and Hystad *et al.* (2009) with permission from the authors. OCD pre-treatment $n = 89$, OCD post-treatment $n = 33$, Soldiers $n = 222$, Students $n = 354$. Significant relations are displayed in bold.

*Significantly different from OCD sample pre-treatment as measured by one-way ANOVAs with Games-Howell post hoc tests, $p < 0.001$.

** $p < 0.05$.

Table 2. Correlations between DRS-15-R pre-treatment, including the three facets, and Y-BOCS scores

Measure	1	a)	b)	c)	2	3
1. DRS-15-R total score	-					
a) Commitment	0.76**	-				
b) Control	0.60**	0.24*	-			
c) Challenge	0.61**	0.15	0.05	-		
2. Y-BOCS pre-treatment	-0.19	-0.20	0.08	-0.23*	-	
3. Y-BOCS post-treatment	-0.18	-0.10	-0.18	-0.10	0.15	-
4. Y-BOCS follow-up	-0.32**	-0.15	-0.19	-0.29**	0.22*	0.47**

Note: DRS-15-R, Dispositional Resilience Scale 15-Revised; Y-BOCS, Yale-Brown Obsessive Compulsive Scale.

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

*Correlation is significant at the 0.05 level (2-tailed).

Table 3. Summary of logistic regression analysis for variables predicting remission post-treatment and at follow-up

	B	SE B	e^B	p
Dependent: remission post-treatment				
Age	-0.03	0.02	0.98	0.30
Gender	-0.64	0.53	0.53	0.23
Y-BOCS pre-treatment	-0.07	0.06	0.93	0.21
DRS-15-R	0.05	0.04	1.05	0.26
Dependent: remission at follow-up				
Age	-0.02	0.02	0.98	0.37
Gender	-1.00	0.51	0.37	0.05
Y-BOCS pre-treatment	0.00	0.05	1.00	0.99
DRS-15-R	0.11	0.04	1.11	0.01*
Dependent: remission at follow-up				
Age	-0.02	0.03	0.98	0.39
Gender	-0.99	0.52	0.37	0.06
Y-BOCS pre-treatment	-0.00	0.05	1.00	0.93
Commitment	0.07	0.07	1.07	0.37
Control	0.14	0.10	1.15	0.15
Challenge	0.14	0.09	1.14	0.12

Note: DRS-15-R, Dispositional Resilience Scale 15-Revised; e^B , exponential B; Y-BOCS, Yale-Brown Obsessive Compulsive Scale. Remission defined as Y-BOCS \leq 12.

*Significant relations are displayed in bold.

regression analysis was run, adding age, gender, Y-BOCS pre-treatment and the three facets as independent variables. The model was not significant ($\chi^2(6, N = 89) = 10.91, p = 0.09$). None of the facets significantly contributed to the model. Details from the main regression analyses are displayed in Table 3. The procedure was replicated with a linear regression analysis which turned out significant ($F(4, N = 89) = 2.83, p < 0.05$). In this analysis, the *challenge* facet was the only significant contributor to the model ($p < 0.05$). To summarize, resiliency pre-treatment was significantly, though weakly related to follow-up remission status, but not related to post-treatment remission status. Comorbidity did not affect the results, and neither of the facets *commitment* nor *control*. The *challenge* facet came out significant in the linear regression analysis, but not in the logistic regression analysis.

Does resiliency change as a result of treatment?

To investigate whether resiliency changed as a result of treatment, a paired-sample t-test was conducted. The analysis revealed a

significant difference in DRS-15-R for pre-treatment scores ($M = 24.70, SD = 6.85$) and post-treatment scores ($M = 27.66, SD = 6.57$); $t(32) = -3.72, p < 0.01$. Cohen's d_z was calculated for the paired-samples *t*-test, and was found to be 0.65, equivalent to a medium effect size. Corresponding effect sizes for the three facets were 0.50 for *commitment*, 0.43 for *control* and 0.43 for *challenge*, equivalent to medium effect sizes. Two independent sample *t*-tests revealed no significant differences in change scores on DRS-15-R for patients in remission vs. patients not in remission post-treatment ($t(33) = 0.12, p = 0.91$, nor at follow-up ($t(33) = 0.25, p = 0.81$). Change in resiliency was not significantly related to remission status post-treatment or at follow-up.

DISCUSSION

The current study investigated resiliency in patients diagnosed with OCD. The main objectives of this study were to investigate differences in resiliency between OCD patients and two reference groups, examining the association between resiliency and OCD symptoms before and after going through a concentrated 4-day treatment, and finally to examine changes in resiliency scores after completing concentrated exposure therapy.

Our results revealed that OCD patients scored significantly lower on the Dispositional Resilience Scale compared to university students and military soldiers both pre- and post-treatment. The largest difference was found for the *commitment* facet, a facet intended to measure engagement in tasks and sense of purpose. The lower scores on resiliency in the OCD group might indicate that higher resiliency works as a buffer against stress and psychopathology in general. In this sense, the fact that OCD patients still scored significantly lower on the DRS-15-R post-treatment than the reference groups could indicate a vulnerability for relapse. On the other hand, it is possible that the disorder itself weakens the patients' resiliency. For example, OCD patients might have less sense of control, might view changes as overwhelming and have a less sense of purpose because of their OCD.

We found no relation between pre-treatment scores for OCD symptom severity and resiliency. Nor was there a significant relationship between Y-BOCS scores post-treatment and DRS-15-R post-treatment ($r = -0.35, p = 0.05$). These results seemingly give little support to the hypothesis that lower resiliency scores in the OCD group are the result of their disease. This finding also

contrasts previous studies in non-clinical groups by Hjemdal *et al.* (2011) and Sun *et al.* (2014), showing a relation between OCD symptoms and resiliency. On the other hand, comorbidity was found to be negatively related to resiliency scores. Consequently, the hypothesis that resiliency acts as a buffer against stress and psychopathology in general seems a more likely hypothesis. However, there was a restriction in range in Y-BOCS scores pre-treatment, as all patients displayed high scores before initiating treatment, prompting caution in interpreting the results.

Pre-treatment resiliency scores were neither related to OCD symptom severity pre-treatment nor remission status at post-treatment. Resiliency was weakly related to follow-up remission status (odds ratio of 1.11) and weakly related to OCD symptom severity at follow-up. This implies that patients' initial resiliency does not hinder nor facilitate treatment effects to a great extent. However, considering its relation to follow-up status, resiliency might play a small role in maintaining change achieved during treatment, for instance through increasing homework compliance (which is completed after the 4 day treatment) or acting as a buffer preventing relapse. The latter might be explained by better stress management in patients with higher resiliency, as indicated by research on the relation between stress coping and resiliency (Eschleman *et al.*, 2010). Likewise, a study of resilience in PTSD patients suggested that resilience might affect cognitive styles related to optimism and self-efficacy and hence protect against psychopathology (Davidson *et al.*, 2012).

While resiliency is traditionally viewed as a reasonably stable personality characteristic (Bartone, 2007; Windle, Bennett & Noyes, 2011), we found resiliency scores to improve significantly following treatment. There was an average difference of three points before and after treatment, equaling a difference of 0.65 Cohen's *d*. One explanation for this finding could be that patients learn something during treatment that enables increased resiliency. On the other hand, in line with our previously reported results, comorbid diseases (e.g., depression and anxiety) could make patients less resilient, and if anxiety and depression lifts following treatment, patients' resiliency scores might improve. This adds further evidence in favor of the hypothesis that resilience is more related to psychopathology and stress in general, and less to OCD specifically. At the same time, one should be careful to over-generalize this finding as this analysis was conducted with a moderate sample size.

Strengths and limitations

One shortcoming of the current study is the small proportion of patients with both pre- and post-treatment measures of resiliency ($n = 33$). Future studies should include more participants with repeated measures of resiliency. Another limitation concerns the comparison groups. There was an uneven distribution of age and gender in the three compared groups. Whereas the military soldier group consisted almost exclusively of men, the student sample and the OCD sample consisted mostly of women. Our results, however, revealed no gender differences in DRS-15-R scores, and no significant difference in resiliency scores between the male dominant soldier group and the female dominant student group. As our results revealed a significant relation between age and resiliency, the age difference between the younger comparison

groups and the older OCD group presents a limitation considering interpretation of our findings. However, the correlation between age and resilience in the current sample was weak. Also, the comparison groups were not screened for psychopathology. This leads to the next limitation; the lack of a comparison group with psychiatric patients. We do not know whether our results are unique for OCD patients. Previous studies have linked lower resilience scores to the course of treatment outcome in PTSD and depression (Camardese *et al.*, 2007; Davidson *et al.*, 2012). Our results indicate a link between comorbid anxiety and depression and resiliency. This is in line with research linking resilience to harm avoidance, persistence and anxiety disorders in general (Cloninger *et al.*, 2012; Eley *et al.*, 2013; Ettelt *et al.*, 2008). Future studies should look into whether low resiliency could be a transdiagnostic factor in psychopathology. It might also be that other measures of resilience could be better at capturing resiliency in psychiatric populations, as DRS-15-R originally was designed for measuring resiliency in military populations. Hence, we cannot conclude whether our results are specific for OCD or whether the results would be the same for other psychiatric disorders. As discussed above, it could be the case of a general vulnerability. However, to our knowledge, this is the first study to use DRS-15-R in a clinical population of patients with a psychiatric disorder. Future research should investigate this further in other samples. The same goes for measures of OCD. In our study we measured OCD with a state measure of OCD (the Y-BOCS) rather than a trait-measure of anxiety. One can hypothesize that results would have been different with trait- rather than state-measures. Moreover, it is unknown whether the change in DRS-15-R scores from pre- to post-treatment reflects a fundamental trait change. Another limitation concerns the restriction of range in OCD scores. The fact that all OCD patients score high on the Y-BOCS before treatment might affect correlations between Y-BOCS and DRS-15-R. Furthermore, the weak correlation between the three subscales on the DRS-15-R, presents a next limitation, making it hard to interpret total DRS-15-R scores. This is in line with criticism of the resiliency construct, which claims that resiliency should be considered three separate phenomena rather than a unitary construct (Hull, Van Treuren & Virnelli, 1987). However, there is also evidence in favor of viewing resiliency as a unitary general dimension (Hystad *et al.*, 2010). Another shortcoming of our study is the lack of monitoring of homework compliance. As mentioned above, hardiness might contribute to relapse-prevention. Hence, it would be interesting to investigate whether hardiness (for instance the commitment facet) could be related to homework engagement. A final limitation is the urge of patients to discontinue use of anxiolytics. This was not formally monitored and might have led to symptom increase prior to treatment, representing a possible confounding variable.

One of the strengths of this study is the use of two different reference groups to compare measures of resiliency in OCD patients with populations that have already been studied and described in the literature. A second strength is the use of the cET treatment format which offers solid treatment outcome, presumably reducing the influence of several external factors, such as time effects, therapist competency and life events through offering the treatment over four consecutive days and thorough

therapist training. It is also assumed the format yields high ecological validity as all OCD patients in the current catchment area are referred to the clinic, which is part of the ordinary public health service.

Conclusion and implications

The results show that patients with a diagnosis of OCD reported lower resiliency scores than students and military soldiers, but resiliency was unrelated to OCD symptoms pre- and post-treatment. The study further revealed a weak relationship between resiliency and remission at follow-up. However, our results indicate that patients' initial score on the DRS-15-R does not hinder treatment effects to a great extent in this ERP treatment format. We recommend future research to investigate resiliency in other patient groups, and to investigate resiliency in other treatment formats for OCD to investigate whether the reported results are specific to our patient group and/or treatment format or could be generalized to other settings and samples. We also recommend future research to further look into the possibility of resiliency changing as a result of psychological treatment. Our results indicated this could be the case, albeit in a small subsample in the current study. Longitudinal studies are needed in order to investigate the development of resiliency and psychopathology to find out whether one might be a result of the other, or whether the development of the two is interlinked. Furthermore, research should aim at identifying treatment options for patients with poorer treatment response.

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Is sensory processing sensitivity related to treatment outcome in concentrated exposure and response prevention treatment for obsessive-compulsive disorder?

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ABSTRACT

It has been debated whether concentrated exposure and response prevention (ERP) is too difficult to tolerate for some patients. This report therefore uses quality assurance data looking into whether sensory processing sensitivity (SPS) affects treatment outcome among patients with OCD. SPS is a personality trait regarding heightened levels of emotional reactivity and deeper cognitive processing of emotional stimuli. Patients received concentrated exposure treatment for obsessive-compulsive disorder (OCD). They were assessed with one of the most widely used questionnaires for measuring SPS, the Highly Sensitive Person Scale (HSPS). Analyses tested whether HSPS scores at pre-treatment affected treatment outcome, and if sensitivity changed from pre- to post-treatment. Results revealed there was no significant relation between sensitivity and treatment outcome after controlling for pre-treatment levels of OCD, depression, and anxiety. HSPS scores were significantly reduced after treatment ($d = 1.22$). This indicates that concentrated ERP is suitable also for patients scoring high on HSPS, and the main conclusion is that patients' sensitivity does not hinder treatment response.

1. Introduction

Patients suffering from obsessive-compulsive disorder (OCD) are disturbed by intrusive and anxiety provoking thoughts or images (obsessions), which they try to control or neutralize using behaviors or rituals (compulsions; American Psychiatric Association, 2013). The disorder is highly debilitating, and until Victor Meyer in 1966 introduced exposure and response prevention (ERP) treatment, OCD was associated with poor treatment outcomes. A large number of trials have confirmed that ERP combined with other cognitive behavioural therapy (CBT) is the recommended psychological treatment for OCD. The treatment approach can be delivered in a number of different formats, e.g. individually or to groups of patients, and widespread or concentrated. Meta-analyses have shown that about 50–70% of the patients can expect significant clinical change (Skapinakis et al., 2016; Öst, Havnen, Hansen, & Kvale, 2015; Öst, Riise, Wergeland, Hansen, &

Kvale, 2016). However, given a refusal rate of 15% and a dropout rate of 15% (Öst et al., 2015), there is clearly a need for improving the CBT/ERP approaches in order to help more patients.

The Bergen 4-day treatment (B4DT) format for OCD seems to represent such an approach. The format is firmly rooted in evidence-based treatment with CBT, ERP, modelling and cognitive restructuring as main ingredients. However, the B4DT is not individual treatment or group treatment. It is delivered to 3–6 patients by the same number of therapists, and has thus been labelled “individual treatment in a group setting”. The treatment is delivered during four consecutive days, where the two middle days can be seen as one prolonged one-session treatment. The last day consists of preparation for how to integrate the change into normal everyday living. The B4DT has low refusal and dropout rates (e.g. Launes et al., 2019). There might be a number of reasons for this. One possible reason is that patients only have to take one week off from studies or work to complete the treatment. Also, the

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format offers both prolonged and individually tailored sessions with a single therapist, combined with the group format where they can observe, support, and be supported by other patients going through basically the same process of change. In addition, since the format is concentrated, the patients see the results more quickly than in other treatment formats.

The B4DT is offered within the public health care system in Norway. It uses outcome assessment as an integrated part. Several reports have demonstrated that nearly 90% of the patients are responding post-treatment and 70% are recovered four years later (Hansen et al., 2018a, 2018b). A reduction of 35% or more on Y-BOCS was needed to be classified as a treatment responder, and a post-treatment score of 12 points or less to be considered recovered ((Mataix-Cols et al., 2016). These rates also include the patients who refuse as well as the number of patients that drop out during the treatment. The results have been replicated to new samples of patients as well as to new clinics (Kvale et al., 2018; Launes et al., 2019). Recently a randomized controlled trial showed the same results when comparing the B4DT to self-help and waiting list (Launes et al., submitted).

Quality assessment and monitoring of treatment outcome is an integrated part of the B4DT. This allows for monitoring change and adapting treatment for the individual patient. It can also summarize treatment outcome for certain groups of patients who might need extra interventions after treatment. Previous reports have shown that severity of the disorder, number of comorbid disorders, number of previous treatments, or the patient's hardiness, do not influence treatment outcome (Havnen, Hansen, Ost, & Kvale, 2017; Holm et al., 2019). These reports mirror studies that have tried to identify predictors in CBT/ERP for OCD, as it has been difficult to identify reliable predictors (Keeley, Storch, Merlo, & Geffken, 2008; Knopp, Knowles, Bee, Lovell, & Bower, 2013).

One potential predictor that has not been investigated is sensory processing sensitivity (SPS). SPS is proposed as a personality trait by Aron and Aron (1997), and involve that highly sensitive individuals perceives and processes external and internal stimuli more intensely. Highly sensitive individuals are found to report stronger emotional reactivity and behavioural inhibition (Aron, 2013; Aron, Aron, & Jagiellowicz, 2012). Being highly sensitive has been proposed to involve both an ability to detect subtle stimuli and a tendency to be overstimulated by external stimuli (Aron & Aron, 1997; Benham, 2006). This would imply that highly sensitive individuals with OCD would be expected to experience more distress related to exposure to anxiety provoking stimuli and to a higher degree seek to avoid these stimuli.

One common scale for measuring SPS is the Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997) which consists of items such as "Are you easily overwhelmed by strong sensory input?", "Do you try hard to avoid making mistakes or forgetting things?", and "Do you make it high priority to arrange your life to avoid upsetting or overwhelming situations?" SPS has been associated with OCD both in children and in adults. In a case series study of six children diagnosed with OCD, Hazen et al. (2008) found that each child displayed particular sensitivity to specific ordinary sensory stimuli such as smells, textures, skin sensations and sounds (similar to what is measured with the HSPS). The children experienced distress and performed ritualistic behavior to relieve these sensations. The authors argue this is different from traditional obsessions, such as fear of contamination. They argue that, at least for a subset of patients with OCD, abnormalities in sensory processing and integration might play an important role in their OCD.

Similarly, Dar, et al., (2012) found a link between hypersensitivity to oral and tactile stimuli and ritualistic behavior in 61 children. Studies of adults have also found a significant correlation between sensitivity and OCD-symptoms, both in students (sensitivity measured with the German version of the HSPS, $r = 0.52$; Konrad & Herzberg, 2017) and in a large sample of adults (sensitivity measured with Oral and Tactile Hypersensitivity Scale, $r = 0.34$; Dar, et al., 2012). In sum, there are already some studies indicating a link between OCD and SPS, but

none of these have investigated the relation between HSPS and OCD in a clinical setting.

It is important to monitor treatment outcome for patients with OCD in order to decide whether special adaptations are needed. CBT and ERP for OCD provokes discomfort and anxiety, and persons suffering from high sensitivity are commonly recommended to protect themselves from sensory stimulation. However, the idea that treatment is experienced as too aversive for the client has largely been based on anecdotal evidence (Lee & Rees, 2011). Even though exposure therapy is an effective treatment for anxiety disorders, many clinicians do not routinely offer it to patients, and this might be a result of clinicians' attitudes towards exposure therapy (Deacon et al., 2013; Olatunji, Deacon, & Abramowitz, 2009). Therapists' concern about whether patients tolerate the (temporary) distress caused by exposure therapy has been proposed as one of the main objections against exposure therapy. This was supported by a study by Deacon et al. (2013) who found a link between scores on the TBES (Therapist Beliefs about Exposure Scale; a scale that taps items such as fear that the clients will have difficulty tolerating the distress caused by exposure therapy), and cautious delivery of exposure treatment in hypothetical OCD case work.

One related study found that patients scoring high on Anxiety Sensitivity displayed higher levels of OCD symptoms after CBT treatment than low-scoring patients (Blakey, Abramowitz, Reuman, Leonard, & Riemann, 2017). Anxiety Sensitivity is the fear of the bodily sensation of fear arousal. As sensory processing sensitivity is supposed to involve a general heightened sensitivity, one might expect similar results when investigating SPS in treatment for OCD. On the other hand, Aron and Aron (1997) claim that higher scores on sensitivity measures implies deeper cognitive processing of emotional material. Hence, patients scoring high on SPS might actually benefit more from treatment than their less sensitive peers.

Given the proposed link between OCD and sensitivity, it is important to investigate whether sensitivity might predict treatment outcome in ERP for OCD. Also, even though sensitivity is proposed as a trait (Aron & Aron, 1997), there is a lack of research on potential change over time. One study of the HSPS found a correlation of .88 on test-retest reliability after 1–3 months (Konrad & Herzberg, 2017), but apart from this study there are few accounts as to how HSPS scores changes over time.

In the current report we summarize clinical outcome for patients with OCD who have different degrees of sensory processing sensitivity. We aimed to investigate the correlation between SPS and OCD symptoms, and whether SPS was related to treatment outcome. As previous studies have found some evidence of a link between sensitivity and OCD symptoms, we expected a weak to moderate relationship between OCD and SPS. As the current treatment provokes temporary discomfort and anxiety for the patients, and patients scoring high on SPS might withdraw from such overwhelming situations, one might presume this intensive exposure treatment is too challenging for patients scoring high on the sensitivity trait. Therefore, it was an open question as to whether sensitivity would be related to treatment outcome.

2. Method

2.1. Participants and procedure

Patients with OCD in Norway have the right to receive evidence based psychological treatment delivered by specialist OCD-teams (Kvale & Hansen, 2014). The OCD team at Haukeland University hospital treated the OCD patients in the current paper. As an integrated part of the treatment, patients in the clinic are screened with questionnaires for a medical quality registry (consented by the Norwegian Data Protection Official (NSD/Personvernombudet), May 5th 2012), and data for the current paper were drawn from this registry. A measure of sensitivity was part of this procedure. Patients in the OCD-sample were diagnosed and screened for comorbid diagnoses using the MINI

Table 1
Descriptive statistics.

	M	SD	Min.	Max.
Pre-treatment				
HSPS	4.08	0.98	1.56	6.00
Y-BOCS	26.00	4.71	16.00	36.00
OCI-R	26.37	11.78	3.00	55.00
GAD-7	12.88	5.20	0.00	21.00
PHQ-9	12.50	5.97	1.00	24.00
Post-treatment				
HSPS	3.58	0.98	1.44	5.81
Y-BOCS	10.66	5.19	3.00	29.00
OCI-R	13.02	8.78	0.00	42.00
GAD-7	9.14	4.64	0.00	21.00
PHQ-9	9.07	5.71	0.00	25.00
Follow-up				
Y-BOCS	11.20	5.96	1.00	29.00
OCI-R	14.58	10.27	0.00	42.00
Age	30.31	11.06	18.00	69.00

Note: HSPS = Highly Sensitive Person Scale (mean item scores). OCI-R = Obsessive-compulsive inventory – revised. GAD-7 = Generalized Anxiety Disorder 7-item scale. PHQ-9 = Patient Health Questionnaire.

interview (Sheehan et al., 1998). A sample of 104 patients with OCD (73.1% female, average age 30.31 years) was included in the comparison analyses and the analyses investigating association between baseline sensitivity and treatment outcome. Out of these, 38 reported to be working, 29 were students, 11 were on a sick leave, six were out of work, five lived of disability benefits, two were homemakers, one was a pensioner, and 11 had other arrangements, such as sheltered workshops. Comorbid diagnoses were as follows; 29 patients with depression, 24 with general anxiety disorder, 12 with panic disorder, seven with social phobia, three with eating disorders, one with bipolar disorder, one with PTSD, and one with hypochondria. Table 1 displays a summary of the sample's scores on the different measures.

Patients received the Bergen concentrated 4-day exposure treatment (B4DT). The treatment consists of a four-day program where individually tailored treatment, consisting mainly of exposure and response prevention, is delivered in a group setting with a patient: therapist ratio of 1:1. This is followed by a three-week period of self-exposure tasks. Group treatment is not offered to patients who are non-fluent in Norwegian language, patients with ongoing psychosis, suicidal intention or drug abuse. All patients are recommended to discontinue use of anxiolytics before treatment starts. The treatment is thoroughly described in Havnen, Hansen, Öst, and Kvale (2014; 2017).

2.2. Measures

OCD. Symptoms of OCD were measured using the Obsessive-Compulsive Inventory – Revised (OCI-R; Foa et al., 2002), a self-report measure of OCD-symptoms where the patient rates symptoms on a scale from 0 (“not at all”) to 4 (“extremely”), and higher scores indicate more severe symptoms. Psychometric properties for the OCI-R are good (Foa et al., 2002; Solem, Hjemdal, Vogel, & Stiles, 2010).

Symptoms of OCD were also measured using the Y-BOCS interview (Yale-Brown Obsessive Compulsive Scale; Goodman et al., 1989a; Goodman et al., 1989b), which consists of 10 items considering obsessions and compulsions rated on a scale from 0 (“none”) to 4 (“extreme”). Total scores between 0–7 are considered subclinical, 8–15 as mild severity, 16–23 as moderate, 24–31 as severe and 32–40 as extreme. Trained clinicians administered the Y-BOCS interviews pre- and post-treatment and at 3- and 6-month follow-up. Post- and follow-up interviews were conducted by an independent assessor by phone, while pre-treatment interviews were conducted by a therapist at the local

clinic. Psychometric properties of the Y-BOCS are good (Goodman et al., 1989a, 1989b).

Sensory processing sensitivity. Sensitivity was measured using the Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997) pre-treatment for all 104 patients. Eighty-three patients also answered the HSPS post-treatment. This self-report questionnaire consists of 27 items that are rated on a scale ranging from 1 (“not at all”) to 7 (“extremely”). Mean item scores on the HSPS in unselected student samples usually range from 2.8 to 4.3 with SDs ranging from 0.54 to 0.74 (Aron & Aron, 1997; Benham, 2006, Konrad & Herzberg, 2017). We believe it is useful to use the HSP scale, as this is one of the most widely used measures of sensitivity, and studies report good reliability and validity for the scale (Aron & Aron, 1997; Smolewska, McCabe, & Woody, 2006).

Depression. Symptoms of depression were measured using the Patient Health Questionnaire PHQ-9; (Spitzer, Kroenke, & Williams, 1999). Psychometric properties for the PHQ-9 are adequate both in a medical setting (Gilbody, Richards, Braley, & Hewitt, 2007) and in the general population (Martin, Rief, Klaiberg, & Braehler, 2006). A score of 5–9 indicates mild symptoms; 10–19 indicate moderate symptoms, while 20–27 points indicate severe depression.

Anxiety. Symptoms of general anxiety was measured using the Generalized Anxiety Disorder 7-item scale GAD-7; (Spitzer, Kroenke, Williams, & Löwe, 2006). The GAD-7 has good reliability and validity (Löwe et al., 2008). A score on the GAD-7 of 5–9 indicates mild anxiety; 10–14 indicate moderate anxiety, while 15–21 points indicate severe anxiety.

2.3. Statistical analyses

Partial correlations investigated the relation between sensitivity (measured with HSPS), OCD (measured with OCI-R and Y-BOCS), anxiety (measured with GAD-7) and depression (measured with PHQ-9), controlling for symptoms of depression and anxiety. Two hierarchical linear regression analyses investigated whether HSPS pre-treatment predicted treatment outcome. These were conducted using Y-BOCS and OCI-R at follow-up as outcome variables. In the analyses, we controlled for pre-treatment levels of OCD, depression and anxiety. We then repeated the two hierarchical regression analyses, this time comparing the 25% of patients with highest scorers on the HSPS with the remaining 75%, as Aron and Aron (1997) suggests sensitive individuals make up about 25% in the general population. Finally, two repeated measures ANOVAs investigated whether sensitivity changed from pre-treatment to post-treatment and from post-treatment to follow-up.

Visual inspection of histograms and formal testing with Shapiro-Wilk tests of normality, indicated that neither Y-BOCS follow-up nor OCI-R follow up scores were normally distributed. We removed four outliers with scores above 25 on the Y-BOCS follow-up to correct for this (Shapiro Wilk was then .07). For the OCI-R a square root transformation of data resulted in normally distributed data (Shapiro Wilk = .90). All correlations between predictor variables were less than 0.7, and none of the Variance Inflation Factors were above 2, indicating little multicollinearity. Visual inspection of PP-plots and scatterplots, as well as calculation of standard residuals and Cook's distance indicated linear relationship between independent and dependent variables in both cases. Finally, visual inspection of scatter plots showed rectangular patterns, indicating homoscedasticity. In sum, no violations of assumptions for regression analyses were found after correcting for normality. Missing data were only replaced for three patients, each missing only one item on the HSPS (i.e. 0.001% of the total items). We used individual mean imputation for these three scores, which has been found to be a robust method (e.g. Shrive, Stuart, Quan, & Ghali, 2006).

Table 2

Correlations and partial correlations between measures of OCD, depression and anxiety, and HSPS scores in the OCD group.

	N	Correlation (r) with HSPS pre-treatment	Partial correlation with HSPS – controlling for PHQ-9 and GAD-7
Pre-treatment			
Y-BOCS	102	.11	-.03
OCI-R	73	.24*	.13
OCI-R Washing	73	.15	.08
OCI-R Obsessing	73	.31**	.22
OCI-R Hoarding	73	.20	.16
OCI-R Ordering	73	.11	-.01
OCI-R Checking	73	-.07	-.11
OCI-R	73	.15	.12
Neutralizing			
PHQ-9	103	.34**	.09
GAD-7	103	.40**	.25*
Post-treatment			
Y-BOCS	97	.24*	.20
OCI-R	97	.10	.00
Follow-up			
Y-BOCS	95	.23*	.15
OCI-R	93	.21*	.11

Note: HSPS = Highly Sensitive Person Scale. OCI-R = Obsessive-compulsive inventory – revised. GAD-7 = Generalized Anxiety Disorder 7-item scale. PHQ-9 = Patient Health Questionnaire.

*Correlation is significant at the 0.05 level (2-tailed).

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

3. Results

3.1. Sensory processing sensitivity as a predictor of OCD treatment outcome

To investigate the effect of HSPS on treatment outcome we used the sample of 104 patients as described above whom had all undergone the 4-day treatment. As in previously reported work, the treatment was found to be effective for the sample, with 70.1% of the patients being classified in remission (i.e. Y-BOCS \leq 12) post-treatment, and 67.4% being in remission at follow-up. Mean Y-BOCS score was 26.0 pre-treatment ($n = 102$, $SD = 4.72$), 10.66 post-treatment ($n = 97$, $SD = 5.19$) and 11.20 at follow-up ($n = 95$, $SD = 5.96$).

As can be seen in Table 2, there was a weak relation between HSPS and OCI-R scores pre-treatment and at follow-up, and between HSPS and Y-BOCS scores post-treatment and at follow-up. HSPS scores were also weakly related to depression (measured with PHQ-9) and anxiety (measured with GAD-7). However, when controlling for depression and anxiety, there were no significant relations between OCD scores (measured with Y-BOCS and OCI-R) and HSPS. Hence, we found no unique relation between OCD and HSPS scores in our sample. The strongest correlation was found between sensitivity and symptoms of generalized anxiety, which was also significant when controlling for symptoms of depression.

Results from the Y-BOCS checklist suggested that patients who reported obsessions of religion, symmetry/exactness, somatic, and miscellaneous, as well as miscellaneous compulsions had higher HSPS scores than the patients without such obsessions or compulsions ($p < .05$). The remaining categories of obsessions and compulsions showed non-significant differences, while the miscellaneous obsessions category showed the largest difference ($d = 0.97$) in HSPS scores.

Two hierarchical linear regression analyses investigated the relation between HSPS pre-treatment and OCD-scores at follow-up. We conducted the analyses twice; once using scores on self-report forms (OCI-R) and once using Y-BOCS interview scores as dependent variables. In both cases, we controlled for pre-treatment scores on OCD (measured with the relevant instrument – OCI-R and Y-BOCS respectively), depression (measured with PHQ-9) and anxiety (measured with GAD-7). The model was not significantly predicting Y-BOCS scores at follow-up,

Table 3

Hierarchical regression analyses investigating the relation between HSPS pre-treatment and treatment outcome for OCD sample.

Dependent variable	Step	ΔR^2 for step	Predictor variable	β	t	Sig
Y-BOCS follow-up	1	.04	Y-BOCS pre	.20	1.91	.06
	2	.04	Y-BOCS pre	.14	1.27	.21
			PHQ-9	-.03	-1.21	.83
			GAD-7	.23	1.57	.20
	3	.01	Y-BOCS pre	.14	1.29	.20
			PHQ-9	-.04	-.24	.81
OCI-R follow-up	1	.26	GAD-7	.20	1.29	.20
	2	.05	HSPS	.09	.77	.44
			OCI-R pre	.51	4.97	.00*
	3	.00	OCI-R pre	.42	3.87	.00*
			PHQ-9	.09	.62	.54
			GAD-7	.18	1.35	.18
OCI-R follow-up	1	.26	OCI-R pre	.51	4.97	.00*
	2	.05	OCI-R pre	.42	3.87	.00*
			PHQ-9	.09	.62	.54
			GAD-7	.18	1.31	.20
		HSPS	.00	.03	.98	

Note: Y-BOCS = Yale-Brown Obsessive Compulsive Scale. GAD-7 = Generalized Anxiety Disorder 7-item scale. PHQ-9 = Patient Health Questionnaire. HSPS = Highly Sensitive Person Scale. OCI-R = Obsessive-compulsive inventory – revised.

*Significant relations are displayed in bold.

$F(4, 83) = 2.03$, $p = .10$, but significantly predicted OCI-R at follow-up, $F(4, 68) = 7.65$, $p < .001$. Results from these analyses are presented in Table 3. HSPS was not a significant predictor of follow-up scores in either of the analyses. The regression was also repeated whilst including the four outliers. The results did not change in terms of significance as a consequence.

We then repeated the two hierarchical regression analyses, only this time we compared the top 25% highest scorers on the HSPS with the remaining 75%. The results were almost identical with the two first analyses. The model significantly predicted OCI-R at follow-up, $F(4, 57) = 6.51$, $p < .001$, but not Y-BOCS scores at follow-up, $F(4, 83) = 2.29$, $p = .07$. HSPS was not a significant predictor of follow-up status in either of the analyses ($p = .45$ and $.22$ for OCI-R and Y-BOCS scores at follow-up respectively).

3.2. Do HSPS scores change with treatment?

A repeated measures ANOVA revealed that sensitivity changed significantly from pre- to post-treatment; $F(1, 82) = 30.95$, $p < .001$. Average mean item score on the HSPS dropped from 4.08 ($SD = 0.98$) points before treatment to 3.58 ($SD = 0.98$) post-treatment. Partial eta-squared was .27 (equivalent to a Cohen's d of 1.22), indicating a large effect size. There was no significant change in sensitivity scores from post-treatment to follow-up, $F(1, 79) = 1.79$, $p = .19$.

4. Discussion

This paper reported on whether there is a relationship between sensory processing sensitivity (SPS) and treatment outcome for patients with OCD, as it has been debated whether intensive exposure based therapy is too difficult to tolerate for this group. The results indicated that there was a weak correlation between HSPS and OCD symptoms, but the relation was no longer significant when controlling for anxiety and depression. We found no significant relation between sensitivity and treatment outcome at follow-up. Finally, we found that HSPS scores were significantly reduced after completing treatment (Cohen's d of 1.22), indicating a substantial change. This change seemed to last, as there was no significant difference between post and follow-up scores on the HSPS.

Sensitivity was significantly related to OCD symptoms both pre- and

post-treatment in the OCD-group. Most notably, the obsessing subscale was the only subscale in the OCI-R related to sensitivity. This subscale taps into intrusive thoughts and controllability of these, and the relation might indicate a link between sensitivity and obsessive thoughts. However, anxiety and depression scores were also significantly related to sensitivity, with general anxiety showing the strongest correlation with HSPS scores. Running a partial correlation controlling for anxiety and depression, OCD scores were no longer significantly related to sensitivity. Taken together, this might indicate a more general relation between psychological illness and sensitivity rather than a specific relation between OCD and sensitivity. The weak relation between OCD scores and HSPS might reflect the heightened level of anxiety and depression in our patients with OCD rather than an actual connection between OCD and sensitivity.

Our results revealed no significant relation between sensitivity and treatment outcome. This indicates that patients high on SPS profit from treatment to the same degree as their less sensitive peers. We argue this is an important finding as many therapists might be reluctant to offer exposure therapy to “sensitive” patients (Deacon et al., 2013; Lee & Rees, 2011; Olatunji et al., 2009). Our results indicate that therapists should not be afraid to offer concentrated ERP treatment based on SPS scores. Our results also differ from the results by Blakey et al. (2017) who found a relation between Anxiety Sensitivity and treatment outcome. This indicates that sensory processing sensitivity might differ from anxiety sensitivity in its relation to OCD and treatment outcome.

Mean item score on HSPS was 4.08 for the OCD-group. The largest difference between our OCD sample and other previously reported samples was to the large group of German adults from the general population reported by Konrad and Herzberg (2017; mean item score = 2.75, $SD = 0.62^1$) with a Cohens d of 1.62, followed by the sample of US undergraduates reported by Benham (2006; $d = 1.23$, $M = 3.11$, $SD = 0.54$). Our results were not very different from the sample of US undergraduates reported by Aron and Aron (1997; $d = 0.35$, $M = 4.38$, $SD = 0.74$). Our results are also quite similar to the study on Norwegian students by Grimen and Diseth (2016) who found an average score on HSPS of 4.05. However, their paper does not provide SD s, and therefore it was not possible to calculate the difference. It might be the case that Norwegians in general report themselves to be more sensitive than people from other nations. Future studies should look into possible differences between countries in sensitivity scores. In sum, our results indicate patients with OCD are not particularly sensitive compared with the general population in Norway.

Finally, our results revealed that patients scored lower on the HSPS after completing treatment than before treatment, and this change remained stable at follow-up. The change was considerable, with a large effect size. This might indicate that sensitivity scores are somewhat related to psychological health status, supported by our suggested link between general symptoms of psychological illness and sensitivity. This is also in line with previous studies that suggest personality traits such as harm avoidance and neuroticism might change through the course of treatment (Hedman et al., 2014; Lyoo, Yoon, Kang, & Kwon, 2003). It could suggest that results from the HSPS reflect states rather than trait.

Scores on HSPS were significantly related to scores on anxiety and depression pre-treatment, the change in sensitivity scores could be related to the drop in depressive and anxiety symptoms. However, post-hoc tests revealed no significant relation between change in scores on sensitivity and changes in scores on anxiety ($n = 83$, $r = 0.14$, $p = .21$) or change in depression scores ($n = 83$, $r = 0.16$, $p = .16$). The results might also indicate that patients learn something during treatment that makes them tougher or a bit less sensitive, similar to our previous reports of resilience scores increasing in patients with OCD after completing the Bergen 4-day treatment (Holm et al., 2019). HSPS scores

might decrease after exposure treatment because the primary focus of exposure therapy is learning to tolerate unpleasant sensory experiences, both internal and external. Other factors could also explain the effect, for instance some degree of pleasing behavior. Future research should investigate this effect further in patients with other disorders.

4.1. Strengths and limitations

This is a report from a public health care clinic, summarizing the clinical outcome for patients with different degrees of sensitivity. Thus, there is no rigorous research design or selection of patients. This could also be a strength because one can argue that the ecological validity is high. However, there is a need for studies to replicate the findings and investigate the generalizability of the results between samples, cultures and treatment formats. As the results indicated there might be a general link between symptoms of psychological illness and sensitivity, it would be interesting if future studies included patients with other psychological disorders. In this paper, we have not investigated whether patients with SPS seek help more or less often, and whether general practitioners are affected by this when they decide whether to refer patients to the specialist health care or not. This might be an interesting topic for future studies.

Future studies might also be able to investigate whether the patients' sensitivity affects adherence to exposure therapy and homework or therapists' eagerness to deliver exposure therapy. However, the concentrated ERP treatment employed in the current paper is individual treatment delivered in a group setting over four consecutive days, with a 1:1 ratio between patients and therapists. The actual exposure treatment was delivered during the two middle days. The format therefore enables direct observation of therapists and group leader and direct monitoring of therapy. There is appointed a “second-in-command” for all treatment groups, who is responsible for ensuring that the protocol is followed, and that any possible deviances are reported to the group leader and dealt with immediately. All patients completed all parts of treatment. Furthermore, as our results are based on the B4DT for OCD, we cannot draw conclusions about other treatment formats and other anxiety disorders.

One potential drawback is the use of the artificial cut-off used for 25% highest scorers on the HSPS. Another potential drawback is that we did not measure “not just right experiences” for the patients. As described in the literature, there might be a relation between “not just right experiences”, which is considered to be a feature of OCD (e.g. Coles, Frost, Heimberg, & Rhéaume, 2003), and specific sensory discomfort (Summers, Fitch, & Coughle, 2014) as well as sensory processing difficulties (Hellriegel, Barber, Wikramanayake, Fineberg, & Mandy, 2017). Hence, as we describe HSPS scores to decrease with treatment, it is impossible to tell whether this could be a result of some common factor decreasing during treatment. As there is very limited research on this area of overlap, it would be interesting if future studies could grant this topic a thorough look.

In this paper, we were not able to identify relevant pre-treatment predictors of treatment outcome. This is in line with previous research on predictors of treatment outcome for OCD (Keeley et al., 2008; Knopp et al., 2013). However, a recent study found an advantage of machine learning methods over traditional regressions to identify predictors of treatment outcome for children with OCD (Lenhard et al., 2018). Therefore, it might be relevant for future studies to investigate sensitivity using different machine learning approaches to investigate the topic further. Previous studies have shown that the B4DT yields solid treatment outcome (Hansen et al., 2018a,b; Havnen et al., 2014; 2017; Kvale et al., 2018) and it can be argued that reducing treatment time to four consecutive days might reduce the effect of some external factors, such as significant life events and time effects. The thorough training of the therapists required in this format, and the fact that therapists can help each other out during the course of treatment might also help reduce therapist effects.

¹ Our calculations of mean item score and SD based on original scores reported in manuscript.

4.2. Conclusion and implications

Our results revealed no significant relation between sensitivity and treatment outcome. The patients scoring high on sensory sensitivity benefitted as much from the treatment as the other patients. The only significant predictor of treatment outcome at follow-up was baseline scores on OCD-symptoms. Based on our results we recommend clinicians to offer concentrated ERP treatment regardless of patients' score on SPS. Contrary to common beliefs (Deacon et al., 2013; Lee & Rees, 2011), patients rating themselves as more sensitive profited to the same degree as their less sensitive peers. Finally, we recommend research to look further into the possibility of sensitivity changing as a result of psychological treatment, as our results indicated this might be the case.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jocrd.2019.100486>.

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CLINICAL PSYCHOLOGY & NEUROPSYCHOLOGY | RESEARCH ARTICLE

Post-treatment predictors of follow-up status for obsessive-compulsive disorder treated with concentrated exposure therapy

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Abstract: Recommended psychological treatment for obsessive-compulsive disorder (OCD) is cognitive behavioral therapy (CBT) including exposure with response prevention (ERP). Previous studies have identified few consistent predictors of both short- and long-term treatment outcomes in CBT for OCD. The aim of the current study was to investigate the relation between the combined burden of three post-treatment predictors (subclinical symptoms of OCD, anxiety, and depression) and long-term treatment outcome. A total of 97 patients with a diagnosis of OCD from an outpatient clinic in Norway completed a concentrated four-day group treatment of ERP for OCD. Results revealed that patients in the high-risk group had 2.5 times the risk (odds ratio = 10.1) of having OCD at follow-up compared to patients in the low risk group. Pre-treatment levels of depression, anxiety and OCD were not significantly related to follow-up status. The results indicate an advantage of a combined post-treatment predictor model over single pre-treatment predictors. Furthermore, we argue that the intensive four-day treatment format provides a unique setting for investigating predictors of treatment outcome.

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The OCD-Team in Helse Bergen offers evidence based therapy to patients with OCD. The team integrates clinical practice and research and has published several papers about the four-day intensive treatment. The current paper investigates the treatment format further, investigating predictors of treatment outcome. A list of research publications can be found at <https://helse-bergen.no/ocd-teamet/publications>.

PUBLIC INTEREST STATEMENT

Obsessive-compulsive disorder (OCD) is a psychiatric disorder characterized by intrusive thoughts (obsessions) which provoke strong anxiety. Patients try to control anxiety with rituals (compulsions). Recommended psychological treatments for OCD are cognitive behavioral therapy and exposure therapy. However, about 30% of patients do not benefit fully from treatment. We set out to investigate whether subclinical levels of anxiety, depression, and OCD symptoms at the end of treatment could predict long term treatment outcome. Our study revealed that 72% of patients with no risk factors succeeded in the long run, while only 17% of the patients with all three risk factors succeeded. These results suggest that therapists should monitor these risk factors in order to avoid patients relapsing.

Subjects: Mental Health; Psychiatry & Clinical Psychology - Adult; Psychological Disorders - Adult; Obsessive-Compulsive Disorder in Adults

Keywords: obsessive compulsive disorder; predictors; exposure and response prevention; intensive treatment; anxiety; depression

1. Introduction

Cognitive behavior therapy (CBT) including exposure with response prevention (ERP) typically yields clinically significant change for 60–70% of the patients (Öst, Havnen, Hansen, & Kvale, 2015; Öst, Riise, Wergeland, Hansen, & Kvale, 2016; Skapinakis et al., 2016). Numerous studies have suggested a variety of predictors of treatment outcome in CBT and ERP for obsessive-compulsive disorder (OCD), with pre-treatment levels of depression, comorbid anxiety and OCD-severity among the most common. A review from 2008 suggests that severe depression pre-treatment, as opposed to mild or moderate depression, is related to treatment outcome (Keely, Storch, Merlo, & Geffken, 2008). However, the finding is not consistent (Knopp, Knowles, Bee, Lovell, & Bower, 2013; Olatunji, Davis, Powers, & Smits, 2013). In a review by Knopp et al. (2013), one third of the included studies found a significant relation between anxiety pre-treatment and treatment outcome, but 2/3 did not, so again findings diverge. In the same review one third of the included studies reported a significant relation between baseline OCD severity and treatment outcome (Knopp et al., 2013). Age and gender have also been found to be related to effect sizes in CBT for OCD (Öst et al., 2015), but not consistently (Olatunji et al., 2013).

In sum, the results are inconsistent or conflicting, and so far no consistent predictors for treatment response have been identified (Keely et al., 2008; Knopp et al., 2013). However, a study using post-treatment levels of OCD-symptoms as predictor for long-term treatment outcome shows promising results. This study indicated that patients with full remission of OCD had a success rate of 70%, whereas patients with partial remission had a success rate of merely 45% (Eisen et al., 2013). On the other hand, Eisen and colleagues (2013) did not investigate the combined effect of several predictors, and only about half of the participants (52%) received CBT. Post-treatment levels of symptoms have also been found to predict follow-up status in studies of depression and bipolar disorder (Judd et al., 2008; Kiosses & Alexopoulos, 2013). One possible explanation for the better predictive value of post-treatment score is that clinical aspects, such as anxiety and depression, are addressed directly or indirectly during treatment of OCD, and one could expect less change in such symptoms after treatment termination. In light of this, we propose that post-treatment variables should be better predictors of long term treatment outcome than pre-treatment predictors.

Previous research has been unable to pinpoint stable *single* predictors of treatment outcome. Research on resilience suggests a cumulative stress model, where elevated levels of stress increase the risk for onset and maintenance of psychological problems (Rutter, 2001). Symptoms of depression, anxiety and OCD have all been linked to increased levels of stress as well as functional impairment (Eisen et al., 2006; Mendlowicz & Stein, 2000; Pruessner, Hellhammer, Pruessner, & Lupien, 2003). Furthermore, even subthreshold levels of psychiatric symptoms have been linked to increased impairment (Eisen et al., 2013; Grabovich, Lu, Tang, Tu, & Lyness, 2010; Olsson et al., 1996). In line with this, the combined influence of several predictors should be stronger than the effects of single predictors.

Previous predictor studies have displayed several shortcomings. For instance different treatments have been offered in different predictor studies (CBT vs. SSRI; in-patients vs. out-patients etc.), making it difficult to compare findings. Furthermore, therapist competency is often not controlled for. In a newly developed treatment format (Havnen, Hansen, Haug, Prescott, & Kvale, 2013; Havnen, Hansen, Öst, & Kvale, 2014, 2017), CBT is delivered during four consecutive days, which dramatically reduces unwanted variability in predictor studies, such as extra-therapeutic factors (e.g. effects of time, life events, and therapist competency), through shortening the treatment time period and thorough therapist training (see closer description of the treatment format below). This approach

yields significant acute (one week post treatment) changes in approximately 80% of the patients, with 66% being classified as recovered at follow-up, and with practically no patients terminating the treatment prematurely (Havnen et al., 2013, 2014). The four-day format thus provides a unique opportunity to study long-term treatment response.

In the current study we wanted to investigate if a composite reflecting the combined effect of residual symptoms of OCD, anxiety and depression at post-treatment predicts long-term treatment outcome. The study was conducted with treatment-seeking patients from an ordinary specialist healthcare clinic which yields high ecological validity. We expected that even subclinical levels of these factors could represent vulnerability for worse outcome. We also expected that the combined power of all three predictors would be stronger than single predictors' individual effects in relation to OCD at follow-up because of the increased burden and possible functional impairment caused by them. The identification of strong predictors for treatment outcome is important because it can be used to guide individual tailoring of treatment, and to guide future search for consistent predictors of outcome. The study is unique in the sense that it uses an intensive group therapy of four days instead of a more traditional treatment format, the use of post-treatment predictors instead of pre-treatment predictors, and that it looks at several risk factors combined as opposed to looking at single predictors.

2. Method

2.1. Participants and procedure

The current study is part of a standard quality assurance procedure in an outpatient OCD clinic in Norway. The clinic is part of the ordinary specialist healthcare, where all OCD patients in a catchment area of about 400,000 inhabitants are referred to the OCD-clinic via their general practitioner and local psychiatric department. The patients are granted admission to the OCD-Team if their OCD is considered severe enough to need treatment. Using the Mini International Neuropsychiatric Interview (Sheehan et al., 1998), trained therapists at the OCD-Team assessed diagnostic status of the patients. Patients were offered treatment if they fulfilled the diagnostic criteria of OCD (American Psychiatric Association, 2000). The four-day treatment format was not offered if the patient was psychotic, suicidal, or had ongoing drug abuse. Furthermore, the patients had to be fluent in Norwegian. Patients were urged to discontinue any use of anxiolytics prior to treatment. The rationale for doing so was that patients should not use anxiolytics to regulate their anxiety while doing exposure treatment. A total of 32 treatment groups were offered between July 2012 and February 2016.

As treatment was delivered in a routine care clinic and patients had the right to be granted treatment within 12 weeks after referral, waiting-list was not an option. Patients were offered participation in the groups whenever there was an open slot. Due to seasonal variation in referrals, group size ranged from three to seven patients per group. During the actual period, 15 patients who were initially offered participation in a treatment group did not participate for various reasons. One patient due to substance abuse, one patient needed treatment for an eating disorder, two became sick as the group was about to start and one was unable to participate because of a work situation. About 11 patients did not participate in the first open slot because of sickness or equivalent reasons, but later participated in another group. No patients dropped out during the four-day treatment. In the current paper, only patients who had responded to all relevant questionnaires and interviews were included.

A total of 97 patients (72.2% females) who completed the concentrated treatment were included. Age ranged from 18 to 68 years ($M = 31.45$, $SD = 10.38$). A total of 43 patients (44%) had one or more comorbid psychiatric diagnosis, of which the most common were depression ($n = 12$, 12.4% of total sample), generalized anxiety disorder ($n = 10$, 10.3%), and social anxiety disorder ($n = 5$, 5.2%). Forty patients (41.2%) reported having received treatment previously for their OCD.

All patients received the Bergen concentrated exposure treatment (cET). We only outline the treatment briefly here, and refer to Havnen et al. (2013, 2014) for more thorough descriptions. The four-day format has been labelled individual treatment in a group setting, since the patient-therapist ratio is 1:1. This allows for individually tailored and therapist assisted treatment while simultaneously taking advantage of the group setting where the patients can observe change in others and offer support. The first day of treatment involves psychoeducation and exposure planning. The second and third days are assigned to therapist-assisted exposure. On the fourth day, the patients discuss “lessons learnt”, and plan self-exposure for the next three weeks. An open trial reports that 77% of the patients recovered following cET (defined by Yale-Brown Obsessive Compulsive Scale (Y-BOCS) score of 14 or below, as well as a reduction of at least 10 points on the Y-BOCS from pre to post-treatment), and 65.7% of the patients were classified as recovered at 6 month follow-up (Havnen et al., 2014). Furthermore, drop-out rates and rates of people declining treatment have been reported to be remarkably low for the four-day treatment format; zero patients dropped out and no patients declined treatment in the pilot-study (Havnen et al., 2013).

2.1.1. Therapist competency

All therapists were clinical psychologists or psychiatrists with extensive OCD-relevant clinical experience (ranging from <1 to 30 years). All had undergone a comprehensive training and certification in cET. The training comprises a multiple-choice exam, hands-on clinical training, and supervision from experienced cET therapists.

2.1.2. Measures

Pre-treatment measures were filled out by the patients before treatment initiation and returned to their therapist when patients attended their screening interview. Post-treatment self-report measures were completed by the patients one week after termination of the four-day treatment (i.e. after one week of self-exposure at home) and returned to the clinic in pre-paid envelopes. Since the current study is based on an unselected treatment-seeking patient sample, all measures were collected as part of standard quality improvement. Due to this, some of the instruments for anxiety and depression were replaced with briefer screening instruments half-way through the current time-frame. The measures were used at pre-treatment, post-treatment, and 6-months follow-up.

2.1.2.1. OCD symptom severity. A clinician assessed patients before treatment using the Y-BOCS interview (Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989). An independent assessor conducted Y-BOCS interviews by phone one week after termination of treatment and at follow-up (3 and 6 months post-treatment). All clinicians completing the Y-BOCS interview were specifically trained in the procedure. The Y-BOCS interview has been shown to have good psychometric properties, and to be sensitive to change after treatment (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989).

The Y-BOCS 6-month score was used as indicator of long-term treatment response. We merged data from the two Y-BOCS follow-up assessments, using the 6-month follow-up data when available ($n = 79$) and supplementing with 3-month follow-up data when 6-month follow-up ($n = 18$) were unavailable. A paired-samples t -test showed no significant difference between the 3-month scores and the 6-month scores ($t(65) = -1.33, p = .19$, mean difference = $-.95$).

2.1.2.2. Anxiety. The patients who participated in the first treatment groups (about half of the patients) filled out Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). The patients who participated in the remaining groups filled out the Generalized Anxiety Disorder 7-item scale (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006). This is a briefer self-report measure which has shown good reliability and validity (Löwe et al., 2008). Both GAD-7 and BAI has been proved to yield a good measurement of anxiety (Beck & Steer, 1991; Spitzer et al., 2006). Furthermore, the correlation between GAD-7 and BAI has been reported to be strong ($r = .72$), supporting the assumption that the two measures assess similar aspects of anxiety (Spitzer et al., 2006).

2.1.2.3. *Depression.* Patients from about half of the treatment groups filled out Beck Depression Inventory, revised version (BDI-II; Beck, Steer, & Brown, 1996), which has been shown to have good psychometric properties (Titov et al., 2011). The second half of patients filled out the Patient Health Questionnaire (PHQ-9; Spitzer, Kroenke, Williams, & Patient Health Questionnaire Primary Care Study Group, 1999), which gives a briefer measure of depressive symptoms. The PHQ-9 has been shown to be an adequate screening instrument for depression both in medical settings (Gilbody, Richards, Brealey, & Hewitt, 2007) and in the general population (Martin, Rief, Klaiberg, & Braehler, 2006), and has been found to correlate strongly with BDI-II ($r = .72-.77$; Kung et al., 2013; Titov et al., 2011).

2.1.2.4. *Cut-off criteria for predictor variables.* Cut-off points were set to differentiate a dichotomous high risk vs. low-risk group variable where the low-risk group showed none or very mild symptoms, whereas the high risk group showed mild to severe symptoms at post-treatment. The cut-off criteria also had to yield a similar proportion of high risk and low risk participants when using either the BAI or the GAD-7, as well as for the BDI-II and the PHQ-9.

The cut-off criteria were set to 9 for GAD-7 (Spitzer et al., 2006) and BAI (Julian, 2011), corresponding to mild anxiety. With these cut-off criteria, 56.8% of the patients who had answered the BAI and 54.7% of the patients who had filled out GAD-7 were classified as “at risk”.

For the PHQ-9 the cut-off criterion was set to 12 (Löwe et al., 2004), and for BDI-II it was set to 13 (Salkind, 1969), corresponding to mild depression. With these criteria, 34.1% of the patients who filled out BDI-II, and 37.7% of the patients who filled out the PHQ-9 were classified as “at risk”.

For symptoms of OCD the cut-off criterion was set to 11 on the Y-BOCS, i.e. mild OCD (between asymptomatic and cut-off suggested by Fisher & Wells, 2005). This cut-off criterion placed 47.4% of the patients in the “at risk” group.

Patients were defined as “high risk” if they scored above cut-off on all three scales (anxiety, depression and Y-BOCS post-treatment), and “low risk” if they scored below cut-off on at least one of the scales. Details of mean scores and standard deviations on Y-BOCS, BDI, BAI, PHQ-9 and GAD-7 are displayed in Table 1.

2.2. Statistical analyses

The maximum amount of missing items per questionnaire for this sample was 2. Missing items were replaced with the average score on the questionnaire for the individual patient.

Treatment status at follow-up was based on Y-BOCS scores. Clinical meaningful change was investigated using criteria recommended by Mataix-Cols et al. (2016), which states that a patient can be considered in *remission* with a Y-BOCS score of ≤ 12 , and that a change in Y-BOCS score of $\geq 35\%$ can be considered a significant treatment *response*. In order to assess the predictors individually we used three chi-square (χ^2) tests checking whether high vs. low-scoring on depression, anxiety and Y-BOCS post-treatment were related to remission status at follow-up (i.e. Y-BOCS above or at/below 12).

A multiple regression analysis was also used to investigate the predictive effects of continuous variables (age, gender and post-treatment scores on anxiety, depression and OCD) on Y-BOCS follow-up scores. To incorporate different measures of depression and anxiety in the analysis, depression and anxiety scores were converted to z-scores before running the analysis. We controlled for age and gender in all regression analyses, based on the findings that age and gender might be significantly related to effect sizes in studies of CBT for OCD (Öst et al., 2015).

To further investigate the relationship between predictors and follow-up status, we ran three logistic regression analyses. Logistic regression analyses were chosen because it provides a way of dealing with the different measures applied in the clinic. Through dichotomizing the variables we

Table 1. Measures of psychiatric symptoms

	<i>n</i>	<i>M</i>	<i>SD</i>
<i>Pre-treatment measures</i>			
Obsessive-compulsive symptoms			
Y-BOCS	97	25.26	5.07
Anxiety			
GAD-7	56	12.05	5.37
BAI	25	19.24	11.32
Depression			
PHQ-9	53	13.23	5.69
BDI	43	17.58	9.96
<i>Post-treatment predictors</i>			
Obsessive-compulsive symptoms			
Y-BOCS	97	10.13	4.68
Anxiety			
GAD-7	53	9.68	5.06
BAI	44	12.30	8.82
Depression			
PHQ-9	53	9.74	5.50
BDI-II	44	12.04	9.43
Follow-up measure			
Y-BOCS	97	11.86	6.93

Notes: Y-BOCS = Yale-Brown Obsessive Compulsive Scale, GAD-7 = Generalized Anxiety Disorder 7-item scale, BAI = Beck Anxiety Inventory, PHQ-9 = Patient Health Questionnaire, BDI-II = Beck Depression Inventory, revised version.

aimed at equalizing the different predictors so that it would be possible to combine them into single predictors (anxiety and depression), yielding better power than the different measures by themselves. Furthermore, the use of dichotomous cut-off criteria might be easier and more intuitive to apply in the clinic compared to continuous variables for identifying patients at risk. The questionnaires are often used in this way in the clinic as the forms have cut-offs for mild, moderate and severe levels of distress. In the first logistic regression analysis, age, gender and all three risk factors were entered separately as independent variables. Y-BOCS-score at follow-up (above or at/below 12) was entered as dependent variable. In the second logistic regression analysis, age, gender and the aforementioned new variable (“high risk” vs. “low risk” patients) were entered as independent variables, and again categorical Y-BOCS score at follow-up was entered as dependent variable. Then we ran the second analysis again, this time excluding all patients who had not recovered post-treatment (i.e. Y-BOCS > 12) to make sure the results in the second regression analysis were not a product of non-recovered patients scoring high on the Y-BOCS both post-treatment and at follow-up. We converted odds ratio to risk ratio using online software (<http://clincalc.com>).

We then investigated patients who relapsed vs. patients who remained in remission with t-tests, to find out whether there was a significant difference in demographic factors (age and gender) as well as risk factors for relapsed vs. non-relapsed patients. Relapse was defined using criteria suggested by Mataix-Cols et al. (2016); the patient initially responded to treatment (defined by a Y-BOCS score of 12 or lower) and no longer met this criteria at follow-up (i.e. a Y-BOCS score of 13 or higher). This procedure was not performed for responders (i.e. failing to meet the 35% reduction criteria after initial response and remission) as suggested by Mataix-Cols and colleagues (2016), as this applied for only two patients.

Finally, to examine whether post-treatment predictors were truly better related to follow-up status, we investigated whether pre-treatment levels of depression (measured with PHQ-9), anxiety (measured with GAD-7) and OCD (measured with Y-BOCS) were related to Y-BOCS scores at follow-up using bivariate correlations. A hierarchical linear regression analysis was then run to investigate the effects of age, gender, anxiety pre-treatment (measured with GAD-7), depression pre-treatment (measured with PHQ-9) and Y-BOCS pre-treatment on Y-BOCS score at follow-up. The pre-treatment measures were not analyzed using logistic regression analyses as described above, as all patients scored above cut-off on OCD before treatment. *T*-tests were used to investigate whether mean scores on pre-treatment characteristics (age, gender, Y-BOCS scores, GAD-7 scores and PHQ-9 scores) were different for remission vs. non-remission (i.e. Y-BOCS \leq 12) post-treatment.

3. Results

Nearly 90% (87.6% ($n = 85$)) of the patients responded to treatment (i.e. had a reduction in symptoms of 35% or more from pre- to post-treatment). The corresponding figure for follow-up was 74.2%. Seventy-two patients (74.2%) were in remission (Y-BOCS \leq 12) post-treatment, and 56.7% had symptom remission at follow-up. Mean Y-BOCS scores at pre- and post-treatment and follow-up are displayed in Table 1.

When applying the cut-off criteria as described above for the risk factors, 46 patients (47.4%) scored above cut-off on OCD (Y-BOCS \geq 11), 54 (55.7%) scored above cut-off on anxiety and 35 (36.1%) scored above cut-off on depression post-treatment. When counting number of risk factors, 25 patients had no risk factors, 27 patients had 1 risk factor, 27 patients had 2 risk factors and 18 patients had all three risk factors. In other words, 18 patients were in the “high risk group”, displaying all three risk factors, while 79 patients were in the “low risk” group, displaying 2 or less risk factors. In the last logistic regression analysis where non-responders were removed from the analysis, 8 patients were classified as “high risk” and 64 patients were classified as “low risk”.

Three χ^2 tests were performed to investigate the relation between “at risk” scores on depression, anxiety and Y-BOCS post-treatment and remission at follow-up. We found a significant relation between OCD follow-up status and depression post-treatment (χ^2 (1, $N = 97$) = 8.53, $p = .003$), anxiety post-treatment (χ^2 (1, $N = 97$) = 5.37, $p = .02$) as well as Y-BOCS score post-treatment (χ^2 (1, $N = 97$) = 6.23, $p = .013$). All three risk factors were significant as single predictors of long-term outcome.

A multiple regression analysis was also used to investigate the predictive effect of continuous variables (i.e. age, gender and post-treatment scores on anxiety, depression and OCD) on Y-BOCS scores at follow-up. The results of the regression indicated the predictors explained 23% of the variance ($R^2 = .23$, $F(5,91) = 5.53$, $p < .01$). However, the only significant predictor was Y-BOCS post treatment ($p < .01$). Neither; age ($p = .09$), gender ($p = .42$), anxiety post-treatment ($p = .09$) nor depression post-treatment ($p = .87$) significantly contributed to the model.

A logistic regression analysis was used to investigate the predictive effects of age, gender, and all three risk factors separately for remission status at follow-up. Age ($p = .072$), gender ($p = .59$) and anxiety scores post-treatment ($p = .48$) were not significantly related to remission status at follow-up. Symptoms of depression ($p < .05$) and OCD ($p < .05$), on the other hand, were significantly related to remission at follow-up. All logistic regression analysis results are presented in Table 2.

A second logistic regression analysis investigated the effects of low vs. high-risk patients for remission status at follow-up. Age and gender were again added to the regression. Whereas age ($p = .21$) and gender ($p = .39$) were not significant contributors to the model, having three risk factors (i.e. high scores on depression, anxiety and OCD post-treatment) was significantly associated with worse outcome ($p < .01$). As can be seen in Table 2, this yielded an odds ratio of 10.09. Converting this odds ratio to risk ratio gave a risk ratio of 2.46. Figure 1 displays graphically how the number of risk factors lowered treatment success rate.

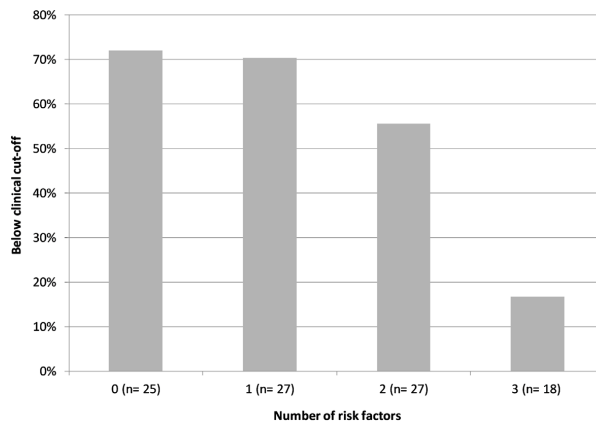
Table 2. Summary of logistic regression analysis for post-treatment variables predicting symptom remission at follow-up

	B	SE B	e^B	p
Analysis 1 (n = 97)				
Age	-.04	.02	.96	.07
Gender	.27	.51	1.31	.59
Depression	1.17	.55	3.21	.03
Anxiety	.37	.53	1.45	.48
OCD symptoms	1.02	.47	2.77	.03
Analysis 2 (n = 97)				
Age	-.03	.02	.97	.21
Gender	.42	.50	1.53	.39
3 Risk factors	2.31	.69	10.09	<.01
Analysis 3 (n = 72)				
Age	-.05	.03	.95	.07
Gender	.23	.63	1.26	.71
3 Risk factors	2.16	.89	8.71	.02

Notes: e^B = exponential B, Depression, anxiety and Y-BOCS score post-treatment coded as 1 for at risk and 0 for not at risk. Y-BOCS score at follow-up coded as 1 if ill at follow-up (i.e. Y-BOCS > 12), and 2 if symptom remission at follow-up (i.e. Y-BOCS ≤ 12). In analysis 1, age, gender and all three risk factors were entered separately as independent predictors. In analysis 2, age, gender and having all three risk factors were entered as independent variables. The third analysis was identical to the second, except for the exclusion of patients not recovered post-treatment. Y-BOCS-score at follow-up (above or at/below 12) was entered as dependent variable for all three analyses.

Figure 1. Remission rates at follow-up decrease with each added post-treatment risk factor.

Notes: The panel displays the percentage of patients scoring below clinical cut-off (i.e. <12) on the Y-BOCS at follow-up for patients having 0, 1, 2 or 3 risk factors (scores above cut-off on depression, anxiety and/or Y-BOCS at post-treatment).



Then we reran the second logistic regression analysis, excluding the patients who had not recovered post-treatment (n = 25). Age (p = .07) and gender (p = .71) were not significant contributors to the model. Having all three risk factors was significantly related to worse outcome (p < .05), again with a high odds ratio (8.71; risk ratio 2.65).

We then investigated relapsed vs. non-relapsed patients as defined above, excluding patients who did not respond to treatment initially (i.e. Y-BOCS > 12 post-treatment). Twenty-five patients relapsed between post-treatment and follow-up. Mean change in Y-BOCS score from post-treatment to follow-up for the relapse group was 8.76 (SD = 6.75). Average Y-BOCS score at follow-up was 6.87

for the non-relapsed group and 17.40 for the relapsed group, and the difference was significant ($t(72) = 9.88, p < .001$). The corresponding figures for pre-treatment and post-treatment Y-BOCS scores were 25.30 and 7.94 for the non-relapsed group and 24.24 and 8.64 for the relapsed group. Neither pre-treatment scores ($t(72) = .91, p = .37$), nor post-treatment scores ($t(72) = -.86, p = .39$) were significantly different between the two groups. *T*-tests revealed no differences in age ($t(72) = 1.65, p = .10$) nor gender ($t(72) = .26, p = .80$) between the relapse vs. non-relapse patients. However, the relapse group had significantly more risk-factors post-treatment ($M = 1.52$, median = 2, mode = 2, $SD = .116$) compared to the non-relapse group ($M = .94$, median = 1, mode = 0, $SD = .89$), $t(72) = 2.38, p < .05$).

To examine whether post-treatment predictors were better related to follow-up status than pre-treatment predictors, we investigated the correlation between pre-treatment levels of depression, anxiety, and OCD and Y-BOCS scores at follow-up. Neither symptoms of depression ($r = -.02, n = 65, p = .88$), anxiety ($r = -.07, n = 67, p = .57$) nor OCD ($r = -.02, n = 97, p = .88$) at pre-treatment were significantly correlated with follow-up status. We ran a hierarchical regression analysis to investigate the relation further. The regression equation was not significant ($F(5,58) = .97, p = .45$). Neither age ($p = .14$), gender ($p = .94$), anxiety pre-treatment ($p = .09$), depression pre-treatment ($p = .25$) nor OCD pre-treatment ($p = .71$) were significantly related to follow-up status. In summary, none of the risk factors pre-treatment were significantly related to follow-up status.

Having investigated pre-treatment predictors for follow-up status, we finally investigated pre-treatment predictors of post-treatment status. Independent sample *t*-tests were used to investigate whether mean scores on pre-treatment characteristics were different for patients in remission vs. not in remission post-treatment. Whereas age ($t(95) = .12, p = .90$), OCD ($t(95) = -.08, p = .28$), anxiety ($t(65) = .13, p = .89$) and depression ($t(63) = 1.09, p = .28$) were not significantly different for remission vs. non-remission, gender was significantly different for the two groups ($t(95) = -2.12, p < .05$), with a larger proportion of men in the non-remission group (44%) compared with the remission group (22%).

4. Discussion

We investigated the relation between post-treatment risk factors and OCD symptom severity at follow-up using an unselected sample of treatment-seeking OCD patients receiving cET in the specialist health care. Nearly 90% of the patients responded to treatment initially, and 74.2% were in remission ($Y\text{-BOCS} \leq 12$) post-treatment. The corresponding numbers for follow-up status were 74.2% responders and 56.7% in remission. Our results showed that patients with mild to moderate symptoms on measures of OCD-symptom severity, depression and anxiety at post-treatment had 2.5 times the risk (odds ratio = 10.1) of having OCD at follow-up. The results still held true when removing non-recovered patients from the analysis (odds ratio = 8.71). As can be seen in Figure 1, each additional risk factor seems to add risk for reduced treatment outcome. Patients who relapsed had significantly more risk factors post-treatment than non-relapsed patients. Pre-treatment levels of anxiety, depression and OCD, however, were not significantly related to Y-BOCS score at follow-up.

Previous studies have been inconsistent regarding the relation between pre-treatment levels of anxiety, depression and OCD-symptoms and treatment outcome (Keely et al., 2008; Knopp et al., 2013). The current study shows that *pre-treatment* predictors have weak predictive validity. However, the study revealed a strong relation between *post-treatment* predictors and long-term treatment outcome. Our study encourages the use of post-treatment predictors for long-term outcome. Eisen and colleagues (2013) found that patients with full remission of OCD symptoms had a success rate of 70%, while patients with partial remission had a 40% success rate. The corresponding figures in our study indicated that patients with 0 risk factors had a 72.0% success rate, while the patients with 3 risk factors had a success rate of 16.7% (see Figure 1). Furthermore, in our study the treatment was better controlled, as all patients received the four-day format delivered by trained therapists, while in the study by Eisen and colleagues, only 52% of the patients received CBT. In the study by Eisen et

al., 36 patients had full remission and 47 patients had partial remission, and 59% relapsed. In our study, more people responded to treatment, less people relapsed and the predictive model proved stronger. Findings from the current study therefore replicates the study by Eisen et al. and extends it by showing that it is also important to monitor for symptoms of anxiety and depression in patients with OCD.

Furthermore, the study revealed a strong predictive effect of the combined burden of several post-treatment predictors. Our results underscore the importance of using several predictors as opposed to single predictors when investigating treatment outcome for psychiatric disorders, which are often complex and multifaceted. This is in line with research on the cumulative stress model from the resilience literature, which states that cumulative levels of stress increases the risk of maintenance of psychological problems (Rutter, 2001). While the patient might cope in face of moderate depression alone, the combined effects of depression, anxiety and OCD-symptoms could overwhelm the patient and might contribute to the higher OCD severity scores found in the high risk group. Several studies have investigated pathways through which stress can influence health (Rod, Grønbaek, Schnohr, Prescott, & Kristensen, 2009; Steptoe, 1991). For instance, Steptoe (1991) and Rod and colleagues (2009) highlight how stress can influence health related behaviors, such as smoking, alcohol use and regular exercise, thus possible worsening the burden for the patient.

Finally, our study supports the use of cut-off criteria for estimating risk of relapse as the multiple regression analysis using continuous variables were not able to identify the risk of having residual symptoms. We also argue the use of cut-off criteria is intuitive and easy to apply in the clinic to identify patients at risk of relapsing.

4.1. Strengths and limitations

One important limitation concerns the use of two different measures for anxiety (BAI and GAD-7) as well as for depression (BDI-II and PHQ-9). This was a result of the current study being part of the quality assurance procedures at an outpatient clinic in its early stages. We made careful steps to make the measures as equal as possible through matching the cut-off criteria and using categorical analyses. This allowed us to get a bigger sample, thus overall strengthening the analyses. Post-hoc we ran the main logistic regression analysis again, with only (1) PHQ-9, GAD-7 and Y-BOCS as risk factors, and (2) BDI, BAI and Y-BOCS as risk factors, both analyses controlling for age and gender. In the first analysis, the risk factors came out significantly related to follow-up status ($p < .01$), whereas in the second they did not ($p = .10$). Hence, GAD-7 and PHQ-9 might be better predictors of follow-up status and pick up different aspects of anxiety and depression than BDI and BAI. However, only seven patients were classified as “high risk” in the BDI/BAI analysis, making the sample size too small to draw firm conclusions. Another limitation concerns the urge of discontinuing use of anxiolytics prior to treatment. This was not monitored formally, and the discontinuation might possibly increase symptoms pre-treatment, representing a confounding variable.

Previous reports of the four-day treatment format have indicated that hardly any patients decline treatment, and that there are very few drop-outs (Havnen et al., 2013), yielding a sample with high ecological validity. Since the intervention is so concentrated, it reduces unwanted variability related to external factors confounding short-term treatment outcome. Also, since the intervention is clearly potent as indicated by nearly 90% of the patients being classified as responders post-treatment, it represents an ideal setting for studying post-treatment predictors for long-term outcome. Future studies should investigate whether our findings also hold true in a standard CBT format.

5. Conclusion and implications

The study found a strong association between the combined effects of post-treatment scores of depression, anxiety and OCD-symptoms and high Y-BOCS scores at follow-up. This collection of symptoms could indicate vulnerability for relapse. Our results indicate that clinicians should be aware of patients displaying these residual symptoms at the end of the treatment period, and maybe pay special attention to these patients in the period following treatment. We recommend future

research to investigate alternative treatments for non-responders and patients with relapse, for example treatment with D-cycloserine and exposure therapy combined (Kvale & Hansen, 2016). We also recommend future research to use both pre- and post-treatment predictors when investigating predictors of treatment outcome.

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Competing Interests

The authors declare no competing interest.

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Doctoral Theses at The Faculty of Psychology,
University of Bergen

1980	Allen, Hugh M., Dr. philos.	Parent-offspring interactions in willow grouse (<i>Lagopus L. Lagopus</i>).
1981	Myhrer, Trond, Dr. philos.	Behavioral Studies after selective disruption of hippocampal inputs in albino rats.
1982	Svebak, Sven, Dr. philos.	The significance of motivation for task-induced tonic physiological changes.
1983	Myhre, Grete, Dr. philos.	The Biopsychology of behavior in captive Willow ptarmigan.
	Eide, Rolf, Dr. philos.	PSYCHOSOCIAL FACTORS AND INDICES OF HEALTH RISKS. The relationship of psychosocial conditions to subjective complaints, arterial blood pressure, serum cholesterol, serum triglycerides and urinary catecholamines in middle aged populations in Western Norway.
	Værnes, Ragnar J., Dr. philos.	Neuropsychological effects of diving.
1984	Kolstad, Arnulf, Dr. philos.	Til diskusjonen om sammenhengen mellom sosiale forhold og psykiske strukturer. En epidemiologisk undersøkelse blant barn og unge.
	Løberg, Tor, Dr. philos.	Neuropsychological assessment in alcohol dependence.
1985	Hellesnes, Tore, Dr. philos.	Læring og problemløsning. En studie av den perseptuelle analysens betydning for verbal læring.
	Håland, Wenche, Dr. philos.	Psykoterapi: relasjon, utviklingsprosess og effekt.
1986	Hagtvet, Knut A., Dr. philos.	The construct of test anxiety: Conceptual and methodological issues.
	Jellestad, Finn K., Dr. philos.	Effects of neuron specific amygdala lesions on fear-motivated behavior in rats.
1987	Aarø, Leif E., Dr. philos.	Health behaviour and socioeconomic Status. A survey among the adult population in Norway.
	Underlid, Kjell, Dr. philos.	Arbeidsløse i psykososialt perspektiv.
	Laberg, Jon C., Dr. philos.	Expectancy and classical conditioning in alcoholics' craving.
	Vollmer, Fred, Dr. philos.	Essays on explanation in psychology.
	Ellertsen, Bjørn, Dr. philos.	Migraine and tension headache: Psychophysiology, personality and therapy.
1988	Kaufmann, Astrid, Dr. philos.	Antisocial atferd hos ungdom. En studie av psykologiske determinanter.

	Mykletun, Reidar J., Dr. philos.	Teacher stress: personality, work-load and health.
	Havik, Odd E., Dr. philos.	After the myocardial infarction: A medical and psychological study with special emphasis on perceived illness.
1989	Bråten, Stein, Dr. philos.	Menneskedyaden. En teoretisk tese om sinnets dialogiske natur med informasjons- og utviklingspsykologiske implikasjoner sammenholdt med utvalgte spedbarnsstudier.
	Wold, Bente, Dr. psychol.	Lifestyles and physical activity. A theoretical and empirical analysis of socialization among children and adolescents.
1990	Flaten, Magne A., Dr. psychol.	The role of habituation and learning in reflex modification.
1991	Alsaker, Françoise D., Dr. philos.	Global negative self-evaluations in early adolescence.
	Kraft, Pål, Dr. philos.	AIDS prevention in Norway. Empirical studies on diffusion of knowledge, public opinion, and sexual behaviour.
	Endresen, Inger M., Dr. philos.	Psychoimmunological stress markers in working life.
	Faleide, Asbjørn O., Dr. philos.	Asthma and allergy in childhood. Psychosocial and psychotherapeutic problems.
1992	Dalen, Knut, Dr. philos.	Hemispheric asymmetry and the Dual-Task Paradigm: An experimental approach.
	Bø, Inge B., Dr. philos.	Ungdoms sosiale økologi. En undersøkelse av 14-16 åringers sosiale nettverk.
	Nivison, Mary E., Dr. philos.	The relationship between noise as an experimental and environmental stressor, physiological changes and psychological factors.
	Torgersen, Anne M., Dr. philos.	Genetic and environmental influence on temperamental behaviour. A longitudinal study of twins from infancy to adolescence.
1993	Larsen, Svein, Dr. philos.	Cultural background and problem drinking.
	Nordhus, Inger Hilde, Dr. philos.	Family caregiving. A community psychological study with special emphasis on clinical interventions.
	Thuen, Frode, Dr. psychol.	Accident-related behaviour among children and young adolescents: Prediction and prevention.
	Solheim, Ragnar, Dr. philos.	Spesifikke lærevansker. Diskrepanskriteriet anvendt i seleksjonsmetodikk.
	Johnsen, Bjørn Helge, Dr. psychol.	Brain asymmetry and facial emotional expressions: Conditioning experiments.
1994	Tønnessen, Finn E., Dr. philos.	The etiology of Dyslexia.
	Kvale, Gerd, Dr. psychol.	Psychological factors in anticipatory nausea and vomiting in cancer chemotherapy.

	Asbjørnsen, Arve E., Dr. psychol.	Structural and dynamic factors in dichotic listening: An interactional model.
	Bru, Edvin, Dr. philos.	The role of psychological factors in neck, shoulder and low back pain among female hospital staff.
	Braathen, Eli T., Dr. psychol.	Prediction of excellence and discontinuation in different types of sport: The significance of motivation and EMG.
	Johannessen, Birte F., Dr. philos.	Det flytende kjønnnet. Om lederskap, politikk og identitet.
1995	Sam, David L., Dr. psychol.	Acculturation of young immigrants in Norway: A psychological and socio-cultural adaptation.
	Bjaalid, Inger-Kristin, Dr. philos.	Component processes in word recognition.
	Martinsen, Øyvind, Dr. philos.	Cognitive style and insight.
	Nordby, Helge, Dr. philos.	Processing of auditory deviant events: Mismatch negativity of event-related brain potentials.
	Raaheim, Arild, Dr. philos.	Health perception and health behaviour, theoretical considerations, empirical studies, and practical implications.
	Seltzer, Wencke J., Dr. philos.	Studies of Psychocultural Approach to Families in Therapy.
	Brun, Wibecke, Dr. philos.	Subjective conceptions of uncertainty and risk.
	Aas, Henrik N., Dr. psychol.	Alcohol expectancies and socialization: Adolescents learning to drink.
	Bjørkly, Stål, Dr. psychol.	Diagnosis and prediction of intra-institutional aggressive behaviour in psychotic patients
1996	Anderssen, Norman, Dr. psychol.	Physical activity of young people in a health perspective: Stability, change and social influences.
	Sandal, Gro Mjeldheim, Dr. psychol.	Coping in extreme environments: The role of personality.
	Strumse, Einar, Dr. philos.	The psychology of aesthetics: explaining visual preferences for agrarian landscapes in Western Norway.
	Hestad, Knut, Dr. philos.	Neuropsychological deficits in HIV-1 infection.
	Lugoe, L.Wycliffe, Dr. philos.	Prediction of Tanzanian students' HIV risk and preventive behaviours
	Sandvik, B. Gunnhild, Dr. philos.	Fra distriktsjordmor til institusjonsjordmor. Fremveksten av en profesjon og en profesjonsutdanning
	Lie, Gro Therese, Dr. psychol.	The disease that dares not speak its name: Studies on factors of importance for coping with HIV/AIDS in Northern Tanzania
	Øygaard, Lisbet, Dr. philos.	Health behaviors among young adults. A psychological and sociological approach
	Stormark, Kjell Morten, Dr. psychol.	Emotional modulation of selective attention: Experimental and clinical evidence.

	Einarsen, Ståle, Dr. psychol.	Bullying and harassment at work: epidemiological and psychosocial aspects.
1997	Knivsberg, Ann-Mari, Dr. philos.	Behavioural abnormalities and childhood psychopathology: Urinary peptide patterns as a potential tool in diagnosis and remediation.
	Eide, Arne H., Dr. philos.	Adolescent drug use in Zimbabwe. Cultural orientation in a global-local perspective and use of psychoactive substances among secondary school students.
	Sørensen, Marit, Dr. philos.	The psychology of initiating and maintaining exercise and diet behaviour.
	Skjæveland, Oddvar, Dr. psychol.	Relationships between spatial-physical neighborhood attributes and social relations among neighbors.
	Zewdie, Tekla, Dr. philos.	Mother-child relational patterns in Ethiopia. Issues of developmental theories and intervention programs.
	Wilhelmsen, Britt Unni, Dr. philos.	Development and evaluation of two educational programmes designed to prevent alcohol use among adolescents.
	Manger, Terje, Dr. philos.	Gender differences in mathematical achievement among Norwegian elementary school students.
1998	Lindstrøm, Torill Christine, Dr. philos.	«Good Grief»: Adapting to Bereavement.
V	Skogstad, Anders, Dr. philos.	Effects of leadership behaviour on job satisfaction, health and efficiency.
	Haldorsen, Ellen M. Håland, Dr. psychol.	Return to work in low back pain patients.
	Besemer, Susan P., Dr. philos.	Creative Product Analysis: The Search for a Valid Model for Understanding Creativity in Products.
H	Winje, Dagfinn, Dr. psychol.	Psychological adjustment after severe trauma. A longitudinal study of adults' and children's posttraumatic reactions and coping after the bus accident in Måbødalen, Norway 1988.
	Vosburg, Suzanne K., Dr. philos.	The effects of mood on creative problem solving.
	Eriksen, Hege R., Dr. philos.	Stress and coping: Does it really matter for subjective health complaints?
	Jakobsen, Reidar, Dr. psychol.	Empiriske studier av kunnskap og holdninger om hiv/aids og den normative seksuelle utvikling i ungdomsårene.
1999	Mikkelsen, Aslaug, Dr. philos.	Effects of learning opportunities and learning climate on occupational health.
V	Samdal, Oddrun, Dr. philos.	The school environment as a risk or resource for students' health-related behaviours and subjective well-being.
	Friestad, Christine, Dr. philos.	Social psychological approaches to smoking.
	Ekeland, Tor-Johan, Dr. philos.	Meining som medisin. Ein analyse av placebofenomenet og implikasjoner for terapi og terapeutiske teoriar.

H	Saban, Sara, Dr. psychol.	Brain Asymmetry and Attention: Classical Conditioning Experiments.
	Carlsten, Carl Thomas, Dr. philos.	God lesing – God læring. En aksjonsrettet studie av undervisning i fagtekstlesing.
	Dundas, Ingrid, Dr. psychol.	Functional and dysfunctional closeness. Family interaction and children's adjustment.
	Engen, Liv, Dr. philos.	Kartlegging av leseferdighet på småskoletrinnet og vurdering av faktorer som kan være av betydning for optimal leseutvikling.
2000 V	Hovland, Ole Johan, Dr. philos.	Transforming a self-preserving "alarm" reaction into a self-defeating emotional response: Toward an integrative approach to anxiety as a human phenomenon.
	Lillejord, Sølvi, Dr. philos.	Handlingsrasjonalitet og spesialundervisning. En analyse av aktørperspektiver.
	Sandell, Ove, Dr. philos.	Den varme kunnskapen.
	Oftedal, Marit Petersen, Dr. philos.	Diagnostisering av ordavkodingsvansker: En prosessanalytisk tilnæringsmåte.
H	Sandbak, Tone, Dr. psychol.	Alcohol consumption and preference in the rat: The significance of individual differences and relationships to stress pathology
	Eid, Jarle, Dr. psychol.	Early predictors of PTSD symptom reporting; The significance of contextual and individual factors.
2001 V	Skinstad, Anne Helene, Dr. philos.	Substance dependence and borderline personality disorders.
	Binder, Per-Einar, Dr. psychol.	Individet og den meningsbærende andre. En teoretisk undersøkelse av de mellommenneskelige forutsetningene for psykisk liv og utvikling med utgangspunkt i Donald Winnicotts teori.
	Roald, Ingvild K., Dr. philos.	Building of concepts. A study of Physics concepts of Norwegian deaf students.
H	Fekadu, Zelalem W., Dr. philos.	Predicting contraceptive use and intention among a sample of adolescent girls. An application of the theory of planned behaviour in Ethiopian context.
	Melesse, Fantu, Dr. philos.	The more intelligent and sensitive child (MISC) mediational intervention in an Ethiopian context: An evaluation study.
	Råheim, Målfrid, Dr. philos.	Kvinnerens kroppserfaring og livssammenheng. En fenomenologisk – hermeneutisk studie av friske kvinner og kvinner med kroniske muskelsmerter.
	Engelsen, Birthe Kari, Dr. psychol.	Measurement of the eating problem construct.
	Lau, Bjørn, Dr. philos.	Weight and eating concerns in adolescence.
2002 V	Ihlebak, Camilla, Dr. philos.	Epidemiological studies of subjective health complaints.

	Rosén, Gunnar O. R., Dr. philos.	The phantom limb experience. Models for understanding and treatment of pain with hypnosis.
	Høines, Marit Johnsen, Dr. philos.	Fleksible språkkrom. Matematikklæring som tekstutvikling.
	Anthun, Roald Andor, Dr. philos.	School psychology service quality. Consumer appraisal, quality dimensions, and collaborative improvement potential
	Pallesen, Ståle, Dr. psychol.	Insomnia in the elderly. Epidemiology, psychological characteristics and treatment.
	Midthassel, Unni Vere, Dr. philos.	Teacher involvement in school development activity. A study of teachers in Norwegian compulsory schools
	Kallestad, Jan Helge, Dr. philos.	Teachers, schools and implementation of the Olweus Bullying Prevention Program.
H	Ofte, Sonja Helgesen, Dr. psychol.	Right-left discrimination in adults and children.
	Netland, Marit, Dr. psychol.	Exposure to political violence. The need to estimate our estimations.
	Diseth, Åge, Dr. psychol.	Approaches to learning: Validity and prediction of academic performance.
	Bjuland, Raymond, Dr. philos.	Problem solving in geometry. Reasoning processes of student teachers working in small groups: A dialogical approach.
2003 V	Arefjord, Kjersti, Dr. psychol.	After the myocardial infarction – the wives' view. Short- and long-term adjustment in wives of myocardial infarction patients.
	Ingjaldsson, Jón Þorvaldur, Dr. psychol.	Unconscious Processes and Vagal Activity in Alcohol Dependency.
	Holden, Børge, Dr. philos.	Følger av atferdsanalytiske forklaringer for atferdsanalysens tilnærming til utforming av behandling.
	Holsen, Ingrid, Dr. philos.	Depressed mood from adolescence to 'emerging adulthood'. Course and longitudinal influences of body image and parent-adolescent relationship.
	Hammar, Åsa Karin, Dr. psychol.	Major depression and cognitive dysfunction- An experimental study of the cognitive effort hypothesis.
	Sprugevica, Ieva, Dr. philos.	The impact of enabling skills on early reading acquisition.
	Gabrielsen, Egil, Dr. philos.	LESE FOR LIVET. Lesekompetansen i den norske voksenbefolkningen sett i lys av visjonen om en enhetsskole.
H	Hansen, Anita Lill, Dr. psychol.	The influence of heart rate variability in the regulation of attentional and memory processes.
	Dyregrov, Kari, Dr. philos.	The loss of child by suicide, SIDS, and accidents: Consequences, needs and provisions of help.
2004 V	Torsheim, Torbjørn, Dr. psychol.	Student role strain and subjective health complaints: Individual, contextual, and longitudinal perspectives.

	Haugland, Bente Storm Mowatt Dr. psychol.	Parental alcohol abuse. Family functioning and child adjustment.
	Milde, Anne Marita, Dr. psychol.	Ulcerative colitis and the role of stress. Animal studies of psychobiological factors in relationship to experimentally induced colitis.
	Stornes, Tor, Dr. philos.	Socio-moral behaviour in sport. An investigation of perceptions of sportspersonship in handball related to important factors of socio-moral influence.
	Mæhle, Magne, Dr. philos.	Re-inventing the child in family therapy: An investigation of the relevance and applicability of theory and research in child development for family therapy involving children.
	Kobbeltvedt, Therese, Dr. psychol.	Risk and feelings: A field approach.
2004 H	Thomsen, Tormod, Dr. psychol.	Localization of attention in the brain.
	Løberg, Else-Marie, Dr. psychol.	Functional laterality and attention modulation in schizophrenia: Effects of clinical variables.
	Kyrkjebø, Jane Mikkelsen, Dr. philos.	Learning to improve: Integrating continuous quality improvement learning into nursing education.
	Laumann, Karin, Dr. psychol.	Restorative and stress-reducing effects of natural environments: Experiential, behavioural and cardiovascular indices.
	Holgensen, Helge, PhD	Mellom oss - Essay i relasjonell psykoanalyse.
2005 V	Hetland, Hilde, Dr. psychol.	Leading to the extraordinary? Antecedents and outcomes of transformational leadership.
	Iversen, Anette Christine, Dr. philos.	Social differences in health behaviour: the motivational role of perceived control and coping.
2005 H	Mathisen, Gro Ellen, PhD	Climates for creativity and innovation: Definitions, measurement, predictors and consequences.
	Sævi, Tone, Dr. philos.	Seeing disability pedagogically – The lived experience of disability in the pedagogical encounter.
	Wiiium, Nora, PhD	Intrapersonal factors, family and school norms: combined and interactive influence on adolescent smoking behaviour.
	Kanagaratnam, Pushpa, PhD	Subjective and objective correlates of Posttraumatic Stress in immigrants/refugees exposed to political violence.
	Larsen, Torill M. B. , PhD	Evaluating principals` and teachers` implementation of Second Step. A case study of four Norwegian primary schools.
	Bancila, Delia, PhD	Psychosocial stress and distress among Romanian adolescents and adults.
2006 V	Hillestad, Torgeir Martin, Dr. philos.	Normalitet og avvik. Forutsetninger for et objektivt psykopatologisk avviksbegrep. En psykologisk, sosial, erkjennelsesteoretisk og teorihistorisk framstilling.

	Nordanger, Dag Øystein, Dr. psychol.	Psychosocial discourses and responses to political violence in post-war Tigray, Ethiopia.
	Rimol, Lars Morten, PhD	Behavioral and fMRI studies of auditory laterality and speech sound processing.
	Krumsvik, Rune Johan, Dr. philos.	ICT in the school. ICT-initiated school development in lower secondary school.
	Norman, Elisabeth, Dr. psychol.	Gut feelings and unconscious thought: An exploration of fringe consciousness in implicit cognition.
	Israel, K Pravin, Dr. psychol.	Parent involvement in the mental health care of children and adolescents. Empirical studies from clinical care setting.
	Glasø, Lars, PhD	Affects and emotional regulation in leader-subordinate relationships.
	Knutsen, Ketil, Dr. philos.	HISTORIER UNGDOM LEVER – En studie av hvordan ungdommer bruker historie for å gjøre livet meningsfullt.
	Matthiesen, Stig Berge, PhD	Bullying at work. Antecedents and outcomes.
2006	Gramstad, Arne, PhD	Neuropsychological assessment of cognitive and emotional functioning in patients with epilepsy.
H	Bendixen, Mons, PhD	Antisocial behaviour in early adolescence: Methodological and substantive issues.
	Mrumbi, Khalifa Maulid, PhD	Parental illness and loss to HIV/AIDS as experienced by AIDS orphans aged between 12-17 years from Temeke District, Dar es Salaam, Tanzania: A study of the children's psychosocial health and coping responses.
	Hetland, Jørn, Dr. psychol.	The nature of subjective health complaints in adolescence: Dimensionality, stability, and psychosocial predictors
	Kakoko, Deodatus Conatus Vitalis, PhD	Voluntary HIV counselling and testing service uptake among primary school teachers in Mwanza, Tanzania: assessment of socio-demographic, psychosocial and socio-cognitive aspects
	Mykletun, Arnstein, Dr. psychol.	Mortality and work-related disability as long-term consequences of anxiety and depression: Historical cohort designs based on the HUNT-2 study
	Sivertsen, Børge, PhD	Insomnia in older adults. Consequences, assessment and treatment.
2007	Singhammer, John, Dr. philos.	Social conditions from before birth to early adulthood – the influence on health and health behaviour
V	Janvin, Carmen Ani Cristea, PhD	Cognitive impairment in patients with Parkinson's disease: profiles and implications for prognosis
	Braarud, Hanne Cecilie, Dr. psychol.	Infant regulation of distress: A longitudinal study of transactions between mothers and infants
	Tveito, Torill Helene, PhD	Sick Leave and Subjective Health Complaints

	Magnussen, Liv Heide, PhD	Returning disability pensioners with back pain to work
	Thuen, Elin Marie, Dr.philos.	Learning environment, students' coping styles and emotional and behavioural problems. A study of Norwegian secondary school students.
	Solberg, Ole Asbjørn, PhD	Peacekeeping warriors – A longitudinal study of Norwegian peacekeepers in Kosovo
2007	Søreide, Gunn Elisabeth, Dr.philos.	Narrative construction of teacher identity
H	Svensen, Erling, PhD	WORK & HEALTH. Cognitive Activation Theory of Stress applied in an organisational setting.
	Øverland, Simon Nygaard, PhD	Mental health and impairment in disability benefits. Studies applying linkages between health surveys and administrative registries.
	Eichele, Tom, PhD	Electrophysiological and Hemodynamic Correlates of Expectancy in Target Processing
	Børhaug, Kjetil, Dr.philos.	Oppseding til demokrati. Ein studie av politisk oppseding i norsk skule.
	Eikeland, Thorleif, Dr.philos.	Om å vokse opp på barnehjem og på sykehus. En undersøkelse av barnehjemsbarns opplevelser på barnehjem sammenholdt med sanatoriebarns beskrivelse av langvarige sykehusopphold – og et forsøk på forklaring.
	Wadel, Carl Cato, Dr.philos.	Medarbeidersamhandling og medarbeiderledelse i en lagbasert organisasjon
	Vinje, Hege Forbech, PhD	Thriving despite adversity: Job engagement and self-care among community nurses
	Noort, Maurits van den, PhD	Working memory capacity and foreign language acquisition
2008	Breivik, Kyrre, Dr.psychol.	The Adjustment of Children and Adolescents in Different Post-Divorce Family Structures. A Norwegian Study of Risks and Mechanisms.
V	Johnsen, Grethe E., PhD	Memory impairment in patients with posttraumatic stress disorder
	Sætrevik, Bjørn, PhD	Cognitive Control in Auditory Processing
	Carvalho, Susana Fonseca, PhD	Prevention of bullying in schools: an ecological model
2008	Brønnick, Kolbjørn Selvåg	Attentional dysfunction in dementia associated with Parkinson's disease.
H	Posserud, Maj-Britt Rocio	Epidemiology of autism spectrum disorders
	Haug, Ellen	Multilevel correlates of physical activity in the school setting
	Skjerve, Arvid	Assessing mild dementia – a study of brief cognitive tests.

	Kjønniksen, Lise	The association between adolescent experiences in physical activity and leisure time physical activity in adulthood: a ten year longitudinal study
	Gundersen, Hilde	The effects of alcohol and expectancy on brain function
	Omvik, Siri	Insomnia – a night and day problem
2009 V	Molde, Helge	Pathological gambling: prevalence, mechanisms and treatment outcome.
	Foss, Else	Den omsorgsfulle væremåte. En studie av voksnes væremåte i forhold til barn i barnehagen.
	Westrheim, Kariane	Education in a Political Context: A study of Knowledge Processes and Learning Sites in the PKK.
	Wehling, Eike	Cognitive and olfactory changes in aging
	Wangberg, Silje C.	Internet based interventions to support health behaviours: The role of self-efficacy.
	Nielsen, Morten B.	Methodological issues in research on workplace bullying. Operationalisations, measurements and samples.
	Sandu, Anca Larisa	MRI measures of brain volume and cortical complexity in clinical groups and during development.
	Guribye, Eugene	Refugees and mental health interventions
	Sørensen, Lin	Emotional problems in inattentive children – effects on cognitive control functions.
	Tjomsland, Hege E.	Health promotion with teachers. Evaluation of the Norwegian Network of Health Promoting Schools: Quantitative and qualitative analyses of predisposing, reinforcing and enabling conditions related to teacher participation and program sustainability.
	Helleve, Ingrid	Productive interactions in ICT supported communities of learners
2009 H	Skorpen, Aina Øye, Christine	Dagliglivet i en psykiatrisk institusjon: En analyse av miljøterapeutiske praksiser
	Andreassen, Cecilie Schou	WORKAHOLISM – Antecedents and Outcomes
	Stang, Ingun	Being in the same boat: An empowerment intervention in breast cancer self-help groups
	Sequeira, Sarah Dorothee Dos Santos	The effects of background noise on asymmetrical speech perception
	Kleiven, Jo, dr.philos.	The Lillehammer scales: Measuring common motives for vacation and leisure behavior
	Jónsdóttir, Guðrún	Dubito ergo sum? Ni jenter møter naturfaglig kunnskap.
	Hove, Oddbjørn	Mental health disorders in adults with intellectual disabilities - Methods of assessment and prevalence of mental health disorders and problem behaviour
	Wageningen, Heidi Karin van	The role of glutamate on brain function

	Bjørkvik, Jofrid	God nok? Selvaktelse og interpersonlig fungering hos pasienter innen psykisk helsevern: Forholdet til diagnoser, symptomer og behandlingsutbytte
	Andersson, Martin	A study of attention control in children and elderly using a forced-attention dichotic listening paradigm
	Almås, Aslaug Grov	Teachers in the Digital Network Society: Visions and Realities. A study of teachers' experiences with the use of ICT in teaching and learning.
	Ulvik, Marit	Lærerutdanning som dannning? Tre stemmer i diskusjonen
2010	Skår, Randi	Læringsprosesser i sykepleieres profesjonsutøvelse. En studie av sykepleieres læringserfaringer.
V	Roald, Knut	Kvalitetsvurdering som organisasjonslæring mellom skole og skoleeigar
	Lunde, Linn-Heidi	Chronic pain in older adults. Consequences, assessment and treatment.
	Danielsen, Anne Grete	Perceived psychosocial support, students' self-reported academic initiative and perceived life satisfaction
	Hysing, Mari	Mental health in children with chronic illness
	Olsen, Olav Kjellevoid	Are good leaders moral leaders? The relationship between effective military operational leadership and morals
	Riese, Hanne	Friendship and learning. Entrepreneurship education through mini-enterprises.
	Holthe, Asle	Evaluating the implementation of the Norwegian guidelines for healthy school meals: A case study involving three secondary schools
H	Hauge, Lars Johan	Environmental antecedents of workplace bullying: A multi-design approach
	Bjørkelo, Brita	Whistleblowing at work: Antecedents and consequences
	Reme, Silje Endresen	Common Complaints – Common Cure? Psychiatric comorbidity and predictors of treatment outcome in low back pain and irritable bowel syndrome
	Helland, Wenche Andersen	Communication difficulties in children identified with psychiatric problems
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	Thygesen, Elin	Subjective health and coping in care-dependent old persons living at home
	Aanes, Mette Marthinussen	Poor social relationships as a threat to belongingness needs. Interpersonal stress and subjective health complaints: Mediating and moderating factors.
	Anker, Morten Gustav	Client directed outcome informed couple therapy

	Bull, Torill	Combining employment and child care: The subjective well-being of single women in Scandinavia and in Southern Europe
	Viig, Nina Grieg	Tilrettelegging for læreres deltakelse i helsefremmende arbeid. En kvalitativ og kvantitativ analyse av sammenhengen mellom organisatoriske forhold og læreres deltakelse i utvikling og implementering av Europeisk Nettverk av Helsefremmende Skoler i Norge
	Wolff, Katharina	To know or not to know? Attitudes towards receiving genetic information among patients and the general public.
	Ogden, Terje, dr.philos.	Familiebasert behandling av alvorlige atferdsproblemer blant barn og ungdom. Evaluering og implementering av evidensbaserte behandlingsprogrammer i Norge.
	Solberg, Mona Elin	Self-reported bullying and victimisation at school: Prevalence, overlap and psychosocial adjustment.
2011	Bye, Hege Høivik	Self-presentation in job interviews. Individual and cultural differences in applicant self-presentation during job interviews and hiring managers' evaluation
V	Notelaers, Guy	Workplace bullying. A risk control perspective.
	Moltu, Christian	Being a therapist in difficult therapeutic impasses. A hermeneutic phenomenological analysis of skilled psychotherapists' experiences, needs, and strategies in difficult therapies ending well.
	Myrseth, Helga	Pathological Gambling - Treatment and Personality Factors
	Schanche, Elisabeth	From self-criticism to self-compassion. An empirical investigation of hypothesized change processes in the Affect Phobia Treatment Model of short-term dynamic psychotherapy for patients with Cluster C personality disorders.
	Våpenstad, Eystein Victor, dr.philos.	Det tempererte nærvær. En teoretisk undersøkelse av psykoterautens subjektivitet i psykoanalyse og psykoanalytisk psykoterapi.
	Haukebø, Kristin	Cognitive, behavioral and neural correlates of dental and intra-oral injection phobia. Results from one treatment and one fMRI study of randomized, controlled design.
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	Bjørknes, Ragnhild	Parent Management Training-Oregon Model: intervention effects on maternal practice and child behavior in ethnic minority families
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	Christiansen, Øivin	Når barn plasseres utenfor hjemmet: beslutninger, forløp og relasjoner. Under barnevernets (ved)tak.
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	Halvorsen, Kirsti Vindal	Partnerskap i lærerutdanning, sett fra et økologisk perspektiv
	Solbue, Vibeke	Dialogen som visker ut kategorier. En studie av hvilke erfaringer innvandererungdommer og norskfødte med innvanderforeldre har med videregående skole. Hva forteller ungdommenes erfaringer om videregående skoles håndtering av etniske ulikheter?
	Kvalevaag, Anne Lise	Fathers' mental health and child development. The predictive value of fathers' psychological distress during pregnancy for the social, emotional and behavioural development of their children
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	Havnen, Audun	Treatment of obsessive-compulsive disorder and the importance of assessing clinical effectiveness
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	Ness, Ingunn Johanne	The Room of Opportunity. Understanding how knowledge and ideas are constructed in multidisciplinary groups working with developing innovative ideas.
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	Krane, Vibeke	Lærer-elev-relasjoner, elevers psykiske helse og frafall i videregående skole – en eksplorerende studie om samarbeid og den store betydningen av de små ting
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	Torjussen, Lars Petter Storm	Foreningen av visdom og veltalenhet – utkast til en universitetsdidaktikk gjennom en kritikk og videreføring av Skjervheims pedagogiske filosofi på bakgrunn av Arendt og Foucault. <i>Eller hvorfor menneskelivet er mer som å spille fløyte enn å bygge et hus.</i>
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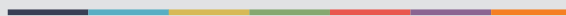
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