

**Personality characteristics, depression and the
use of an Internet-based intervention among
high-school students**



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Abstract

Adolescent depression represents a substantial burden, both for the youth affected and the surrounding family and has poor prognosis when onset is early. Among adolescents, early onset of depression predicts severe and persistent psychopathology in adult life and potential gains from preventing depressive disorders are considerable.

This thesis investigated several aspects regarding the dissemination of an Internet-based intervention (MoodGYM) for treating and preventing depression amongst adolescents. Personality was used in trying to predict the use of this program, and several aspects of the participants' characteristics are discussed. Firstly, the validity and psychometric properties of the Norwegian version of the Junior Temperament and Character Inventory was assessed. It proved to have good psychometric properties, a reasonable factor structure, and is significantly correlating with depression, self-esteem, and self-efficacy. Further, it was made clear that disseminating a self-directed MoodGYM intervention proved difficult. An attempt to increase uptake and adherence using weekly tailored e-mail reminders was made, but yet only a very small portion of the participants actually used the program. As the problem with uptake and adherence was evident, an investigation of the association between personality and depression, and the characteristics of MoodGYM users was done. The results revealed that level of depressive symptoms best predicted the use of the program and that personality can provide useful information about the users. Personality may thus represent an important contribution for the understanding of adolescent behaviour concerning mental health and well being and aiding in finding appropriate ways to increase the effective use of Internet-based interventions like the MoodGYM program.

Sammendrag

Depresjon hos ungdom kan ofte utgjøre en betydelig byrde for både den som lider av det, men også familie. Hos ungdom predikerer tidlige episoder ofte alvorlige og vedvarende psykopatologiske tilstander som voksen og mulige gevinster for forebygging av depresjon er betydelige.

Denne avhandlingen undersøkte flere aspekter vedrørende implementeringen av en internett-basert intervensjon (MoodGYM) til bruk for behandling og forebygging av depresjon hos ungdom i den videregående skolen. Personlighet ble brukt for å forsøke å predikere bruk av programmet, og flere karakteristikk av brukere ble diskutert. Først blir validiteten og psykometriske egenskaper av den norske versjonen av Junior Temperament and Character Inventory (JTCI) undersøkt nærmere. Dette instrumentet viste seg å ha gode psykometriske egenskaper, en akseptabel faktorstruktur og den korrelerer signifikant med depresjon, selvtillit og mestringstro. Videre ble det slått fast at implementeringen av denne typen intervensjon ved bruk av MoodGYM byr på en del utfordringer. Som et forsøk på å øke bruk ble ukentlige skreddersydde e-poster og påminnelser sendt ut. Til tross for dette, var det svært få som faktisk brukte programmet. Da det ble klart at veldig få deltagere brukte programmet ble en undersøkelse av sammenhengen mellom brukere, personlighet og depresjon gjort. Denne viste at de med forhøyet symptomtrykk på depresjon var mest sannsynlig å bruke programmet, og analyser av personlighet bidro til en videre beskrivelse av brukerne. Personlighet kan derfor representere et viktig bidrag til forståelsen av ungdommer når det kommer til mental helse og velvære. Dette kan derfor bidra til videre utvikling og effektiv bruk av internet-baserte intervensjoner som MoodGYM.

List of papers

- I Vangberg, H. C. B., Eisemann, M., Waterloo, K., Richter, J., Rozsa, S., & Cloninger C.R. The Norwegian Junior Temperament and Character Inventory (JTCI): An assessment of its psychometric properties. *Comprehensive Psychiatry*. In press, 2013.

- II Lillevoll, K. R., Vangberg, H. C. B., Griffiths, K., M., Waterloo, K., & Eisemann, M. Uptake and adherence of a self-directed internet-based mental health intervention with tailored e-mail reminders in senior high schools in Norway. *Under review, 2013*

- III Vangberg, H. C. B., Lillevoll, K. R., Waterloo, K., & Eisemann, M. (2012). Does personality predict depression and use of an internet-based intervention for depression among adolescents? *Depression Research and Treatment*, 2012, 1–11. doi:10.1155/2012/593068

Introduction

Background

According to the World Health Organization (WHO) depression is a leading cause of disability (WHO, 2001). The WHO predicts that, of all diseases, in 2020 depression will impose the second largest burden of ill health worldwide (Hosman, Jane-Llopis, & Saxena, 2005) and represents the second largest cause of reduced functionality and death. Mental health disorders are highly prevalent and project a lifetime risk of up to 31% for any mood disorder (Kessler et al., 2007) and cause severe impairment in many domains in daily activities, quality of life, and an increase in medical service utilization (Ayuso-Mateos et al., 2001; Greenberg et al., 1999; Kringlen, Torgersen & Cramer, 2001; Wittchen & Jacobi, 2005).

Depression as a mental disorder has longstanding roots in history. The word depression comes originally from the Latin *deprimere*, which means to “press down”, indicating feelings of being down, sad, or low (Halvorsen, 2009). Old Norwegian and Icelandic laws and the Saga literature provide early medical and psychiatric information (Hoyersten, 2007). Here, the word *Hugarvólað* implies deep depression with frequent suicidal attempts.

Depressive disorders are characterized by an abnormal depressed mood and loss of pleasure (*DSM-IV*; American Psychiatric Association, 1994). This blunted affect is present most of the day, nearly all days, for at least two weeks, and the resulting lack of motivation can be quite crippling. In addition, there are a number of other symptoms causing marked functional impairment, such as sleep disturbance, lack of energy, concentration difficulties, lack or decrease of appetite, inappropriate feelings of self-reproach, recurrent morbid thoughts about death and suicidal ideas. According to one estimate, there is an 85 % probability that after recovery a new

episode will occur within fifteen years following the index episode (Mueller et al., 1999), indicating that the most important risk factor for developing depression is a previous episode.

Depression during adolescence is a highly prevalent condition, with high recurrence rates, often associated with poor psychosocial and academic outcomes and increased risk of other mental disorders (Cuijpers, Boluijt & van Straten, 2008; Thapar, Collishaw, Potter & Thapar, 2010). Estimates of prevalence indicate that between 1-6 % of adolescents are affected by a depressive episode each year, and clinically relevant depressive symptoms not meeting the criteria for major depressive disorders are found in up to 30 % of the adolescent population. At the age of 18 about 23- 24 % of Norwegian adolescents have experienced at least one depressive episode (Sund, Larsson, & Wichstrom, 2011). Most adults with recurrent depression have had their initial depressive episode as a teenager (Cuijpers et al, 2008; Thapar, et al., 2010), which emphasizes the necessity of a focus upon prevention and early intervention.

Preventing depression

Psychological treatment of depressive disorders is as effective as many other medical treatments, but there are several reasons why prevention of depression through interventions should be attempted (Smit, 2008). The annual prevalence of new cases of depression is rather substantial, and the crippling effect it has on an individual's quality of life is significant. Further, the economic consequences of the disease are significant, as well. Estimates indicate that by the year of 2020 depression alone will account for 5.2 % of all Disability Adjusted Life Years (DALY = Years of

Life Lost + Years Lived with Disability) (Hosman et al. 2005). Already today it is the leading cause of disability in Europe.

Potential gains from the prevention of depressive disorders are considerable (Merry, 2007), and it is important to focus prevention towards specific high-risk groups such as adolescents (Thapar et al., 2010). Among adolescents, early onset of depression predicts severe and persistent psychopathology in adult life (Lewinsohn, Clarke, Seeley, & Rohde, 1994). At the same time, community studies reveal higher rates of under-diagnosis among adolescents than adults (Leaf et al., 1996).

Adolescent depression is also causing an increased risk for suicide (Gould, Greenberg, Velting, & Shaffer, 2003), which represents the third leading cause of death in the age group 14-19 (Thapar et al., 2010). Adolescent depression represents a substantial burden, both for the youth and the family, and has poor prognosis when onset is early. Consequently, it is important to regard preventing and/or delaying the onset of depression in this group as a major public health priority.

Personality and depression

The link between personality and depression can be traced back to ancient Greece, when Hippocrates and Galen argued that bodily fluids were responsible for a person's psychopathology (Klein, Kotov & Bufferd, 2011). Though science has abandoned this assumption, there is still a necessity of understanding the association between depression and personality as it provides important implications for research and clinical practice.

Depressive disorders are complex and include several aspects ranging within the social, biological, psychological, developmental and social domains (Klein, et al., 2011; Merry et al., 2011). It is proposed that individual factors constitute a

predisposition for developing depressive disorders, and obviously, the way we think, feel, behave, and relate to others can contribute to the development of a variety of mental disorders (Widiger & Smith, 2010). This idea has led to the development of various treatments for depressive disorders in adolescents and young adults. Also it is important for the understanding how to target high-risk individuals and to tailor treatment to increase adherence, efficiency and outcome (Klein et al., 2011).

Before addressing personality further, some conceptual issues need to be clarified regarding the very construct of personality. Traditionally, personality has been divided into two components, temperament and character (Cloninger, 1994; Klein et al., 2011). Temperament is thought to refer to stable, biologically based individual differences in emotions and their regulation, whereas character refers to differences related to socialization. However, this distinction has been challenged since a vast body of evidence has shown that personality comprises the characteristics of temperament including a genetic and biological basis of personality (Krueger & Johnson, 2010). During the last century a variety of personality taxonomies have been proposed, which in the 1980's were integrated into the Five-Factor – model (Big Five) (Klein et al., 2011; Kotov, Gamez, Schmidt & Watson, 2010; Markon, Krueger & Watson, 2005). These five factors are: neuroticism, extraversion, conscientiousness, agreeableness, and openness (to experience), all correlating strongly with depression and other psychopathological disorders (Kotov et al., 2010).

Temperament and Character Inventory

A theoretical model to assess temperament and character to describe underlying biogenic structures of personality has been developed by Cloninger, Przybeck, Svrakic and Wetzel (Cloninger, 1986; 1994; Cloninger, Svrakic &

Przybeck, 1993) resulting in the Temperament Character Inventory (TCI) that measures personality by the two higher order dimensions, temperament and character. Compared with many other contemporary trait approach theories this model of personality is addressing personality problems and disorders as well as normal personality to a greater extent than many others. (Halvorsen, 2009). According to this theory, temperament varies on an individual basis and reflects the fundamental organization of brain systems, which are responsible for activating, maintaining and/or inhibiting behaviour in response to stimuli (Cloninger, 1986, 1994; Cloninger et al., 1994). The four derived temperament dimensions are *Novelty seeking (NS*, exploratory impulsiveness versus stoic frugality), *Harm Avoidance (HA*, anxiety proneness versus outgoing vigor and risk-taking), *Reward Dependence (RD*, social attachment versus aloofness), and *Persistence (PS*, industrious versus underachieving). When these four traits were initially elaborated, Cloninger assumed that personality development could be described in a materialistic fashion, i.e. all thoughts were a consequence of sensory experience or their reflection (Cloninger, 2004). Cloninger discovered that he could not distinguish his healthy friends from his patients based on temperament alone. Further he found that temperament alone did not account for individual differences in maturity, or whether a person was suffering from a personality disorder. Afterwards, the work on finding the lacking aspects in his model began by developing measures of three additional “character” traits (Cloninger et al., 1993). Character refers to self-concepts and individual differences in goals and values, which in turn affect voluntary choices and intentions (Cloninger, 2004). According to Cloninger (2008) character is moderately influenced by sociocultural learning and matures gradually throughout life. The three described character dimensions are *Self-Directedness (SD*, *Self-concept*), *Cooperativeness (C*, *concept of*

relations with others) and *Self-Transcendence (ST, concept of our participation in the world as whole)* (Cloninger, 2004). These aspects of personality interact to facilitate adaptation to life experiences and also influence the vulnerability for emotional and behavioural disorders.

The aim of psychotherapy is that treatment can be said to fundamentally improve personality, especially character (Cloninger, 2004). Empirically it has been shown that SD at the beginning of therapy predicts the degree of improvement following the intervention. After inclusion of the character traits, providing a measure of different concepts of self and self-other relations, which are regulated by higher cognitive processes, it was proposed that interactions between temperament and character traits influence the adaption to life experience and establish an individual proneness to depression (Cloninger, 2004; Halvorsen, 2009). Scores on the TCI have shown to be variant between depressed individuals and non-depressed (Cloninger et al., 1994). Elevated scores on HA and lower scores on SD and C have often been found associated with depression or depressed mood in adult populations (Cloninger, Bayon & Svrakic, 1998; Richter, Eisemann & Richter, 2000; Richter, Polak & Eisemann, 2003).

The Junior Temperament and Character Inventory

Since the adult version of the TCI appeared unsuitable for use in an adolescent population, Luby, Svrakic, McCallum, Przybeck and Cloninger (1999) developed the Junior Temperament and Character Inventory (JTCI). Previously two forms of the JTCI had been described and validated for use among children according to their age: a) the Pre-school Temperament and Character Inventory (Constantino, Cloninger, Clarke, Hashemi & Przybeck, 2002) and b) the Junior Temperament and Character

Inventory (Luby et al., 1999). The JTCI has been translated and validated in many languages, including American English (Copeland, Landry, Stanger & Hudziak, 2004; Rettew, Copeland, Stanger & Hudziak, 2004), Spanish (Sancho, Arija, & Canals, 2008; Schwartz, Sepulveda & Quintana, 2009), French (Asch et al., 2009), German (Schmeck, Goth, Poustka & Cloninger, 2001), Korean (Lyo et al., 2004), Japanese (Hiramura et al., 2010), Portuguese (Moreira et al., 2012), and Italian (Andriola et al., 2012). The JTCI was initially used among children aged 9-12 years old (Luby et al., 1999), and subsequently among slightly older age groups (Andriola et al., 2012; Asch et al., 2009; Dinya, Csorba & Grosz, 2012; Moreira et al., 2012; Olvera et al., 2009; Schmeck et al., 2001) providing good psychometric properties in children and adolescents up to 18 years of age. This measure has shown to be useful in clinical practice to evaluate implications of temperament and character in regard to psychopathology. It is also shown to perform equally or better than other models for personality or intelligence in predicting academic performance (Moreira et al., 2012).

Another aspect of the ability to provide good measures of childhood and adolescent temperament is related to the study of risk factors for the development of mental disorders. A study by Caspi, Moffitt, Newman & Silva (1996) was the first to point out that behavioural style and behaviour as early as at the age of three years could predict mental disorders in early adulthood. A similar predictive observation has been made in a study on behavioural assessments at age 11 resulting in a prediction of alcohol abuse at age 27 (Cloninger, Sigvardsson, & Bohman, 1988; Luby et al., 1999). These findings showed that high scores on NS and low scores on HA during middle school were strong predictors of alcohol abuse in early adulthood and suggested the applicability of the JTCI in identifying risk factors of later psychiatric disorders. It has also been noted that children describing themselves as

novelty seekers, as less reward dependent and as less cooperative are running an increased risk of referral to mental health treatment for children (Luby et al., 1999).

So far, research on the relationship between JTCI and depression among adolescents is rather limited. Some studies have reported associations between JTCI and psychopathology in adolescents (Althoff et al, 2012; Dinya et al., 2012; Dinya, Csorba, & Grósz, 2011; Poustka, Parzer, Brunner & Resch, 2007; Schmeck et al., 2001). Schmeck and colleagues (2001) reported a negative correlation between several forms of psychopathology, including anxiety and depression and SD. Others (Althoff, et al., 2012) have found high scores on NS and HA, and low scores on RD and PS among dysfunctional children. Elevated levels of HA have also been reported among depressed adolescents (Dinya et al., 2011).

The need to further investigate different aspects of temperament and character among adolescents is obvious, and studies assessing their predictive value for uptake and adherence in mental health interventions and treatment are necessary. The JTCI has shown to be a useful tool in assessing different behaviours in adolescents and thus should also be used in studies addressing prediction of onset, development, remission, and relapse of depression. The understanding of underlying factors of uptake of and adherence to internet-based interventions for depression is crucial for optimising such interventions and their treatment effect.

Internet-based interventions

During the last two decades various kinds of communication technology have revolutionized the way we interact with each other across the globe. History will prove whether the Internet has been a revolution similar to Gutenberg's invention of the printing press (Skinner & Zack, 2004). Nonetheless, the Internet today is used for

many forms of communication ranging from online shopping to dating, and its usability for psychological treatment is at hand.

Psychotherapy and counselling across space and time have longer traditions within psychology than many of us might be aware of. As early as in 1909, Sigmund Freud reported the use of distance counselling by letters to provide instructions on how to cure a five-year old boy “Hans” from his horse phobia (Freud, 1955; Skinner & Zack, 2004). There is no indication that Freud thought of replacing traditional face-to-face treatment with this written form, rather he regarded it as a supplement. Today, online treatment appears in many forms and it has many names. But no matter the label, the idea of these new platforms is to deliver psychotherapeutic services through technological solutions like the Internet (Barak, Klein & Proudfoot, 2009).

Several types of psychotherapy, such as interpersonal therapy, short-term psychodynamic therapy, problem-solving therapy and cognitive behaviour therapy (CBT) have shown to be effective in treating depression (Andersson, 2006; Cuijpers, van Straten, Andersson & van Oppen, 2008). The latter has proven to be transferable into an Internet format (Andersson, 2009; Johansson & Andersson, 2012). Originally, CBT was developed by Aaron Beck (Beck & Wood, 1976), and was based on his cognitive model of depression. He proposed that individuals prone to depression were characterized by a negative way of thinking about themselves, the world and the future due to cognitive distortions. In CBT people learn to monitor and evaluate their own feelings and thoughts in order to recognize those that contribute to a negative emotional state, and then learn how to challenge these properly.

In 2006, a summary of the research on Internet-based CBT (ICBT) was published providing insight into a field that was relatively new at that time (Andersson, 2006). The prospects then were regarded as promising, but not enough

research existed to establish the efficacy of these kinds of treatment programs and interventions (Johansson & Andersson, 2012). Since then, growing evidence indicates that guided ICBT is more efficient than unguided ICBT. However, one positive aspect of unguided ICBT is its cost efficiency (Lintvedt, Griffiths, Eisemann & Waterloo, 2013) and its potential to reach far more people. We can conclude that ICBT treatments are effective and offer a good alternative to traditional face-to-face psychological treatment and medication. One of the unique qualities of internet-based treatment is that therapeutic changes can take place in an anonymous context, which can facilitate help-seeking and minimize psychological distress (Lintvedt, Sørensen, Østvik, Verplanken & Wang, 2008). People who feel stigmatized by their problems, diagnosis or counselling process are more likely to seek help online where they feel less ashamed than in a personal encounter with a therapist or physician (Rochlen, Zack & Speyer, 2004).

Research on mental health interventions on the Internet has shown that allowing people anonymity, and liberating them from limitations of time and geographical space, has direct beneficial effects in producing positive health outcomes (Christensen, Griffiths & Jorm, 2004; Joinson, 2004; Sheese, Brown & Graziano, 2004). Thus, the accessibility of mental health care has been increasing for groups whose threshold for seeking traditional care is high, such as adolescents struggling with mental health issues. (Paperny & Hedberg, 1999, Barney, Griffiths, & Christensen, 2009).

One program that is widely used for the purpose of treating and preventing depression is MoodGYM (<https://moodgym.anu.edu.au/welcome>). In randomized controlled trials (RCTs) MoodGYM has been found effective in reducing depressive symptoms (Christensen et al., 2004) and anxiety (Christensen, Griffiths, Korten,

Brittlife & Groves, 2004). Another study among a university student sample found that an intervention combining unguided Internet-based CBT (MoodGYM) and psycho-education was effective in reducing depressive symptoms (Lintvedt et al., 2011).

The MoodGYM program consists of five modules based upon CBT, i.e. methods for overcoming dysfunctional thinking, relaxation, objective problem solving, and coping strategies for relationship issues (Griffiths, Christensen, Jorm, Evans & Groves, 2004). The training modules focus upon developing strategies for coping with issues and circumstances that might cause depression. Often it is intended for the participants to work through one module per week during a five weeks period. In addition to the five modules, the site contains a personal workbook, an interactive game, and a feedback evaluation form (Christensen et al., 2004). The first module introduces “characters” which are modelling thinking patterns recognizable to the user. It further demonstrates the interaction between mood and the way of thinking using animated diagrams and interactive exercises. Module two describes different types of dysfunctional thinking and how to challenge the validity of negative thoughts. It also provides a self-assessment for dysfunctional thoughts. Module three presents the user with several strategies for overcoming the dysfunctional thoughts and also assesses self-esteem to provide training to increase it. The fourth module deals with life-event stress, pleasant events and activities in order to increase focus upon the activities creating more positive experiences and emotions. The final and fifth module covers problems concerning typical issues regarding relationship break-ups. Exercises from the workbook are integrated into each of the above modules. Every module is designed complete in approximately 45-60 minutes, and in the latest

version of the MoodGYM program (Mark II) core assessments are compulsory not allowing the user to skip or alternate between the different modules.

Adherence and dropout

“Drugs don’t work in patients who don’t take them” (Osterberg & Blaschke, 2005, p. 487).

The use of internet-based interventions among adolescent samples has revealed some difficulties in implementation (Christensen, Reynolds & Griffiths, 2011). Motivating young people to seek help for mental health problems has emerged as a challenge. One reason for low adherence might be that ICBT applications allow the users to easily enter and leave a treatment program, which is resulting in a lack of commitment to the treatment. Consequently, determining and characterizing those using and benefiting from Internet interventions is an important issue.

The word “adherence” is preferred instead of compliance by many health care providers, since the latter implies that the patient is passively following the doctors directions, and that the treatment plan is not based on a therapeutic alliance or contract established between the patient and the health care provider (Osterberg & Blaschke, 2005).

The identification of the users’ characteristics could be useful both for increasing adherence and for the prediction of treatment outcome (Batterham, Neil, Bennett, Griffiths & Christensen, 2008; Ritterband, Andersson, Christensen, Carlbring & Cuijpers, 2006; Yildiz, Pauler, & Sachs, 2004).

The observed lack of commitment may result in poor adherence. In addition, higher attrition rates are observed in unmonitored settings (Christensen et al., 2011). As noted by Christensen and Mackinnon (2006), some non-completers may in fact be

e-attainers, i.e. after having obtained what they need from a program they discontinue. Since it is important to obtain sufficient adherence to yield an effect, Christensen, Griffiths & Farrer (2009) suggested that automated reminders and messages might improve adherence to open access intervention sites and proposed further research in this area. Lintvedt et al. (2011) suggested tracking in the form of automatically generated tailored e-mail or text messages as a way to reduce attrition.

There are different findings regarding the characteristics predicting dropout and adherence (Arnow et al., 2007). The few consistent characteristics are low socioeconomic status, inexpedient personality traits and drug abuse. As concerns internet-based interventions, there is sparse information about characteristics of users vs. non-users, which is pointed out as a shortcoming (Field, 2009; Ritterband, et al., 2006; Steiro & Austvoll-Dahlgren, 2007).

Aims of the thesis

The overall aim of the thesis has been to contribute to the knowledge in the use of an intervention program for improving the mental health state of adolescents, and especially in reducing depressive symptoms. In particular, characteristics like personality, level of depression, and self-esteem of those using this intervention program should be studied.

Specific aims were:

1. To assess the psychometric properties of the Norwegian version of the Junior Temperament and Character Inventory (JTCI) in terms of validity, factor structure and internal consistency (Paper I).
2. To evaluate the feasibility of disseminating a self-directed internet-based mental health intervention (MoodGYM) among a community sample of adolescents (Paper II).
3. To investigate the possible benefits of e-mail feedback and reminders to increase uptake and adherence (Paper II).
4. To assess the predictive power of gender, age and personality characteristics for the severity of depressive symptoms among adolescents (Paper III).
5. To explore the characteristics of users versus non-users of an Internet-based intervention program (MoodGYM) (Paper III).

Methods

Procedure

The different studies comprising this thesis are part of a project aiming to contribute to the knowledge and evaluation of an effective Internet-based self-help program for mental health issues, the MoodGYM.

The design involved a four-arm RCT with measures administered at baseline and at post- intervention. All students were recruited from eleven high-schools in Troms County in Northern Norway in two rounds separated by approximately 9-11 months. The schools were not randomly selected, rather the school administration agreed to participation in the MoodGYM trial. All schools in the county were offered to enter the study, but several schools were already participating in alternative interventions or could not attend for other reasons. Members of the research group visited the schools, which had agreed to enter the study for recruitment of the students willing to participate. These schools represented two types of curriculum: a general theoretically orientated and an occupationally orientated educational program. The data collection was done in a classroom setting either by computer or a pen- and paper version. The recruitment procedure included a short lecture about mental health in general, and a general presentation of the MoodGYM program. Afterwards the students were invited to participate in a study of MoodGYM. Those students consenting could choose whether to participate in the survey only or in the MoodGYM trial as well. The survey was also used as the baseline measure for those participating in the trial. There was no screening or selection prior to data collection. Students willing to participate in the MoodGYM trial received a username and password via e-mail within a week of recruitment for registration in the program. The use of MoodGYM was self-directed, without personal follow-up and no time

allocation during school hours. Within 6-8 weeks, the research team returned to collect post-intervention data.

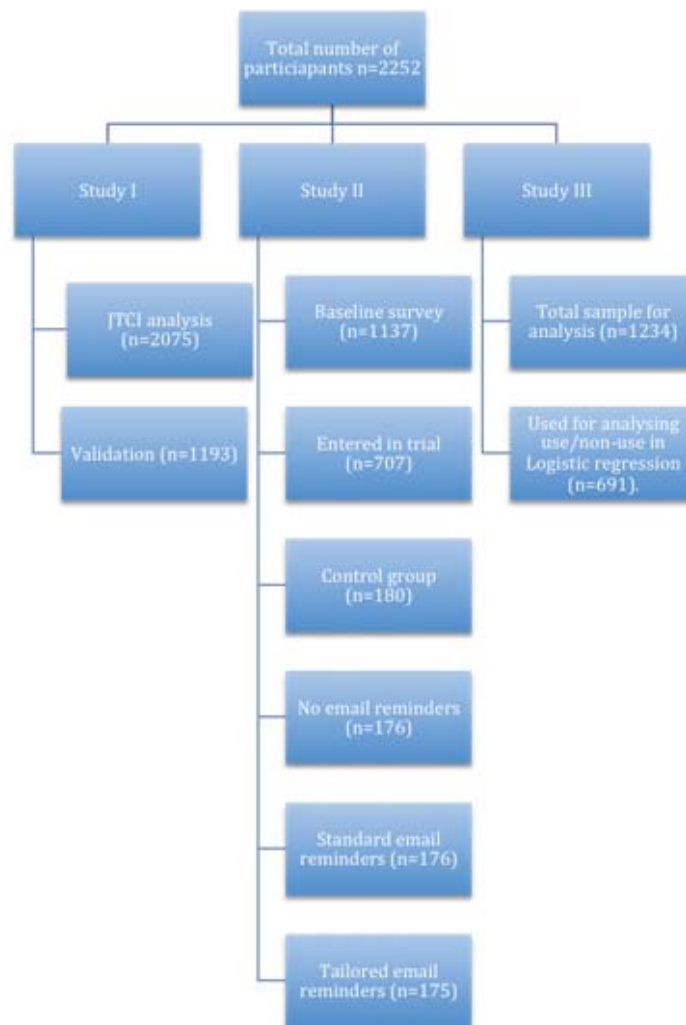
Sample

The overall number of participants in this study was 2252 high school students, but after an initial data screening, a total of 2075 (50.2 % females and 49.8 % males) aged 15-20 years were included in the final sample. The study was based on two separate data collection rounds in 2008 and 2009, respectively.

Different criteria were used for the selection of the sample based on the aims of the three parts of the study. In the first study we aimed to assess the psychometric properties of the Norwegian JTCI among adolescents in terms of factor analysis, reliability and validity. Subjects with more than two items missing in the JTCI and those above the age of 18 years were excluded from the study. In this sample, the two data collections were combined to provide a larger sample for analysis.

In the second study, a total of 1137 students completed the baseline survey and 775 students consented to participate in the MoodGYM intervention trial group. Although 775 individuals consented, only 707 were enrolled in the trial due to data entry error. These were allocated to one of three MoodGYM intervention groups (n=527, receiving tailored weekly e-mail, standardized weekly e-mail, or no e-mail) or a waitlist control group (n= 180). See figure one for details.

Figure 1: An overview of the sample and sample distribution across the tree studies.



Note: See study II for further details.

The third study is also based upon the material collected at baseline, the pre-intervention measure, and the sample comprised 1234 individuals. The sample for the two latter parts of the study is smaller than in the first part due to the nature of the data. In part one, mainly the JTCI was used in the analysis, and in the second part, pre- and post-intervention data was used, limiting the sample to those who had completed both. In the third study, the sample from the latest collection was used due to missing data on depressive symptoms in the first round of data collection.

Measures

Personality

The Junior Temperament and Character Inventory (JTCI) (Luby, et al., 1999) is a self-administered questionnaire containing 103 items scored on a five-point scale (1 to 5) ranging from “totally agree” to “totally disagree”. The Norwegian version of the JTCI was developed according to established guidelines (Sartorius & Kuyken, 1994) following several steps based on the German version of the JTCI 12-18R (Goth & Schmeck, 2009). This procedure included translation, back-translation by independent native speakers, and linguistic revision of items. The validity and psychometric properties of the Norwegian version have also been assessed in part one of the study.

Level of depression

Level of depression was measured using a Norwegian version of the Centre for Epidemiologic Studies Depression scale (CES-D) (Radloff, 1977), developed to assess depressive symptomatology in the general population. This 20-item self-report scale yields scores ranging from 0 to 60 (scores given from 0 to 3), with a score of 16 or above indicating a clinical level of depression. However, a cut-off score above 24 was used to detect more accurately clinical cases among adolescents (Radloff, 1991; Roberts, Lewinsohn, & Seeley, 1991). CES-D has high internal consistency (general population $\alpha = .85$; clinical population $\alpha = .90$) (Radloff, 1977)

Self-efficacy

Self-efficacy was measured by means of the Norwegian version of the General Self-Efficacy Scale (GSES) (Crandal, 1973; Røysamb, 1998). The scale consists of ten items and assesses the ability of an individual's belief in handling difficult

situations in an appropriate way. Responses are reported on a four-point scale ranging from “not at all true” to “exactly true”.

Self-esteem

Self-esteem was assessed using the Norwegian version of The Rosenberg Self Esteem Scale (Crandal, 1973; Rosenberg, 1965), as a measure of global self-esteem. The scale consists of ten statements related to overall feelings of self-worth or self-acceptance. The items are answered on a four-point scale ranging from strongly agree to strongly disagree yielding a score between 10 and 40.

Summary of results: papers I-III

Paper I

Vangberg, H. C. B., Eisemann, M., Waterloo, K., Richter, J., Rozsa, S., & Cloninger C.R. The Norwegian Junior Temperament and Character Inventory (JTCI): An assessment of its psychometric properties. 2013. *Comprehensive Psychiatry*. In press, 2013.

Two thousand and seventy-five (2075) high school students (age 15-18) completed the Junior Temperament and Character Inventory (JTCI) as a part of a larger study investigating the intervention effect of an Internet-based program for mental health. The aim of this study was to assess the psychometric properties of the Norwegian version of the JTCI among Norwegian high school students by means of factor analysis, reliability and validity. The psychometric properties of the Norwegian version were found to be satisfactory, and four temperament and three character factors were successfully extracted providing good internal consistency ($\alpha = .78 - .85$). This structure was then compared to an ideal model using orthogonal Procrustes Rotation, which is a very strict criterion, providing a good indication of the similarity of the theoretical model and the structure extracted. Significant correlations were also found with depression symptoms, self-esteem and self-efficacy.

Paper II

Lillevoll, K. R., Vangberg, H. C. B., Griffiths, Kathleen, M., Waterloo, K., & Eisemann, M. Uptake and adherence of a self-directed internet-based mental health intervention with tailored e-mail reminders in senior high-schools in Norway. 2013. *Under review.*

Internet-based cognitive behavioural therapy (ICBT) is a promising approach to prevention and reduction of depressive symptoms among adolescents. However, a lasting problem concerning this approach concerns uptake, adherence and attrition. The aim of this study was to evaluate the feasibility of disseminating a self-directed internet-based mental health intervention (MoodGYM) in senior high schools. Further, we wanted to investigate the possible effects of tailored and weekly e-mail reminders on initial uptake and adherence to the intervention. A baseline survey was conducted in four senior high-schools in two Norwegian municipalities (n=1337). 707 (52.8 %) of the students consented to further participation and were allocated in one of three MoodGYM intervention groups or a wait-list control group. We tested for effects in tailored email and self-report of current need of help in initial uptake using logistic regression and the effect of receiving weekly e-mail on adherence using ordinal regression. The results revealed problems concerning uptake and adherence, with only 45 (8.5 %) individuals actually using the program. The tailored e-mails and self-reported need for help did not predict initial uptake and the main reason reported for non-use was “*lack of time/forgetting about it*” and “*doubt of usefulness of the program*”. This study highlights the significant challenges present in disseminating a self-directed internet-based intervention despite taking measures to ensure that as many as possible could use it in terms of dispatching weekly e-mail reminders.

Paper III

Vangberg, H. C. B., Lillevoll, K. R., Waterloo, K., & Eisemann, M. (2012). Does personality predict depression and use of an internet-based intervention for depression among adolescents? *Depression Research and Treatment*, 2012, 1–11.

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Novel ways of dealing with the increasing occurrence of depression have been developing over the last decade. Many forms of treatment and interventions have emerged and one is e-therapy. The use of Internet-based intervention programs among adolescents has revealed good effects in some settings, but a lasting problem has been implementation, adherence, and attrition. The aim of this study was to investigate the association between personality, using the Junior Temperament and Character Inventory (JTCI), and adolescent depression. Further, to look closer at the personality characteristics for such an Internet-based intervention, the MoodGYM. In accordance with previous research, the personality characteristics of Harm Avoidance (HA) and Self-Directedness (SD) emerged as the strongest predictors of depressive symptoms. Further analysis identified the JTCI domain Reward Dependence (RD) and depression (CES-D) as the only variables predicting use/non-use of the MoodGYM program.

General discussion

This thesis set out to expand the knowledge regarding the use and users of an Internet-based intervention for treatment of depression among adolescents. The importance of finding ways to increase adherence and minimize dropout in Internet-based treatments is underlined in this thesis, and aspects regarding characteristics of users are of importance. The general findings will first be discussed before a closer look at possible implications follows.

The aim of the first study was to provide a valid psychometric measurement for the personality of adolescents and young adults personality. The JTICI already exists in many other languages and cultures and has proven valuable in the assessment of different aspects regarding mental health issues.

In the process of evaluating how to proceed in the development of the Norwegian JTICI, the question raised whether the original American version should be used necessitating an adaptation of some items to the Norwegian culture. An decision was made to use the existing German version due more cultural similarities between Germany and Norway.

The Norwegian version presented in study one, yielded good psychometric properties emerging from factor analysis and validity in form of correlations with depressive symptoms, self-esteem, and self-efficacy. The instrument was investigated among a relatively large sample consisting of 2075 individuals indicating a reasonable representation of the adolescent population. The internal consistency was determined using Cronbachs alpha coefficients, and the factor structure was explored by factor analysis using principal axis factoring with direct oblimin rotation. The structure of temperament and character was tested separately, and the derived factor structure was subsequently tested against an ideal factor matrix using Procrustes rotation. Further

principal component analysis with promax rotation was separately applied for temperament and character to analyse the factor structure on a subscale level.

The Norwegian version of the JTICI was found to have acceptable psychometric properties in students ranging in age between 15-18 years in terms of internal consistency and validity indicated by significant correlations with depression, self-esteem and self-efficacy. Four temperament and three character factors were successfully extracted yielding good internal consistency (α ranging from .79 - .85).

A multivariate analysis of covariance showed that girls scored significantly higher on HA, RD, CO, and ST scales. On the other hand, they scored lower on NS, PS, SD, than boys.

In order to assess the validity of the JTICI, additional analysis including other measures were done. The findings show a significant association between all of the JTICI domains and depression, self-esteem, and self-efficacy. The strongest associations concerning depression emerged with HA (positive) and with SD (negative). These findings are in line with previous studies (Cloninger, Svrakic, & Przybeck, 2006; Farmer & Seeley, 2009; Vangberg, Lillevoll, Waterloo, & Eisemann, 2012). Furthermore, self-esteem also yielded a negative correlation with HA and a positive with SD. This is a reasonable finding given the nature of self-esteem. Individuals low on self-esteem are likely to be harm avoidant and pessimistic. A similar association was also seen with self-efficacy, which should decrease with harm avoidant emotional reactions and increase with self-directed personality characteristics.

The JTICI has proven to be a good and valuable measure in assessing the personality characteristics of adolescents and young adults. However, we also found an unexpected strong association between HA and SD, indicating that the distinction

between these two dimensions has partly been lost in the Norwegian JTCI version. This association is rather large, and a suspected confound in the German test seems to be exaggerated in the Norwegian test. This confounding of HA and SD is undesirable since the two dimensions have distinct biological and psychological correlates (Cloninger, 2008). Developing a personality measure that is adapted to cultural and national differences is important for several reasons. The JTCI provides a good measure of the dimensions of temperament and character, including not only more or less automatic emotional reactions and goals and values, but also self-transcendental aspects like spirituality (Andriola, et al., 2012). Therefore it has been stated that the JTCI also provides a good indicator for both well- and ill-being and thus is suitable for use in the assessment of important issues like understanding how adolescents adapt to e.g. school environment. The latter is confirmed by a study by Moreira et al. (2012) stating that the JTCI predicts academic outcome better than IQ-scores in 12 to 18 year old individuals. This opens for a discussion of the importance of personality in school-settings. Normally performance in this setting is measured by traditional academic achievement in terms of facts and skills, but the focus should be turned more towards developing strategies for promotion of social and emotional control as well as well-being.

The JTCI provides a personality profile of adolescents useful for the development of therapeutic guidelines for tailoring treatment based on individual needs, and parents can be given cues on how to better relate to their children in a constructive way (Andriola, et al., 2012).

One of the aims of this thesis was to evaluate the feasibility of disseminating the MoodGYM intervention among an adolescent community sample in Troms County in the North of Norway. To further assess this intervention, one of the four

intervention groups received tailored e-mail and reminders based on the individual scores e.g. CES-D and reported social and psychological problems. This was done in order to give a more personal imprint on the intervention and to see if this increased both uptake and adherence to the program compared to the two other intervention groups and controls. Analysis revealed that those volunteering to take part in the MoodGYM trial reported a significantly higher level of depressive symptoms compared to the survey-only group. Also scores on self-esteem were significantly lower in the trial sample, and more reported current need for help. On the other hand, they did not differ in self-efficacy.

The overall uptake of MoodGYM across the three intervention groups was unexpectedly low with only 45 individuals actually using the program. The only significant predictor of initial uptake was average grade. Intervention group membership had no effect on initial uptake.

Concerning the effect of weekly tailored and standard e-mail reminders, no effect on use was found. However, those scoring higher on CES-D at baseline used more of the program than low scorers, indicating that individuals experiencing depressed mood found the idea of the program as more appealing. This was also the case for those with low scores on self-esteem, which is not surprising since self-esteem is associated with depressed mood.

Although it seems that there is no effect of e-mails, both standard and tailored, it is nonetheless interesting to observe that a relatively high percentage of the participants have such elevated levels of depression, which should make it appealing for them to try such a easily accessible treatment. This adds up to the argument that unguided interventions in form of a universal approach do not yield a good effect. The

major problem in this study seems to be uptake. Obviously, participants found the approach and/or program appealing.

Another explanation for this very low uptake might be depression itself. The feeling of hopelessness experienced by depressed individuals could function as an impediment since they may lack the hope that anything would help right now. Further, the accompanying lack of ability to concentrate very well can also deter participants from using this kind of approach.

The findings in this study stress the necessity to find conditions for the use of ICBT in school-settings to ensure uptake and adherence. Others (Calear, Christensen, Mackinnon, Griffiths, & O'Kearney, 2009) have implemented the MoodGYM program in the school curriculum with teachers present in the classrooms. In a universal approach this seems to be a better solution to ensure the use of a program. It would also be necessary to evaluate if one should aim to include a whole school-population when only a relatively small percentage is actually affected by depressed mood. Alternatively, an indicated or targeted prevention and treatment approach could show to be effective and less resource demanding. This, combined with tailored feedback by e-mails based on measures like depression, anxiety, self-esteem, and, personality could prove effective. Also, guided interventions may be an adequate way of delivering mental health prevention measures.

In the search for explanations why our subjects refrained from using the presented intervention program, questions about the characteristics of the users vs. non-users arise. Firstly, it was interesting to look closer at the predictive power of variables like gender, age, and personality characteristics (JTIC) for the severity of depressive symptoms. The strongest association was found between CES-D and the domains of Harm Avoidance (HA) and Self Directedness (SD), but also Reward

Dependence (RD), Novelty Seeking (NS), and Cooperativeness (CO) emerged as significant predictors. In a regression model it was found that the JTCI explained 40 % of the variance in CES-D, after having controlled for age and gender. This confirms the assumption that personality does play a central role for our understanding of depression. Scoring high on HA is common with depressed mood, indicative of a person who is worrying a lot, has a pessimistic way of thinking, and is rather fearful. Cloninger et al. (2006) identified HA as a marker for vulnerability to depression, while SD functioned as a protective factor against the development of depression.

Though it is an obvious established association between the domains of HA and SD among many different psychiatric disorders (Althoff et al., 2012; Dinya et al., 2012; Dinya et al., 2011; Olvera et al., 2009; Rettew, Althoff, Dumenci, Ayer & Hudziak, 2008; Vangberg et al., 2012), it is arguable that since most of these investigations have been done regarding the higher order domains, the analysis might have been on a too broad level. The findings might indicate a more general distress that is common in these kinds of disorders (Halvorsen, 2009), thus lowering the sensitivity of the measure. Using the facets on the lower level of the JTCI can provide a more accurate and detailed picture on the issue if vulnerabilities towards depression might be present. In Vangberg et al., (2012) analyses on the facet level of the JTCI were done as an attempt to provide a more detailed picture of the relationship between depressive symptoms and personality. It should be underlined that the use of the facets in analysing this relationship should be made with caution. The JTCI contains less than half the number of items than the adult TCI. This means that the number of items given each domain and facet is comparatively rather low and might compromise the reliability of the measure. Nevertheless, it provides an interesting picture of

individuals with elevated levels of depression. The facet level regression analysis showed that the JTICI facets explained 46 % of the variance in CES-D scores. Furthermore, the facets emerging as significant predictors of depression characterised individuals lacking the ability to set and work towards long-term goals. They also seem tending to worry and expecting poor outcomes of situations even when assured the opposite. These individuals also resemble withdrawn and independent, not responsive to social pressure. The latter characteristic seems like a trait describing a strong individual, not necessarily troubled by mood disorder. On the other hand it might be an artefact of the other characteristics and that it seems plausible that individuals lacking self-image and expect poor outcomes actually prefer to be out of harms way. This could be done by withdrawing from others and put on a “game-face” not giving the world any cues of the troubles behind the mask.

One of the challenges with treating depression, and maybe especially among adolescents is the stigma attached to this mood disorder. Many young people will look at depression as a weakness, thus preventing those struggling with it to open up and talk to other peers about their troubles. This combined with the problems ICBT interventions are encountering regarding uptake and adherence provides a challenge that needs to be addressed. As an attempt to provide at least some clues to who the users of such a program are, we proceeded with analysing the personality characteristics of the users vs. non-users of MoodGYM (Vangberg et al., 2012).

The results from the logistic regression analysis revealed that on the higher order domains of the JTICI, only Reward Dependence (RD) predicted use of the program. RD depicts individuals as socially detached, preferring to keep distance, and being independent. Also the level of depression correlated significantly with use, indicating that presenting this kind of intervention does appeal to some of those

adolescents experiencing depressive symptoms. The association between RD and use of MoodGYM, might be explained by the nature of the above described personality characteristics. If a person suffers from elevated levels of depressive symptoms, and at the same time is a person who prefers being alone and not depend on the support of others, the road to seeking help from others may appear long. Seeking help from peers, parents, therapists, and doctors may not be preferable. Therefore, when presented with a program like MoodGYM, the idea of being able to sit at home and work through problems alone and anonymously should be appealing.

Once again the notion that the higher order domain might be too wide a measure, another logistic regression analysis on the facet level was done. In this analysis gender emerged as a significant predictor for use, indicating that females are more likely to use this kind of intervention than males. Also, depressive symptoms predicted use also in this model. Furthermore, facets significantly predicting use were: *regimentation* (NS4), *anticipatory worry* (HA1), *vigour* (HA4), *independence* (RD4), *pragmatic* (P3) and *resourcefulness* (SD3). This association draws a picture of those using MoodGYM as individuals being efficient workers and following rules in order to achieve goals. They also seem to be independent and not to care about others thinking or behaviour. The fact that they worry of outcomes might function as a facilitator for the efficient and goal-directed behaviour. The other observation that they seemingly do not care of others opinions, could be a result of the latent worry. They fear corrections from others, thus present themselves as independent and not in need for any kind of help, including mental health issues. Once again the notion that these are individuals who might find this approach appealing, compared to traditional help seeking, is strengthened by these findings.

These aspects together with depressive symptoms and gender, only moderately predict use of MoodGYM. This indicates that there are most likely other components and factors that function as equal or better predictors of use. Nonetheless, exploring personality characteristics is an interesting approach, and the findings can give developers of ICBT-programs indications for what to take into consideration when further developing such interventions.

Methodological considerations and limitations

There are also several methodological considerations that have to be made when performing this kind of intervention.

When collecting data, the survey was completed in a classroom setting that for some might lack the appropriate level of anonymity required to provide reliable responses. Due to the low level of participation in the users group, definite conclusions based on data provided cannot be drawn, given the relative low effects yielded.

In our study we wanted to present the MoodGYM program as a preventive treatment aiming to increase self-esteem and well-being. This approach was chosen since it could be unnatural presenting treatment to a group of normal adolescents and not to a group of targeted depressed individuals. This may have affected the rate of users, since it is not likely that adolescents not feeling depressed nor recognizing any depressive symptoms, would use this kind of program. Those intending to use this, would rather soon after log on realize that the program is not designed for boosting self-esteem in the traditional matter, rather it is made to increase self-esteem in depressed and troubled individuals. This might affect both uptake and adherence given that non-depressed individuals logging in would soon leave the program

without using it. Further, adolescents who do not feel the need for treatment will simply not enter this kind of program.

The MoodGYM program is also openly accessible on the Internet, thus making students able to enter and use the program outside our trial just by changing their username and password or simply create a new online identity. This puts us in the blind on how many individuals were actually using the program.

However, when discussing a universal school-based intervention, in spite of the findings of our study it might have some potential when considering the minimizing of stigma associated with treatment of mental health issues. The challenge now is in developing programs that both function as prevention and treatment, or specific ones. It is also necessary to find ways to make this kind of treatment available and attractive for a wide range of adolescents.

Conclusion

The psychometric properties of the Norwegian version of the Junior Temperament and Character Inventory emerged as satisfactory among students ranging in age of 15-18 years. The JTCI also correlates to scores on depressive symptoms, self-esteem, and self-efficacy, indicating good validity.

Evaluating the characteristics of MoodGYM users proved to be a challenging task. A very low number of participants used the program in our trial, and of those using it, very few completed it. The low uptake made it difficult to investigate the effect of tailored e-mails and reminders and to draw a detailed and valid picture of those using the program. Anyhow, some information resulted from this that hopefully can contribute in the further development of ICBT-interventions concerning design, method and mode of dissemination among the younger population.

Our findings of the predictive value of personality characteristics for depressive symptoms underline the importance of personality in adolescent depression. Assessing the way of thinking, organizing, and adapting to experience seems to play a central role in understanding precursors to the development of depression in this age group. With the genetic heredity also playing a role, the JTCI might prove to be a useful tool in mapping and understanding of adolescent depression. For the use of personality in predicting use of the MoodGYM program, results are not conclusive. There seems to exist a pattern of personality characteristics among those using it that might aid us in the further development of appealing, user-friendly and effective interventions.

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