Linköping Studies in Arts and Sciences No 806
Linköping Studies in Behavioural Science No 227

JUST KNOW IT

The role of explicit knowledge in internet-based cognitive behaviour therapy for adolescents

LINKÖPING UNIVERSITY

Matilda Berg

Just know it

The role of explicit knowledge in internet-based cognitive behaviour therapy for adolescents

Matilda Berg

Linköping Studies in Arts and Sciences No. 806
Linköping Studies in Behavioural Science No. 227
Faculty of Arts and Sciences
Linköping 2021

Linköping Studies in Arts and Sciences • No. 806
Linköping Studies in Behavioural Science • No. 227

At the Faculty of Arts and Sciences at Linköping University, research and doctoral studies are carried out within broad problem areas. Research is organized in interdisciplinary research environments and doctoral studies mainly in graduate schools. Jointly, they publish the series Linköping Studies in Arts and Sciences. This thesis comes from the Division of Psychology at the Department of Behavioural Sciences and Learning.

Distributed by:
Department of Behavioural Sciences and Learning
Linköping University
SE-581 83 Linköping, Sweden

Matilda Berg
Just know it
The role of explicit knowledge in internet-based cognitive behaviour therapy for adolescents

Edition 1:1
ISBN 978-91-7929-687-2
ISSN 0282-9800
ISSN 1654-2029

Cover by: Ida Wallin
Printed by: Liu-Tryck, Linköping 2021

“Alla dessa dagar som kom och gick,
inte visste jag att det var livet”

Stig Johansson

ACKNOWLEDGEMENTS

Min tid i forskarvärlden har alltid existerat parallellt med en annan värld - sagovärlden. Ni vet där det finns kungar och drottningar, prinsar och prinsessor, drakar, hjältedåd, skatter, jättar och troll. I sagorna finns ju också de stora livsfrågorna om gott och ont, moral, sanning, vänskap och kärlek, frågor som gett mig kraft och inspiration när de akademiska tingen känts för svåra eller övermäktiga. Sagor kan verkligen behövas ibland när man ägnar dagarna åt att förstå sig på effektstorlekar, reliabilitetsmått och statistikprogram. Jag vill därför passa på att rikta ett stort tack till sagovärlden och hur den kompletterat forskarvärlden under mina år som doktorand.

Jag vill också rikta ett speciellt tack till min handledare *Gerhard Andersson* som stöttat och inspirerat mig att våga vara mig själv och att ha roligt under min doktorandtid. Det har varit ovärderligt!
Jag vill också speciellt tacka min bihandledare *Alexander Rozental* för all optimism och allt tålamod. Du och Gerhard har fått mig att ”trust in the force” när jag själv tappat orken och lusten att räkna, tänka eller förstå min egen avhandling.

Och så vill jag även speciellt tacka Ida & Ida. *Ida Flink* för att du ställde upp som min opponent och *Ida Wallin* för din hjälp med att göra omslaget till avhandlingen. Din kreativitet är magisk!

Min doktorandtid har innefattat många hjältar och hjältinnor. Därför, för att hylla både er och sagorna, skrev jag mitt tack till er i sagoform. Tack för alla era stordåd och smådåd, som hjälpt mig på min väg mot doktorstiteln och gjort den meningsfull, fylld av skratt, allvar och medmänsklighet.

Sagan om kampen mot Reviewers vid Linköpings Universitet.

Det var en gång en kall och grå morgon i slutet av mars. Matilda vaknade med ett ryck, kallsvettig och lite lätt vibrerande av ångest. Det var dags. Slaget mot Reviewers var här, igen. Reviewers kunde vara en svårfightad sort då de var många i antal och ofta hade skarpa kommentarer och höga krav. Få klarade sig oskadda ur striden mot Reviewers. Många kände uppgivenhet, självkritik och frustration.
Därav Matildas ångest och den kallsvettiga pannan. Med stort motstånd klev hon upp ur sängen och satte på kaffekokaren. Idag skulle ingen yoga eller kosmosbön hjälpa henne. Bara kaffe. Hon svepte i sig koppen, tog sin laptop under armen och gick ut genom dörren.

När hon närmade sig universitetsborgen såg hon sin (hand)ledare *Gerhard Andersson* stå och konversera med ett gäng kollegor. De skrattade åt något skojigt han precis sagt. Gruppen skingrades och Gerhard tittade upp när Matilda passerade förbi. Han såg direkt hennes vemod och gav henne ett leende.
”Hej på dig Berg, är allt bra med dig?”
Hon sänkte blicken och tvekade först om hon skulle belasta honom med sin oro. Men hon visste att det alltid kändes bättre om hon bara berättade vad hon tänkte på.
”Nja. Alltså jo. Men du vet.. jag är lite osäker på om jag kommer klara av det här.”
Han log igen och lyckades som vanligt få Matilda på bättre humör på bara ett par minuter. De pratade om hennes små orosmoln och tvivel. Gerhard visste precis vad han skulle säga för att saker skulle kännas hanterbara igen.
”Det ska allt gå bra det här Matilda!” avslutade han innan försvann iväg.

Tacksamt gick hon därifrån, lättare i hjärtat och mer modig än innan samtalet. Gerhard fick henne alltid att känna att saker var möjliga och spännande att klara av.
Matilda gick in i byggnaden. Mobilen ringde i fickan. Det var *Alexander Rozental*, hennes andra (hand)ledare som ringde.
”Hej” sa han. ”Jag ville bara kolla läget. Om du behöver något eller undrar något?”.
Matilda log igen. Alexander ringde som vanligt på avtalad tid och visade sitt stöd. Utan hans avstämningar och uppmuntran hade uppdraget varit svårt att klara av.
”Det är lugnt.” svarade hon. ”Lite turbulent i mitt inre kanske, många tankar…”
Alexander var tyst en stund innan han svarade. ”Kan du konkretisera det där du sa med ditt inre? Kan du operationalisera det?”.
Matilda skrattade. Han var rolig den där Alexander. Ett roligt forskarsnille. Med stora mängder självdistans.
”Skämt och sido.” fortsatte han med glimten i rösten. ”Det är klart det känns så just nu. Det här ska ju va en plågsam process!”
Matilda skrattade till igen. ”Tack Alex, som vanligt!” sa hon och la på.

Matilda la ner mobilen i fickan, riktade om sitt fokus och började gå mot personalköket. Hon skulle äta en sista måltid innan slaget med sitt närmsta krigargäng; doktoranderna vid barnbordet. *Tomas Lindegaard* mötte henne vid mikrovågsugnarna och gav henne en varm kram.
”Nämen hej Matilda, va fint att se dig!”.
Hon kände hjärtat slappna av när hon såg honom. Bästa Tomas. Vapendragaren genom alla år. Han var hennes prefrontal cortex när hennes egna försvann. Tänk att det kunde finnas så mycket ömhet och klarsynthet i en och samma person.
”Det är himlans fint att se dig också Tomas!” sa hon och kramade tillbaka.
”Här sitter vi!”. Det var *Anton Käll* som ropade, han som alltid hämtade alla när det var dags att äta och ställde upp i tid och otid. Han satt bredvid hela doktorandligan; *Örn Kolbeinsson*, den varma räddaren-i-nöden pedagogen sitt fantastiska (läs: fanatiska) behavioristsinne, *Mats Dahlin* som var så härlig, skarp och rolig att prata med om livet och forskningens alla olika sidor, *Line Nordgre*n med sin humor och uppfriskande rakhet, lika uppfriskande *Sandra Nyberg* med sin gedigna APA-expertis, den skojigt ironiska och något morgontrötta *Mikael Skagenholt*, *Hajdi Moche* som visste precis när man kunde behöva en extra omtänksam tanke, *Per Andersson* med sin vänliga närvaro, *Ieva Biliunaite* with all her brightness and social competence, och *Nathalie Hallin* som visste allt om fantasins och böckernas underbara värld. Matilda skrattade åt kollegornas forskarskämt och lyssnade på olika frustrationer och förtroligheter. Till doktorandligan tillhörde också *Malin Bäck*, *Lina Viita*, *Stefan Blomberg*, *Anna-Karin Åkerman*, *Robert Persson Asplund* och *Julia Aspernäs*. De var ett fint gäng!
Så dök *Anna Malmquist* (ANNA MALMQUIST!) upp och log det där leendet som alltid nådde ögonen. Hon var en eminent kursledare, och vän. *Kristin Silfvernagel,*

en annan vän, slog sig också ner. Hon hade alltid sett och hjälpt dem alla i deras små och stora behov. Även *George Vlaescu,* den humoristiska och mega-effektiva webmastern anslöt sig till gruppen. Samtalen gick över i samhällsfrågor, pokémon och fotboll. Matilda kände sig glad men blev också mer och mer nervös ju mer tiden gick. Slaget närmade sig.

När hon ätit upp reste hon sig för att hämta en kopp kaffe. Hon blickade ut över salen. Lunchrummet var fullt av människor med olika superkrafter. Hennes ögon mötte *Eva Hammar Chiriac*, som alltid stöttat och stärkt Matilda på alla sätt och vis, *Örjan Dahlström* som hade förmågan att säga precis det man behövde höra för att känna sig trygg, den varma pedagogförebilden *Ulrika Birberg Thornberg,* den ofantligt roliga och träffsäkra *Erika Viklund,* den knivskarpa och omtänksamma *Maria Jannert,* och den färgsprakande *Ann-Charlotte Münger.* Ja massor av kollegor var på plats, gamla som nya. Vid ett bord satt fina *Felix Koch och Anett Sundqvist, Emil Holmer, Elisabeth Ingo, Sally Wiggins, Carolina Lundqvist, Fredrik Falkenström, Mikael Sinclair*, *Stefan Gustafson, Johan Näslund, Doris Nilsson,* och *Hugo Hesser. Robert Johansson* mötte Matildas blick och höjde kaffekoppen till en skål i luften. Hon skålade tillbaka. Hon och Robert hade haft många närande samtal om universum, forskning och konst.
Ali Sarkohi gick förbi henne på väg ut ur lunchrummet gav henne en dikt innan han försvann vidare. Matilda log. Hon var säker på att dikten skulle hjälpa henne om slaget blev tufft. Efter Ali kom diskursanalytikern *Mikael Tholander*. Han var sådär lurig och klurig i blicken som vanligt, alltid redo att starta intressanta diskussioner. ”Jag ska hälsa från *Chato*” sa han innan han försvann vidare. Matilda log igen. Chato var den empatiska f.d. empatiforskaren som uppmuntrat henne till att bli doktorand från första början, för många långa år sedan på psykologprogrammet.
”Hälsa tillbaka!” sa hon och gick tillbaka till de andra.

Slaget närmade sig och det var dags att gå. Doktorandligan reste sig. Matilda fick uppmuntrande ord med sig på vägen, som vanligt.
På väg ut ur rummet mötte hon flera andra kollegor som hälsade glatt. Det var *Britt-Marie Alfredsson* (extra tack för all din trygga, tydliga hjälp inför disputationen), *Fredrik La Fleur, Åsa Wrede, Maria Hugo-Lindén, Anette Larsson*, *Carl Lindström* och *Eva Stolt*. Resten av personalen skulle vara körda utan deras ständiga fixande och hjälpande händer. *Ellinor Sellgren* kramade om Matildas axel och sa lycka till. Ellinor visste hur viktigt det kunde vara med en smula magi i livet.

Nu ringde telefonen igen. När Matilda svarade hörde hon en kör av tjejröster. Det var de tre hjältinnorna *Ella Radvogin*, *Emelie Hjort* och *Anna Svanberg Wärn* från psykologutbildningen. De hade stöttat varandra och haft roligt tillsammans när Matilda behövt det som mest.
”Kör i vind Matbe!” ropade de glatt i kör.

Deras röster påminde Matilda om andra psykologstudenter, alla dem som gjort ett så ovärderligt jobb i deras behandlingsstudier: *Karin Strömberg, Erik Wallner, Maja Näsman, Hanna Åhman, Linn Viberg* och *Josefine de Brun Mangs,* och så *Sofia Engvall* och *Lovisa Mellerby,* som tillsammans rådde hem hela LOA-studien, *Victoria Aminoff, Elise Sörliden, Malin Sellén, Alexandra Glistring, Jennelie Andersson* och *Alma Eide* för allt jobb i LUNA-studien. *Anna Flygare*, *Sofia Palmebäck*, *Linn Hagvall* och *Julia Sjöbrink* för deras insatser i SIA-studien. Och såklart *Sofie Johansson* och *Lina Liljethörn* för deras gemensamma exjobb på psykologprogrammet som bidragit till innehållet i studierna i Matildas avhandling. Matilda kände sig härmed också tacksam för samarbetet med den varma och närvarande *Mikael Ludvigsson,* skarpa och konstnärliga *Andrea Capusan* (jag kommer alltid försöka ha med AUDIT för din skull), och så den enormt uppskattade kliniska handledaren *Maria Zetterqvist.* Matilda tänkte också på *Naira Topooco* och alla insatser hon gjort för tonårsbehandling via nätet, alltifrån layout till behandlingsinnehåll. Hon skickade dem alla en extra tanke för den forskning de gjort tillsammans, och till deltagarna i deras studier. Hon hoppades att de gjort skillnad.

”Jag ska hälsa från några från Partners också” sa Ella innan de la på.
Hon och kompanjonen Ella hade jobbat sina första år i psykologlivet på Psykologpartners, ett annat järngäng i landet. Matilda fylldes av nostalgi och hon mindes sin tid på Partners i Göteborg innan hon blev doktorand och Reviewfighter: *Rebecka Malm* som blev en vän för livet, *Helena Klemetz* med sitt stora(syster) hjärta och nu även medforskare, *Jens Nordberg* med all sin kreativitet och inspiration, *Per-Johan Niemandius* som var en like i poesi, tragik och komik, *Celia Young* som var världens bästa chef, *Hana Jamali* som också var världens bästa chef, mäktiga *Viktor Brune,* dunderduon *Helena Ringnér och Tomas Ringnér,* mjuka och skojiga *Carin Thorngren,* sköna *Johan Andeliu*s, och kloka *Johannes Lundell.* De hade varit Matildas första psykologerfarenhet i arbetslivet. Den tiden hade en speciell plats i hennes hjärta och påverkade henne fortfarande i hennes psykologroll, både inom och utanför Universitetet.
Matilda passade på att skicka ett tack till nuvarande partnerskollegor i Östergötland; *Maria Lind*, *Sonia Buck*, *Fredrik Gunnarsson*, *Julia Ridal, Magnus Stalby*, *Henning Lantz*, *Therese Andersson*, och alla de andra som gjorde skillnad för människor varje dag. Hon tackade *Kristofer Vernmark* för djupet och inspirationen att tro på den stora kärleken!

När Matilda lagt på efter samtalet så stängde hon av mobilen. Det var dags för fullt fokus nu. Hon hoppades att *Viktor Kaldo* och *Jens Högströms* eminenta granskningar av hennes avhandlingsarbete hade förberett henne väl. Och all hjälp från *Martin Pettersson* vid Liu-Tryck!

När hon gick upp för trapporna tänkte Matilda på alla dem där hemma som hon älskade. De tre verklighetsvännerna *Helena Wikner*, systrami until the end of all things, den ömsinte och vise hunken *Claes Johansson*, och det vilt kompetenta underhållningsgeniet *Johannes Ermagan*.
Andra nära vänner därute dök också upp: *Sara Tavakolizadeh* och deras själsliga och världsliga äventyr, barndomsvännen *Cecilia Lundin* som var så rolig att magen ofta krampade av skratt, *Frida Lager* med sina oceanvida perspektiv, kärleksgudinnan *Julia Fries*, kärleksguden *Anders Nilsson,* och nyfunna *Johanna Lindegaard* med sitt skimrande hjärta. Hon tänkte på vikingen *Sebastian Dahl, Clemens* with the eagle-google spirit, den magiska *Menorah Isalind* och hur de alla hyllade varandras egenheter. Må vi alltid få sjunga och leka ihop framför eldar och himlaportar.

Sedan tänkte Matilda på sina kära systrar *Mi* och *Linn,* deras döttrar *Ida, Clara, Lykke*, *Ingrid,* och deras partners *Jacob* och *Markus*. Hon tänkte på älskade *Haide* och den stora saknaden. *Kerstin och Uffe,* paret på Ängskär som alltid varit som en del av familjen, och så *Lotta, Kim* och *Line*. Vilka somrar de haft ihop! Matilda tänkte även på goingarna i familjen *Sturén* och *Nachtweij,* och deras härliga, smittsamma mat-natur-och-rörelseglädje.

Så var trapporna slut och korridoren mot Matildas arbetsrum närmade sig. Matilda tänkte på sin levnadsglada mamma *Annie Åkerstedt Berg* som kunde rädda barn i nöd och i lek, och sin pappa *Mats Berg* som visste allt om värme, bus och filosofiska livsvisdomar. Matilda kände en kärlekstår rulla längs med kinden. Hennes allra käraste föräldrar!

Så var Matilda framme vid sitt arbetsrum. Slutporten. Bakom väntade skärmen, tangentbordet och Reviewkommentarerna. Det var dags!
Innan hon öppnade dörren stannade hon upp och lät hjärtat omfamna den person som fick henne att bli den högsta och bästa versionen av sig själv, varje dag; *Richard Nachtweij.* Kung Richard Lejonhjärta, hennes lekkamrat och livspartner både i verkligheten och i sagorna.
“Jag älskar dig” sa hon tyst för sig själv och slöt ögonen. ”Över alla oceaner, änglamarker och himlajordar”.
Så öppnade hon ögonen igen, gick in genom dörren, mot slaget och ut i verkligheten.

Det som hände därefter gick kanske aldrig till historien. Men tillsammans vann Matilda och de andra doktoranderna många slag mot Reviewers, och personalen på Linköpings Universitet jobbade vidare, sådär lite lagom lyckliga, i de flesta av sina dagar.

ABSTRACT

The role of explicit, declarative knowledge in general health care and in psychotherapy is a growing field of research. In many areas of healthcare, knowledge is regarded as an important factor for successful interventions. Participants within mental-health interventions should ideally gain knowledge about their specific conditions and strategies to improve, in order to manage their problems in more helpful ways. In Cognitive Behaviour Therapy (CBT), explicit knowledge is a core feature when treating clients and educating them about their symptoms, problems and potential solutions. Still, the role of knowledge and its relation to treatment outcome within CBT treatments is unclear. CBT administered over the internet (ICBT), is mainly based on psychoeducative texts and thus provides a suitable format for an initial evaluation of explicit knowledge within a clinical research context. The role of explicit knowledge could be of particular importance in the study of younger target groups, who probably have their first treatment experience. Their knowledge gain and its use could be of importance both as separate constructs but also in relation to symptom reduction following treatment.

The overarching aim of this thesis was to explore the role of explicit knowledge in internet-delivered CBT for adolescents with depression and anxiety.

Study I explored the role of explicit knowledge in a randomised controlled trial with adolescents suffering from primary depression. A knowledge test was constructed and administered at pre- and post-treatment. Results showed that explicit knowledge and certainty of knowledge about depression, anxiety and CBT increased during treatment, but that these variables were unrelated to treatment outcome. Lower pre-treatment knowledge levels (certainty) however predicted greater improvement in depressive symptoms.

Study II describes the procedure of developing a new knowledge test in the context of ICBT for adolescents with depression and anxiety. An explorative factor analysis was performed and resulted in a three-factor solution with the following factors: Act in aversive states, Using positive reinforcement, and Shifting attention. The procedure presented could illustrate one way of creating a test for knowledge evaluation in ICBT, but its clinical use needs to be evaluated further.

In Study III, participants from a randomised controlled trial of ICBT for adolescent depression were asked about their acquired knowledge and knowledge use six months later. Qualitative methodology (thematic analysis) was used. The results showed two overarching ways that clients can remember and relate to CBT-

principles after treatment; one more explicit way related to the active application of CBT principles, and another vague way of recalling treatment content and the passive usage of CBT. Both ways of recalling CBT principles were related to experiencing the treatment as helpful.

Study IV evaluated the role of learning strategies and chat-sessions in ICBT for adolescents with anxiety and depression. A total of 120 adolescents were randomised to one of four treatment groups, in a 2x2 factorial design with the two factors: with or without learning support and/or chat-sessions. Overall, the results showed general reductions of anxiety and depressive symptoms, and increased knowledge levels. Participants receiving learning strategies during treatment obtained more immediate benefits in treatment outcome and knowledge levels, but at six months follow-up participants without learning support had reached equal amounts of knowledge and symptom reduction. Chat-sessions did not add any effect on treatment outcome or knowledge levels.

In conclusion, this thesis suggests that explicit knowledge is a construct that is independent of symptom reduction and increases during ICBT treatments for adolescents with depression and anxiety. Increased knowledge, and increased certainty of knowledge, are valuable outcomes since CBT emphasises educating clients about symptoms, therapeutic principles, and strategies that they can remember and use later on. The lack of association between explicit knowledge gain and symptom reduction could indicate that explicit knowledge is a necessary but insufficient factor for symptom reduction. Adding learning strategies within a treatment programme could be of importance for enhancing short-term treatment effects.

There is a continued need for more research on the role of knowledge in ICBT, both as an outcome and as a way to improve treatment effects. The findings in this thesis however suggest that research on explicit knowledge is important to understand what makes ICBT work.

Keywords: knowledge, Internet-based cognitive behaviour therapy, adolescents, depression, anxiety

LIST OF PUBLICATIONS

I. Berg, M., Rozental, A., Johansson, S., Liljethörn, L., Radvogin, E., Topooco, N., & Andersson, G. (2019). The role of knowledge in internet-based cognitive behavioural therapy for adolescent depression: Results from a randomized controlled study. *Internet Interventions, 15,* 10–17.

II. Berg, M., Andersson, G., & Rozental, A. (2020). Knowledge about treatment, anxiety, and depression in association with internet-based cognitive behavioural therapy for adolescents: Development and initial evaluation of a new test. *SAGE Open*, *10*, 2158244019899095.

III. Berg, M., Malmquist, A., Rozental, A., Topooco, N., & Andersson, G. (2020). Knowledge gain and usage of knowledge learned during internet-based CBT treatment for adolescent depression. A qualitative study. *BMC Psychiatry, 20,* 441.

IV. Berg, M., Rozental, A., de Brun Mangs, J., Näsman, M., Strömberg, K., Viberg, L., Wallner, E., Åhman, H., Silfvernagel, K., Zetterqvist, M., Topooco, N., Capusan, A., & Andersson, G. (2020). The role of learning support and chat-sessions in guided internet-based cognitive behavioural therapy for adolescents with anxiety: A factorial design study. *Frontiers in Psychiatry, 11,* 503.

CONTENTS

INTRODUCTION

Let us imagine that you are about 17 years old. Lately, or for a longer period of time, school has become a struggle and you feel disconnected from your friends. The situation has become overwhelming. You have trouble sleeping, you avoid situations and activities that you used to enjoy, and your thoughts are weary and highly self-critical. You find yourself irritable most of the time and you do not really recognize yourself anymore. Sometimes you experience intense fear and feel as if you are going to die from a heart attack. You are ashamed of your reactions and do not want to talk to anybody about it. You do not want to see a therapist either, since you have bad experiences from seeking help previously, or doubt that anyone will understand you anyway, or you just lack motivation to seek help at the moment.
Then, one day, you come across information about a research project that will evaluate internet-based cognitive behaviour therapy (ICBT), a therapy form where you can read texts about depression and anxiety and do exercises while receiving weekly support from a therapist. It is for free and you can live anywhere in Sweden since it is online. You decide to give it a go; it can't hurt to try?

This imagined individual is a "typical" participant in the studies of this thesis. At the end of our internet treatments we, as healthcare practitioners and researchers, want these young participants to feel better. The main goal is to reduce their symptoms of anxiety and depression and change maladaptive strategies to more adaptive ones.
Further, we also hope that these young participants *learn* something during therapy, and that their participation in ICBT results in knowledge that they can use and apply in their everyday life. The online treatments include a lot of psychoeducative information, rationales, and texts about symptoms and solutions from a cognitive behavioural therapy (CBT) perspective. By reading and applying the texts, we want to equip these young clients with knowledge and skills that they can remember and use, so that they do not relapse or feel lost when new problems arise in life.

In psychotherapy research, we know that ICBT can reduce symptoms (Ebert et al., 2015; Vigerland et al., 2016). However, we know less about what clients actually learn in treatment and if knowledge gain and learning is connected to better outcomes. Therefore, this thesis focuses of the role of knowledge in ICBT for adolescents. Hopefully, the thesis will contribute to the knowledge field of ICBT and thus to research that aims to improve the mental health of young help-seeking individuals who suffers from depression and anxiety.

1. Why is knowledge important to evaluate in internet-based CBT?

"*One hypothesized active ingredient in a psychoeducational oriented treatment, is the degree to which clients exhibit mastery of the knowledge that is thought to be important for a particular treatment*." (Scogin, 1998, p. 475).

The role of knowledge and learning is a core feature in psychotherapy and CBT, but a scarce area of research. Some studies have, however, begun to explore what clients *actually* learn during therapy and in what way knowledge is connected to successful therapeutic outcomes (Andersson, 2016; Harvey et al., 2014).

Educating clients about their symptoms, problems, and possible solutions is an almost ubiquitous procedure in general healthcare. This is partly based on the assumption that knowledgeable clients will have more successful outcomes (Lukens & McFarlane, 2004; Tursi et al., 2013). Many interventions within general healthcare focus on psychoeducation, i.e., to equip clients with condition specific knowledge in ways that subsequently will help them manage their mental health problems by preventing maladaptive cognitions and behaviours as well as help them engage in more adaptive ones (Sajatovic et al., 2007; Tursi et al., 2013). Psychoeducation can in its simplest form be given in brochure form, or be administered by a therapist in a treatment context. It can be given face-to-face (Lukens & McFarlane, 2004) or via computer and the internet (Fox, 2009).

There is strong support for the positive effects of psychoeducational interventions, especially in cancer and schizophrenia (Lukens & MacFarlane, 2004; Bevan Jones et al., 2018). Psychoeducational interventions have also been shown to reduce depressive symptoms, increase adherence to treatment and improve psychosocial function in depression (Tursi et al., 2013). In bipolar syndrome, in combination with medication, it can improve adherence to treatment (Gonzalez-Pinto et al., 2004). One problem, however, is that studies seldom have evaluated knowledge as an outcome (Lukens & McFarlane, 2004; Tursi et al., 2013). Thus, the intended aim to reach an increase in knowledge is fairly unknown, with some exceptions. For instance, studies within patient education in internet-based somatic care show that knowledge can increase as a result of psychoeducation (Fox, 2009), as well as studies on bipolar disorder (Rouget & Aubry, 2007). Less is known about the effects on knowledge gain in the context of therapy.

The importance of knowledge and learning is also emphasized in the literature on mental health literacy. This research area aims to educate the general public about risks, symptoms, and treatment options to lessen stigma, increase help-seeking behaviours, and prevent mental health issues (Griffiths et al., 2009). Over the

years, researchers within mental health literacy and in somatic care have investigated how to ensure that the interventions result in improved knowledge, and how knowledge gain can be measured in an objective, reliable way (Lukens & McFarlane, 2004; Wei et al., 2013; O'Connor & Casey, 2015).

Despite the emphasized importance of knowledge in general healthcare, few studies evaluate what clients actually learn during psychotherapy and if knowledge gain is important for symptom reduction. There is research indicating that clients tend to forget about content learned during therapy, and/or that they remember the content incorrectly, and that poor memory of treatment content can be related to less improvement in outcomes (Gumport et al., 2015; Zieve et al., 2019). Thus, there is a need to evaluate knowledge gain and its relation to treatment outcome during therapy further, in order to understand more about why and how clients benefit from psychotherapy and if gaining knowledge is of importance to improve.

Evaluating what clients learn, know, and remember during and after therapy is of particular interest in psychotherapies based on traditional CBT, and especially in ICBT (Harvey et al., 2014; G.Andersson, 2016). With the increasing acceptance of CBT and ICBT as effective treatments for a range of conditions there has been increased interest in understanding its active components and thus how to isolate and evaluate factors that contributes to treatment outcome (G.Andersson, 2018). The role of knowledge in CBT or ICBT has rarely been evaluated, despite its emphasis on educational components. This is a bit surprising, since one main aspect of CBT, and in particular ICBT, is to provide clients with knowledge such as facts, information, rationale and instructions that they can use and apply in their everyday life. ICBT is based on psychoeducative texts, along with other interventions and exercises that target behaviour change, with an aim to provide clients with knowledge that helps them gain insights and master their symptoms and life-situations in a more adaptive way (Friedberg et al., 1998; Scogin, 1998; G.Andersson et al., 2012). Despite this, the role of knowledge gain and its importance have rarely been studied in ICBT, with the exception of a few studies (G.Andersson et al., 2012; Strandskov et al., 2018). In face-to-face cognitive therapy, some studies indicate that learning and treatment outcomes can improve by isolating and strengthening learning processes during treatment (Zieve et al., 2019).

Thus, there has been a discrepancy between what is assumed to be important in CBT treatments and the amount of attention it has been given in research. Given the emphasis on educational components in ICBT it is reasonable to evaluate its role further. This thesis will focus on the role of explicit knowledge in ICBT treatments, since ICBT relies mainly on informative texts and that clients gain

knowledge bout CBT by reading and applying knowledge learned from the texts. Clients are assumed to read and understand the material and then use it in real life situations. In contrast to face-to-face CBT, therapists in ICBT can have a greater difficulty monitoring what clients learn during therapy since the texts are the main source of therapeutic instructions (not the therapist themselves). This makes knowledge acquisition particularly interesting to evaluate in ICBT. Also, in ICBT, all clients receive the same material which makes knowledge provision and its effects easier to isolate and evaluate, compared to face-to-face therapies where psychoeducation is more integrated and adjusted to the problems expressed by the client during the sessions. ICBT has been described as an ideal context to evaluate knowledge and learning (Harvey et al., 2014).

Further, based on its format and structure, ICBT can be viewed as a form of online patient education. In all educational contexts, there is a need to determine and specify indented learning outcomes and evaluate whether participants actually gain that knowledge (Kirkpatrick & Kirkpatrick, 2006; Anderson et al., 2001). Given that knowledge provision is a distinct feature in ICBT, and that the treatment format relies on the educational components of CBT, it should be evaluated accordingly.

2. What is knowledge?

Knowledge is a multifaceted concept with various definitions. Throughout the history of philosophy, a range of theories and perspectives have been used to define and capture what knowledge *really* is. Knowledge can be viewed as a "state of mind, an object, a process, a stipulation of having access to information, or a capability" (McCall et al., 2008, p. 79). Thus, knowledge can be related to many things; it can refer to what a dancer does when performing pirouettes, when a teacher explains a mathematical equation, or when an individual uses information about economics to make a decision about where to place money.

A traditional epistemology (i.e., the study of knowledge) that is fairly adopted today defines knowledge as a "well, justified belief" (Gustavsson, 2000). Thus, knowledge contains both truth and belief, and we know something when we have justified reasons to believe our understanding of a phenomena or factual situation is true. A common way to categorize knowledge is Aristoteles's three forms of knowledge: episteme, techne and fronesis (Gustavsson, 2000). Epistemene is knowledge needed to understand how the world works, techne is knowledge needed to produce or create, and fronesis is needed to develop good, ethical judgement as a citizen in society.

It is beyond the scope of this thesis to cover all ways to characterize knowledge or how individuals can represent knowledge, but I will summarize some definitions and distinctions which are relevant in this thesis. The studies in this thesis are performed in the context of ICBT, and thus how knowledge can be operationalised and evaluated in relation to psychological interventions, see below.

2.1 Declarative and non-declarative knowledge

One common distinction in cognitive psychology is between *declarative* and *non-declarative* aspects of knowledge. Several models of knowledge separate knowledge that is consciously and mentally represented/accessible, from knowledge that is represented in observable behaviours and procedures that we are not necessarily aware of. For instance, these two knowledge systems have been labelled *declarative* versus *procedural knowledge* (Binder, 1999), *declarative* versus *non-declarative knowledge* (Haladyna, 1994), and *explicit* versus *implicit knowledge* (Brewin, 1996). Declarative explicit knowledge involves episodic and semantic information that is consciously available for us and that we can explicitly express and articulate. Implicit knowledge, or non-declarative knowledge, contains perceptual and procedural representations beyond our conscious awareness, such as habits, skills, and automatized behaviours (Squire, 1992;

Brewin; 1996). Broadly speaking, this distinction refers to the difference between knowing something intellectually, and (or) knowing something through behaviours and performed procedures. Further, most of these models include other forms of knowledge, such as *meta-cognitive knowledge* (Söderström & Björk, 2015; Anderson et al., 2001) or *self-reflective knowledge* (Benett-Levy et al., 2009). These forms of knowledge refer to knowledge about what you know and thinking or reflecting about your own thinking and learning.

This thesis will focus on the cognitive, declarative, explicit aspects of knowledge, i.e., knowledge that we are consciously aware of and able to recollect from our memory, which we can declare with words. This way of defining knowledge is compatible with an information-processing approach common in cognitive psychology i.e., that knowledge can be encoded and stored in memory as mental representations that can be elaborated, transformed, retrieved, and used (McCall et al., 2008; Wilson, 2004). Another important concept is *constructive knowledge.* Constructive knowledge highlights the current notion within education that individuals are active, co-creators of their own knowledge and thus not passive receivers of quantitative bits of information (Anderson et al., 2001; Hattie, 2008). Individuals know and relate to what they know, constructing new knowledge from instructions and information, rather than only receive and add information to their memory.

2.2 Levels of knowledge

An additional way to categorise knowledge is to differentiate between levels of knowledge. There are several taxonomies within pedagogy and educational research that distinguish basic forms of knowledge from more advanced levels. For example, Hattie (2008) in his review of over 800 meta-analyses on the most effective interventions in education, referred to a model that divides knowledge into three levels: 1) surface knowledge 2) deeper understanding and thinking ability, and 3) constructive knowledge. Surface knowledge refers to basic facts and single units of knowledge, often the first step when learning something new. Deeper understanding refers to a level where knowledge concerns interrelations between different units and facts and understanding how they are related and integrated into a whole. Constructive knowledge includes knowledge that goes beyond accepted, confirmed or established knowledge and reflects a capacity to make critical reflections or draw new conclusions. This level is about going beyond the given answer to create new predictions and hypotheses based on previous knowledge.

This thesis will use a common and well-recognized taxonomy within pedagogy to define different levels of knowledge similar to the taxonomy of Hattie (2008), i.e., the revised version of Bloom's knowledge taxonomy by Anderson et al. (2001). The taxonomy specifically aims to categorise all kinds of explicit knowledge within four different levels on a dimension from concreteness to abstraction, with an aim to clarify how knowledge can be evaluated within educational contexts.
The first and most basic level is *factual knowledge*, that refers to knowing basic elements within a field. The second level is *conceptual knowledge,* that refers to knowing how the basic facts are interlinked and are related to each other, into patterns, theories, models, and principles. The third level is *procedural knowledge* and includes knowledge about how to do something and when to use it. The fourth and final level is *meta-cognitive knowledge,* that, as mentioned, refers to knowledge about one's own knowledge and cognitions (Anderson et al. 2001).

Further, the revised taxonomy of Bloom includes a cognitive dimension that distinguishes between different ways of *using* knowledge along a dimension of complexity (Anderson et al., 2001). Knowledge can be used by *remembering* (i.e., recognition, recall), *understanding* (i.e., classifying, interpreting), *applying* (apply knowledge on concrete situations)*, analysing*, *evaluating,* and *creating* knowledge. The cognitive dimension highlights that there are various ways to know and use knowledge, ranging from recognising facts, understanding a procedure, to creating a principle and apply it in a new situation.

2.3 Knowledge verses learning

Learning and knowledge are closely connected and sometimes used as synonyms. Hattie (2008) regards knowledge and learning as synonyms when he distinguish levels of surface, deep, and constructive forms of knowledge/learning.

As with knowledge, learning can be divided into declarative or behavioural forms. Söderström and Björk (2015) separated *verbal learning* (i.e., solve mathematical problems or geometry) from *motor learning* (type, play, basketball, sew). They defined learning as a *change in knowledge or behaviour* that can be retrieved and accessible across longer time-periods and across various situations. Thus, learning occurs when changes in knowledge or behaviours can be used in a flexible way, in situations beyond the given moment that knowledge is acquired. Changes in knowledge (or behaviour) should, according to them, be relatively permanent in order to be labelled learning. Learning is not to know something occasionally, but something that can be retrieved and applied in various situations.

Hattie and Donoughe (2016) also described learning as a *change, between levels of knowledge*. According to them, learning occurs when knowledge is transformed from basic levels of information, to deeper levels of understanding or when individuals can go beyond given information and use knowledge to explore other ideas or apply it in new situations.

Importantly, what is supposed to be learned, and when learning occurs, depends on the context. According to Kirkpatrick and Kirkpatrick (2006), all training programs need indented learning outcomes which should be specified and evaluated accordingly. They defined learning similar to Söderström and Björk (2015) as well as Hattie (2008), but briefer. They defined learning as *any* increase in knowledge connected to the specific training program that is evaluated. Kirkpatrick and Kirkpatrick (2006) clearly separated learning outcomes from behaviours and suggested that practitioners should evaluate these two outcomes separately, i.e., have outcomes of declarative knowledge *and* behaviours.

Subsequently, this thesis operationalises learning as positive *changes* in explicit declarative knowledge following specific ICBT programs. This definition is in line with Söderström and Björk (2015), Hattie (2008), and Kirkpatrick and Kirkpatrick (2006) who all somehow focused on declarative aspects of learning and how these mental changes can be captured and measured accordingly. Thus, the focus is not on learning as changes in observable procedural knowledge learned during CBT.

2.4 Summary: Definition of knowledge in this thesis.

To summarise, this thesis defines knowledge as explicit, declarative knowledge within the context of ICBT for adolescents. Further, to separate from different forms of explicit knowledge, the revised taxonomy by Anderson et al. (2001) is used, which includes four knowledge levels: facts, concepts, procedures, and meta-cognition. The thesis will specifically focus on explicit knowledge about the facts and concepts of CBT provided within our online treatment materials, and whether this (theoretical) knowledge can be learned (increase) or manipulated during participation in an ICBT treatment. Acquired knowledge is something we will derive from what the clients say, write, and respond on our measures of knowledge in connection to the internet programs.

3. What is explicit knowledge in internet-based CBT?

"*Like thinking about the long-term consequences of skipping school for example, now I can understand why it's not so nice doing certain things even if it is a relief there and then when you do it. I had not realised*
that.. like.. before.. that.. yeah.. that it may not be so good for you in the long run."
[Participant, Study III]

3.1 Declarative verses non-declarative knowledge in CBT

Psychotherapy has been described as a learning process (Sacturo, 2010) with the purpose of engaging clients in new adaptive learning experiences (Brewin, 1996). As mentioned, in CBT clients are supposed to feel better, but also to acquire knowledge that subsequently will help them cope better with daily difficulties and reduce symptoms. One goal of therapy has been declared as helping clients to become their own therapists (Strunk et al., 2016).
Brewin (1996) applied the above-mentioned distinction between declarative and non-declarative aspects of knowledge in CBT for depression and anxiety. For example, after participating in an ICBT trial, participants might know, explicitly, about symptoms of anxiety and have access to the verbal instructions on how to gradually challenge them. They might also know, implicitly, how to challenge fearful situations as a set of actions that are performed, rather than explicitly formulated as verbal instructions (only). Brewin (1996) described that CBT includes interventions that specifically target and alter both non-declarative knowledge as well as declarative, verbally accessible knowledge. According to Brewin (1996), non-declarative knowledge is targeted by altering behaviour, for instance, by letting clients enter previously avoided situations until they learn that anxiety is not dangerous. Declarative knowledge is targeted through interventions that modify cognitions, with the aim to increase awareness of maladaptive thoughts and dysfunctional self-managing strategies and how to challenge them.

A similar distinction between declarative and behavioural knowledge within CBT has been made by researchers who evaluate training programs for CBT psychotherapists (Westbrook et al., 2012). These researchers distinguish declarative from procedural knowledge systems and add a third form of knowledge: *self-reflective knowledge* (similar to the meta-cognitive knowledge level in Anderson et al. 2001). They pinpoint that interventions such as lectures or reading strengthens declarative knowledge about CBT, whereas interventions such as role-play strengthens procedural knowledge. Since ICBT is based on texts and the main way to learn ICBT is through reading, it is reasonable to evaluate its effect on declarative knowledge.

Importantly, declarative and behavioural knowledge are dependent on each other in CBT. It has been suggested that declarative knowledge gain is necessary to enable implementation (procedural knowledge) of CBT techniques in real-life, i.e., that improvement in declarative knowledge suggest some progress toward the ability to implement CBT in practice (Bennett-Levy et al., 2009; see McCall et al., 2008 for the same theory applied in other contexts than CBT). According to the theory of experimental learning, a well-recognised theory of learning in CBT, learning occurs when explicit ideas and knowledge are tested and applied in real life (Bennett-Levy et al., 2009; 2004). It is thus necessary to have some knowledge to apply, and meaningful learning of therapeutic content is achieved by applying and testing the knowledge in real life. However, how declarative and procedural knowledge are linked to each other during CBT is so far based on theoretical assumptions, rather than empirical research.

3.2 Psychoeducation

One evident aspect of declarative knowledge in CBT and specifically in ICBT is *psychoeducation*. Psychoeducation is an inherent part of CBT and clients are not only encouraged to do things differently, but, as CBT progresses, also encouraged to *learn and understand* the CBT principles before they are tested.
In CBT, psychoeducation is the delivery of theoretical information about salient cognitive behavioural principles fundamental to a certain condition (Friedberg et al., 1998). This can be information about symptoms and their causes from a CBT perspective, CBT principles, and models connected to the targeted condition, as well as information on how individuals stay well according to CBT. Some researchers define psychoeducation as the initial, orienting information about prevalence, course, and treatment options for mental health problems, and distinguish it from knowledge about treatment content related to certain CBT models or interventions, such as cognitive restructuring (Zieve et al., 2019). Other researchers highlight that psychoeducation is more than the initial orienting information, and that it is not only about providing information to the clients, but to actively engage and empower them in their own treatment (Stafford & Colom, 2013). Some include personalized feedback in association with psychoeducation (Donker et al., 2009). Psychoeducation has been divided in to active and passive forms. Active psychoeducation refers to psychoeducation that is facilitated by a professional, that includes interaction with the client, whereas passive psychoeducation refers to the provision of materials that individuals assimilate on their own (Donker et al., 2009).

The purpose of psychoeducation in CBT has been described differently, i.e., whether it is provided for motivational reasons, to improve engagement in the treatment (Beshai et al., 2019), or to correct misconceptions (Cash & Hrabosky, 2003) and increase actual knowledge gain of treatment principles (Friedberg et al., 1998; Strandskov et al., 2018). The aim with psychoeducation is however, overall, to help clients cognitively master, understand and become aware of their problems and potential solutions, rather than engaging them in emotional transforming experiences, although psychoeducation as a separate intervention can be considered to bring about effective change (Sajatovic et al., 2007).

As mentioned, psychoeducation can result in improved treatment adherence and psychosocial functioning for adults with depression (Tursi et al., 2013), and reduce symptoms of depression and psychological distress in adolescents (Donker et al., 2009). But the unique effects and its role in CBT is fairly unknown. For instance, psychoeducation has been found equally effective as CBT in a group treatment of patients with bipolar disorder (Parikh et al., 2012), but less effective than CBT when treating health anxiety (Newby et al., 2018).
In research on ICBT, ICBT with guidance is often more effective than ICBT with no guidance (Baumeister et al., 2014), indicating that it is not the psychoeducative texts only that are the active components, but in combination with therapeutic support. Some research show that focus on learning and training of specific skills can be more effective than psychoeducation (Kim & Mueser, 2011; Farmer & Chapman, 2016). It is however unknown how much psychoeducation within CBT and ICBT contributes to treatment outcomes, and if psychoeducation results in increased knowledge and understanding.

3.3 Treatment rationale

Psychoeducation is closely connected to *treatment rationale* (Friedberg et al., 1998). A rationale can be defined as a schema that contains the conceptualization of factors connected to the clients' problems and how symptoms can be decreased and managed (Ahmed & Westra, 2009). A rationale answers two critical questions: why am I feeling this way and what can I do about it? (Addis & Carpenter, 2000). The rationale can give hope and credibility to the specific treatment and lessen potential confusion. Ahmed and Westra (2009) referred to studies that demonstrated that systematic desensitization (a CBT treatment technique for phobias) was more effective with rationale that without it, and that systematic desensitization with therapeutic rationale but without the technical elements was as effective as providing systematic desensitization. A positive response to and understanding of the treatment rationale has been connected to more positive outcomes in therapy when treating, for example, social anxiety

disorder (Ahmed & Westra, 2009) and obsessive-compulsive disorder (Abramowitz et al., 2002). The common focus in research has, however, been positive expectancy and acceptance of rationale rather than evaluating actual learning outcomes of receiving a rationale and its relation to treatment outcome. As with research about psychoeducation, there is a gap in research whether rationales increase knowledge and whether learning the rationale is important for therapeutic success in CBT.

3.4 Viewing declarative knowledge in (I)CBT through a pedagogical lens

Finally, if applying the revised version of Bloom's taxonomy on ICBT (the definition framework of explicit knowledge within this thesis), *factual knowledge* could be facts about symptoms and mental health, for example knowing that irritability can be a symptom of depression or that anxiety is a non-dangerous feeling. *Conceptual knowledge* could be knowledge about how behaviours are linked to short- and long-term consequences within applied behavioural analysis, or how negative thoughts are linked to how we feel within the rationale of cognitive restructuring. *Procedures* could be knowledge about how to gradually perform a graded exposure exercise or how to structurally incorporate energising activities into a mood-diary within the intervention of behavioural activation. *Meta-cognition* could be knowledge about what the participant herself knows about her knowledge level, knowledge gaps and what she needs to know more about, for instance reading more about safety behaviours before performing a graded exposure exercise. Meta-cognitive knowledge is in line with the notion of Strunk et al., (2016), highlighting that therapy should help clients to become their own therapists. As mentioned, this thesis focuses on the first two levels, i.e., facts and concepts of CBT within ICBT treatments, but also recall and recognition of procedures.

Taken together, declarative knowledge in CBT and ICBT is a core feature, but its role and effects on knowledge gain and its connection to therapeutic outcomes are fairly unknown. Further, there is a lack of research that clarifies more specifically what clients are expected to learn, with some exceptions (Friedberg et al., 1998; Scogin et al., 1998; G.Andersson et al., 2012; Strandskov et al., 2018; Harvey et al., 2014). G.Andersson et al. (2012) and Strandskov et al. (2018) constructed items based on the specific treatments' content and tested whether knowledge increased during ICBT for adults. In studies by Harvey and her colleagues (2016; 2018) a predetermined list of therapeutic points related to treatment content has been used in order to evaluate clients amount of learning in the context of CT for adults with depression. These are ways of clarifying what

clients are supposed to learn during therapy, and to evaluate whether clients do acquire the indented knowledge outcomes.

Taken together, previous research has partly failed to identify specific declarative CBT knowledge that may change during participation in an ICBT programme, which could prove helpful when developing and structuring the treatment formats.

4. How can knowledge be measured in ICBT?

"We are clearly not measuring what we teach to our patients"
Friedberg (1998, p. 46)

4.1 Measuring knowledge in general healthcare

In order to evaluate the role of explicit knowledge we need to measure it. To our knowledge, measures of knowledge gain are generally lacking in psychotherapy research. In general healthcare, however, attempts have been made to measure explicit knowledge gain within studies. For instance, studies within internet-based somatic care have evaluated explicit knowledge as an outcome within the framework of psychoeducation and the concept of patient education (Fox, 2009; Ryhänen et al., 2010). These studies mainly measure knowledge via short self-designed knowledge questions. For example, Bartholomew et al. (2000) measured knowledge through three open-ended recall questions about cognitive steps in handling asthma and coded the number of correct answers (for instance; *what can you do to stop an asthma problem before it starts?* 0-4 points). They also constructed a knowledge test with true and false statements targeting procedural knowledge, i.e., what to do and how to do it. They briefly mention a Cronbach's alpha of α =.73. Keulers et al. (2007) evaluated knowledge gain during an education program for individuals with carpal tunnel syndrome provided face-to-face or through internet. However, the only details provided about the measure was that it contained statements about the education programme and that a "good" answer was given one point and an incorrect answer was given zero points. Throughout the studies, little information is given about the tests and their psychometric properties, and it is also unclear how knowledge outcomes relate to other outcome measures.

Overall, the reviews of Fox (2009) and Ryhänen et al. (2010) show that knowledge increases with the usage of internet or computer-based patient education programs. Fox's (2009) review included 25 studies that aimed to increase knowledge over a large variety of conditions, interventions, ages and levels of education, and states that knowledge increased in 22 of the programs. Ryhänen et al. (2010) reviewed 14 articles on patients with breast cancer (of which nine were randomized controlled trials) and concludes that knowledge increases during internet-or computer-based patient education.

In studies on mental health literacy, declarative knowledge has mainly been measured by using a few open-ended question or vignettes, where answers are rated by independent coders (O'Connor et al., 2014). For instance, when

evaluating educational interventions for parents about informed consent, Campbell et al. (2004) scored free recall transcripts, giving one score for each bit of accurately recalled information (compared with a predetermined list of intended learning outcome). Another example are studies on adolescents that use self-constructed questionnaires describing scenarios with youths suffering from problems such as depression, social anxiety, or normal life crises (Burns & Rapee, 2006; Coles et al., 2016;). For each vignette, the participants are asked to openly describe the matter in their own words.

Overall, however, researchers studying mental health literacy underscore the need of constructing more robust scales in order to claim efficacy of interventions effect on increased knowledge (Wei et al., 2013; O'Connor et al., 2014). For instance, Wei et al. (2013) conducted a systematic review of 27 studies (17 643 youths between the age of 12-25), evaluating the effectiveness of school mental health literacy programs in enhancing knowledge, improving help-seeking behaviours and reducing stigmatizing attitudes. Even though knowledge increased significantly in most of the studies, Wei et al. (2013) pinpoints that only two studies used validated, objective measures.

Reavley et al. (2014) made an effort to quantify assessment of mental health literacy by creating scales for vignettes in relation to depression, anxiety disorders, and schizophrenia. The scale scoring was based on consensus of experts. Testing the scale scores on data from 6019 individuals over the age of 15, revealed promising results supporting the scale's discriminating validity, i.e., those with mental health disorders or those with a significant other with a problem typically had a higher mean score. Further, the study supports that higher levels of mental health literacy is associated with less stigmatising attitudes such as recognising disorders as illnesses rather than weakness. Further, The Mental Health Literacy Scale (MHLS) has been developed (35 items) to measure all aspects of mental health literacy in a more structured and objective way (O'Connor & Casey, 2015).

Taken together, within general health care, measures of knowledge have been used and explicit knowledge seems to increase as a result of interventions when measured. However, most studies lack descriptions of their test development procedures, and do not provide information about the psychometrics or how increased knowledge relates to other outcomes. Further, quantifying knowledge acquisition and evaluate its association to health-related cognitions and behaviours is important. Research is emerging on how to quantify knowledge acquisition in a more robust and objective way in order to draw valid conclusions about knowledge gains during educative interventions.

4.2 Measuring knowledge in CBT

There are those who have evaluated explicit, declarative knowledge within the framework of CBT and ICBT, although the general research is scarce. Two early studies on *bibliotherapy*, i.e., text-based psychological treatments (such as self-help books) mentioned and began to evaluate explicit knowledge around late 90's (Friedberg et al., 1998; Scogin et al., 1998). Friedberg et al. (1998) evaluated the role of knowledge by testing 123 depressed patients in knowledge of CBT principles. The test was described as a self-constructed, academically inspired test with 28 true or false claims. The researchers found that knowledge increased during treatment but was not correlated with changes in depressive symptoms. Scogin et al. (1998) found similar results when they compared level of knowledge in 99 depressed patients who received a self-help book about cognitive therapy and 22 patients who did not receive the self-help book. Knowledge of cognitive therapy increased for the group with the self-help material, and it was possible to distinguish the groups from each other by using the results from the test, but they found no correlation with any of the depression measures. The test was also constructed for the purpose of the study, with 21 claims about depression and cognitive therapy. Together, these two studies show that theoretical knowledge can increase as a result of reading text-based treatments, but without any relation to treatment outcome.

Since then, other researches have continued to measure what clients actually learn and remember of their treatments in CBT. Harvey and colleagues (2014) published a review on the importance of measuring what clients remember and learn during treatment, partly due to the generally poor client memory of treatment content and its potential connection to less beneficial effects of treatment. Since then, they have conducted several studies on how memory and learning of treatment content can be measured and supported during therapy, often in the context of cognitive therapy for adult depression (Gumport et al., 2015; Gumport et al., 2018; Harvey et al., 2016).

Instead of using multiple-choice tests, they measured explicit acquisition of treatment content through free-recall tasks and open-ended questions related to vignettes. For instance, they asked patients to write down what they remembered from treatment during 10 minutes and compared the answers with a predetermined list of treatment points (Dong et al., 2017; Harvey et al., 2016; Lee & Harvey, 2015). Then the answers were scored by coders in number of correctly remembered treatment points.

Further, these researchers measured *learning* by asking clients about their thoughts and treatment application the last 24 hours or the last week (Gumport et al., 2015; 2018). They also measured learning by asking the clients what they

would think or do connected to hypothetical scenarios, and then code the amount of correctly generalised treatment points (Gumport et al., 2018). Here, they used items from the Ways of Responding Questionnaire that was developed to assess patients amount of cognitive coping skills (WOR; Barber & DeRubeis, 1992). WOR is a thought-listening procedure where clients are asked to imagine what they would think or do in hypothetical scenarios. Responses are rated as positive if they are similar to what is learned in therapy, and negative or neutral if not.

Harvey and colleagues have also evaluated the relationship between clinical outcomes and outcomes of remembered and learned treatment points and found mixed results. Some studies found a connection between remembering treatment content and reduced symptoms (Lee & Harvey, 2015), or mechanisms related to symptoms (Zieve et al., 2020), but not others (Harvey et al., 2016; Dong et al., 2017). In these studies, no connection could be found between outcomes of memory, learning, and mood outcomes. The researchers highlight that the results showed promising effect sizes in a positive direction, and that lack of power could explain the non-significant results.
Further, Gumport et al. (2015) found that generalization of learned treatment points predicted lower rates of depression but this was not replicated in a later study, where the number of accurate treatment thoughts predicted depression outcome instead (Gumport et al., 2018). These results thus show that there are inconsistent associations between different measures of learning and treatment outcome, and suggests that correlations between recall of treatment content and treatment outcomes may differ depending on when recall is acquired/measured during treatment. It could be that remembering and learning treatment content is more important in the beginning or during therapy than afterwards, as declarative knowledge becomes more implicit and automatized over time (Zieve et al., 2019; 2020).

Importantly, Harvey et al. (2014) defined learning as the process where change in *behaviour* occurs as a result of experiences when we interact with the world. They did however include changes in cognitive reasoning, thoughts and reported application when they measured learning. Thus, behavioural definitions of learning do not always refer to observable bodily procedures but can include cognitive aspects and verbal responses to a test when operationalised within CBT, i.e., measuring new ways of *cognitively* managing symptoms and problems.

Another example of how explicit aspects of knowledge has been measured in CBT was a study on treatment rationale. Abramowitz et al. (2002) assessed 28 OCD clients understanding of the rationale by providing them reading material and informal quizzes during the first treatment sessions. By using a coding manual, they rated how much the clients had comprehended of the material. They found

that better understanding of the treatment rationale was related to less symptoms of OCD post-treatment, indicating the importance of knowing the rationale to benefit from treatment. However, no more information was given about the content of the specific material, the quizzes or the coding procedure. Further, as mentioned, knowledge gain is rarely evaluated in relation to rationales, and the results from the study have not been consequently confirmed.

To measure procedural knowledge is not the aim of this thesis, yet it can be relevant to mention that it has been measured within CBT trials, mostly in terms of skill usage frequency. For instance, Terides et al. (2016) constructed a 12-item test with an aim to measure procedural knowledge in CBT; Frequency of Actions and ThoughtS questionnaire (FATS). FATS tap the amount of skill usage, such as rewarding behaviours and cognitive restructuring. Higher amount of self-rated skill usage has been associated with better outcomes in depression and anxiety (Terides et al., 2016). Other measures of skill usage are Skills of Cognitive Therapy (SoCT) that contains 8 items asking about the usage of cognitive and behavioural skills the past week on a 5-point frequency scale that both therapists and patients complete respectively. As with the FATS, depressed clients with a higher frequency rate of used CBT skills on SoCT tend to have better outcomes (Jarett et al., 2011). A third example is the Competencies of Cognitive Therapy Scale–Self Report (CCTS-SR) that contains 29 items on mainly cognitive skills rated on a 7-point frequency scale (Strunk et al., 2014). In cognitive therapy, scores on CCTS-SR have been found to correlate and predict outcomes of depression (Forand et al., 2018). Finally, another example on how procedural knowledge can be measured is the Behavioural Approach Test in spider-phobia. Here, approach behaviour is measured as the number of inches to the spider, i.e., how close participants approach feared and previously avoided stimuli (Norton & Weiss, 2009).

Thus, explicit knowledge can be measured in various ways; true/false statements, multiple choice formats, vignettes and open-ended questions with coders that compare responses with a predetermined scoring list. These different ways to measure knowledge all have their pros and cons. The use of open recall tasks can generate answers beyond the given information (Vakil et al., 2018) and thus provide more depth. Meanwhile, open-ended questions can induce bias (Keulers et al., 2007) where multiple-choice tests are a more objective way to measure knowledge levels since they are independent of the opinions of unique coders. Further, free recall tasks have a tendency to result in less information than questions that requires recognition or cues (Gumport et al., 2018).

4.3 Measuring knowledge in ICBT

To our knowledge, only two published randomised controlled trials have evaluated explicit knowledge gain during treatment in ICBT (G.Andersson et al. 2012; Strandskov et al., 2018). In G.Andersson et al. (2012), 204 adult participants with social anxiety disorder were randomized to guided ICBT or a control group. They found that knowledge about social anxiety and its treatment increased significantly. They found a small, significant correlation between knowledge gain and two of the secondary measures of social anxiety, but no correlation with the primary outcome measure. Strandskov et al. (2018) also found increased knowledge as 92 patients with an eating disorder participating in a randomised controlled trial of an ACT-influenced ICBT programme. They found a significant increase in knowledge with strong effect (d = 1.12; the only study that presents effect size on knowledge gain), but no correlation between knowledge improvement and other outcome measures was found. As in the early studies on bibliotherapy, both studies on ICBT measured knowledge via self-designed multiple-choice tests for the treatment-specific problem of 11 and 16 items, respectively.

Importantly, the two tests described above incorporated certainty ratings. This means that the participants rated their level of experienced certainty related to each item on a 3- or 4-point Likert-scale (from "I am guessing" to "I am totally certain"). This is a way to separate guessing from accuracy (G.Andersson et al. 2012; Strandskov et al. 2018). To distinguish accuracy from certainty is done in experimental cognitive psychology, relying on research that shows how certainty can affect individual information-processing (Tiedens & Linton, 2001). Further, incorporating certainty is potentially important in ICBT treatments given that there is a "common-sense" aspect to CBT knowledge, and the correct answer might be easy to guess within a multiple-choice framework. Certainty can also be a of clinical value, since level of certainty could affect whether clients apply the rationale or not (Friedberg et al., 1998). For instance, being certain that anxiety is not a dangerous feeling could help a client to challenge his or her fears during an exposure task. Finally, the relevance of using certainty ratings is supported by arguments from researchers within mental health literacy. For example, O'Connor et al. (2014) addressed the importance of separating what an individual actually knows from their beliefs when measuring knowledge as an outcome.

Other studies have evaluated explicit knowledge about CBT in internet-based contexts. One study within the field of mental health literacy randomized 525 individuals to either a website about cognitive behavioural training, a website with more general information, or a control group (Christensen et al., 2004). The study

used a self-designed test on understanding depression (e.g., *depression literacy*) and CBT principles, and found that CBT knowledge increased via the CBT website and general knowledge increased via the general website. Data from the same trial showed reduced stigmatizing attitudes about depression, but these changes were not mediated by changes in knowledge of cognitive-behavioural principles (Griffiths et al., 2004).

Further, there is a scale for measuring CBT knowledge in Internet-based contexts called the Cognitive Therapy Awareness Scale (CTAS). It contains 40 statements about CBT and how to use CBT techniques (Wright et al. 2002). CTAS has been evaluated in studies without control groups, for instance in one pilot study that investigated the effect of a computer-based CBT program on 96 patients with anxiety and depression (Wright et al. 2002). They also measured self-rated experience of increased knowledge on a 5-point scale. CTAS has also been used in a study on group-based psychoeducation on CBT for anxiety and depression and in epilepsy and comorbid conditions (Macromdimitris et al., 2010; 2011). These studies showed that knowledge measured by CTAS increased significantly after the intervention. They did not perform any analyses on knowledge gain and its connection to other measures, however. Since none of the studies used control groups the results should be interpreted with caution.

Thus, efforts have been made to measure declarative knowledge in psychotherapy. Taken together, results indicate that explicit knowledge can increase during interventions related to CBT and ICBT but is not always related to clinical outcomes. When measured, results have primarily shown no correlation between knowledge and symptom reduction, but too few controlled studies have been done within ICBT to draw any conclusions.

Moreover, other gaps remain. For instance, none of the studies evaluated the role of pre-treatment knowledge, despite that it has been measured at baseline (Andersson et al., 2012; Strandskov et al., 2018). Prior knowledge is known to affect later knowledge acquisition (Shapiro, 2004; Hattie & Donoghue, 2016). Also, qualitative studies focusing on knowledge gain and usage in ICBT are very rare. A meta-synthesis identified 24 studies reporting qualitative data about adult clients' experiences of digital health interventions (Patel et al., 2020). They found three key themes revealing the experienced value of personalizing treatment content to the unique individual, how pre-intervention beliefs such as hope can affect participant engagement, and the importance of receiving personal support in order to understand and engage with the program properly. To our knowledge, only one ICBT study included specific questions about knowledge acquisition, finding that clients with Social Anxiety Disorder can recall content-specific knowledge (Halmetoja et al., 2014).

In conclusion, little is known about what forms of knowledge that can or should be measured in ICBT and whether a certain form of knowledge is of particular interest (for instance, knowledge about management strategies or symptoms, general principles or treatment-specific knowledge). In Kronmüller et al. (2007), knowledge about treatment in 28 depressed clients predicted lower levels of symptoms two years later, in comparison with knowledge about symptoms and coping. Subsequently, the measurement and evaluation of declarative knowledge in ICBT warrants further research.

5. Can knowledge be manipulated in ICBT?

In addition to measuring explicit knowledge and its relation to treatment outcome, it can be of relevance to strengthen and support knowledge gain during ICBT in order to improve treatment outcome. As mentioned, research has shown that clients can have poor memory of treatment content which has been connected to less beneficial outcomes (Harvey et al., 2014; Zieve et al., 2019). Thus, evaluating the role of explicit knowledge is not only about *what* clients learn, but *how* they learn and how ICBT programmes can strengthen learning of core treatment principles and whether it affects treatment outcome or not.
In this case, psychotherapy could learn a lot from research on education and cognition about effective learning, see below.

5.1 Effective learning in education

Much research has been conducted within educational research and in cognitive research on how to make learning more effective for students, i.e., how to manipulate learning in a favourable way through educative interventions. Hattie and Donoghue (2016) stated that the purpose of education is to equip students with *learning strategies*, i.e., knowledge about how to learn and know more efficiently and effectively. Learning strategies can be categorised into *cognitive strategies* such as elaboration to deepen understanding, *meta-cognitive strategies* such as regulate and planning one's own learning process and *motivational strategies* such as increase believes about one's capacity to learn (Hattie & Donoghue, 2016). Since this thesis target cognitive aspects of knowledge and learning, cognitive learning strategies are in focus here.

Overall, research shows that *how* we learn is important for what we actually remember and know later on. For instance, in a synthesis on 228 meta-analysis on learning strategies, Hattie and Donoghue (2016) promoted the importance of strategies that develop both surface knowledge (basic facts and details) and deep knowledge (thorough understanding) and to teach skills of transfer (apply it in new situations). They concluded, however, that learning strategies are effective depending on their aim and must be related to context. The most effective learning strategies can vary depending on the content of the subject, and whether the intention is to strengthen surface knowledge, consolidate knowledge or transfer knowledge. If the aim is to support recall of accurate facts, more basic learning strategies will be more effective, whereas more advanced learning strategies are needed if the focus is to deepen understanding and flexibility. For instance, to acquire surface knowledge, strategies which integrate new information with prior knowledge were found to be effective (d = 0.93), and so

was outlining and transforming (*d* = 0.85). To consolidate surface learning (i.e., make surface knowledge easily available to deeper understanding), rehearsal and memorization were among the most effective strategies (*d* = 0.73). To acquire deep learning, elaboration and organization were the most effective (*d* = 0.75), and to consolidate deep learning seeking help from peers was among the effective strategies (*d* = 0.83), as well as evaluation and reflection (*d* = 0.75).
In order to acquire and consolidate transfer knowledge, strategies targeting similarities and differences were most effective (*d* = 1.32), as well as seeing patterns to new situations (*d* = 1.14).
Hattie and Donoghue (2016) did not explicitly define each strategy and its specific content. Thus, the exact meaning and implication of the learning strategies can possibly differ between studies. Bearing this in mind, research has been done on how to help students learn more effectively, showing that learning strategies can affect learning in various ways. Researchers within psychotherapy have just recently begun to use knowledge about effective learning and apply it in psychotherapy.

5.2 Effective learning in psychotherapy

Some researchers have begun to transfer implications from research made in educational and cognitive research to clinical contexts. Harvey et al. (2014) presented eight cognitive techniques that aim to deepen learning during CBT, inspired from educational and cognitive research. A cognitive support strategy aims to strengthen the memory and learning of what Harvey et al. (2014) call a therapeutic point, e.g., an idea, principle, ability, or experience that a therapist wants the patient to remember or implement.

The purpose of the eight cognitive strategies is thus to strengthen patients' learning about the treatment content and study how the strategies affect mood outcomes. They are based on knowledge such as humans limited capacity to keep information in their working memory (e.g., *encoding* issues), the importance of more in-depth learning to really understand what is learned (e.g., encourage *deep processing*), the difficulties individuals can have in applying what they have learned in new contexts (e.g., *transfer* problems).

The eight strategies presented by Harvey et al. (2014) are: *mobilize attention recruitment;* recruit attention by highlighting that something is important to remember, *categorization;* re-arrange the material in helpful categories/common themes*, evaluation,* processing the material by asking about pros and cons of trying out a suggested technique or compare a treatment point with a hypothetical alternative, *application;* making connections between abstract

concepts and models of therapy to hypothesized or real scenarios, *repetition;* rephrasing, revisiting or restating information*, practice remembering;* practice active retrieval of a treatment point, *use cue-based reminders;* develop cues to facilitate memory of treatment content*,* and *praise recall*; praise correct recall (Harvey et al., 2014).

Harvey and her colleagues have evaluated these strategies in several studies (Zieve et al., 2019). Results point in the direction of improved client recall of treatment content and clinical outcomes when exposed to the cognitive support strategies. According to the researchers some studies have however been too underpowered to reach statistical significance (Harvey et al., 2016; Dong et al., 2017), but one study did reveal significant effects on memory of treatment outcome (Gumport et al., 2018). Thus, results are promising on using strategies to modify explicit memory and learning of treatment content, but more research is needed.

Results from experimental studies on effective learning are in line with the cognitive support strategies presented by Harvey et al. (2014). Söderström and Björk (2015) promoted the importance of supporting learning in a way that makes knowledge *durable* and *flexible,* i.e., that individuals can access what they have learned over time and in various contexts. Flexible and durable learning is arguably important for clients going through therapy.
Experimental studies have repeatedly revealed the importance about using strategies that enable the individual to *actively retrieve and generate their own answers* rather that passively engage in the material, such as re-reading (Söderström & Björk, 2015). When we retrieve information actively ourselves, rather than just re-reading or repeating the material, knowledge becomes more accessible and recallable the next time (Söderström & Björk, 2015). Based on the this research, Björk (2016) introduced the concept of *desirable difficulties* as a guideline on how to make learning durable and flexible. Desirable difficulties in learning are *desirable* since learning lasts and becomes more accessible in various contexts over time. Desirable difficulties while learning should be *difficult* in the sense that it needs to be a bit challenging to learn in order for it to stick and be accessible later on. There are strategies that can feel easy and illusionary effective in the moment, such as re-reading, but is easily forgotten over time. Other strategies can be experienced as frustrating, such as actively retrieve the material in your own words, but strengthens recall over time.

Björk (2016) also emphasized the importance of clarifying intended learning outcome and to make sure that desired outcomes are repeated multiple times in varying forms during the learning process, preferably connected future situations where it will be relevant for the individual to remember them.

Taken together, there are ways to manipulate and strengthen learning of treatment content during the course of CBT. This could preferably be incorporated and used in ICBT.

Finally, when discussing effective learning in the context of CBT, it is important to mention that the theoretical framework of CBT includes various principles of learning. *Classical conditioning* and *operant conditioning* are two central concepts that aim to describe how learning occurs. Briefly, according to CBT learning theory, responses are learned and shaped by associations made between environmental events and internal reactions (classical conditioning), as well as the presence or lack of contingent reinforcement upon behaviour (operant conditioning; Bouton 2007; Wenzel, 2017). Applying learning strategies based on CBT learning theory is thus about finding ways to establish helpful associations and cues that can facilitate retrieval, and to reinforce (encourage, praise, reward) responses defined as relevant learning for the individual. Classic and operant conditioning are inherent parts of CBT and are applied when designing interventions, more or less explicitly and rarely with the clear aim to strengthen declarative knowledge (Radomski et al., 2019; Wozney et al., 2017). They are also used in the treatment manuals of this thesis. The focus in this thesis is however to specify and explicitly evaluate principles of effective, declarative learning in ICBT and will primarily deal with educational and cognitive science, see below.

5.3 Effective learning in ICBT

To our knowledge, no study has yet implemented and evaluated learning strategies in ICBT programmes. There are, however, research on how to make internet health-care programmes more engaging by using *persuasive designs*, i.e., technological strategies designed to shape, reinforce or change certain thoughts, attitudes, and behaviours (Hamari et al., 2014). Persuasive design strategies aim to 1) support primary task use 2) support the interaction between the program and the user 3) supporting change using social influence and guidance, and 4) to increase experienced credibility of the programs (Radomski et al., 2019). Persuasive components can include *reduction* by dividing target behaviour into more simple steps; *self-monitoring* by providing a dairy; *reminders* using automatic messages each week; or using *recognition* by for instance presenting stories from previous participants about the helpfulness of the program (Kelders et al., 2012). Persuasive designs have been found to change a range of desired behaviours or attitudes, such as users' awareness, motivation and consumption behaviours (Hamari et al., 2014). Persuasive designs can also increase participants adherence during treatment programs (Kelders et al., 2012). However, not all studies actually

measure psychological elements but rather discuss them as potential consequences of the intervention (Hamari et al., 2014).

Some persuasive design studies have targeted learning-related outcomes, such as motivating children to read and write through a created game-like intervention using qualitative and observational methods (Lucero et al., 2006). One quantitative study found a significant positive impact of personalised persuasive SMS on 57 students self-regulated learning during an introductory information system course. They used Motivated Strategies for Learning Questionnaire (MSLQ), an 81-item scale that taps frequency of self-regulated learning strategies. A total of 31 items measured student's different usage of cognitive and meta-cognitive strategies, for instance *"When I study the readings for this course, I outline the material to help me organize my thoughts".*

ICBT can been described as a persuasive system including technological components designed to affect the participants behaviours and attitudes toward a goal of improved health (Radomski et al., 2019; Wozney et al., 2017). ICBT includes user interaction with the program and material with therapeutic content with the aim to lessen symptoms. However, the design within ICBT programs vary and the effect of design components on symptoms is fairly unknown. For instance, Radomski et al. (2019) used a persuasive system perspective on ICBT for adolescent anxiety and evaluated persuasive design components by making hypothetical links between the design used within programs and symptom reduction. They evaluated 15 studies on adolescents with anxiety under 19 years of age by analysing 63 informational documents about the technical features used and its intended effects within programs. Radomski et al. found that some persuasive components were commonly reported in programs that had a reducing effect on symptoms, such as self-monitoring, social role (creating a presence of others in the program by videos of peers), and rehearsal. A total of seven treatment studies reported use of rehearsal techniques with the aim to increase understanding and comprehension of the material, using quizzes at the end of the modules or interactive tasks such as connecting different sentences to the correct term, or worksheets including application to inspire deeper learning. However, according to Radomski et al., the components were generally not so well described. They also stated that formal evaluations of persuasive components and its effect on symptoms are lacking and further systematic research is needed on the role of persuasive design components such as rehearsal. A similar review on ICBT for adolescents with depression reached similar conclusions (Wozney et al., 2017) and encouraged future research to use designs such as factorial designs to evaluate the effect of persuasive components on treatment outcomes. Factorial designs enable researchers to evaluate the unique contribution of different factors

within treatments (Watkins et al., 2020), and thus possibly strategies targeting learning of treatment content.

In general, persuasive designs have had the overarching aim to increase engagement and exposure to content (Kelders et al., 2012) rather than strengthen learning of program content. To our knowledge, the evaluation of persuasive design components as ways to manipulate learning of treatment content have not been uniquely and properly evaluated in ICBT.

Harvey et al. (2014) emphasized the unique possibilities of ICBT to experimentally examine the impact of learning strategies on learning and treatment outcomes, by incorporating support strategies within or between online sessions. Based on the above-mentioned research on effective learning, it would be reasonable to test how explicit knowledge gain can be strengthened and supported in ICBT. Inspired by Hattie and Donoghue (2016), Harvey et al. (2014), and Söderström and Björk (2015), strategies to strengthen learning could be easily implemented and used in an ICBT format, comparing the effect between participants who receive support strategies and those who do not. In the learning support condition, treatment principles can be highlighted and referred to continuously, clients can be asked to provide their own summary at end of each chapter, to fill out quizzes, categorize the information in new ways, or compare how they view a situation before and after reading a certain piece of information.

To our knowledge, no such study has been done in ICBT for either adults or adolescents. Many researchers do use pedagogical tools to improve their treatment material within ICBT programs more or less consciously and intentionally but without proper investigation of its relevance and potential effect on learning and mood outcomes. The role of learning support could thus preferably be examined in order to make conclusions about its importance for learning and therapeutic outcome in ICBT.

Adolescents constitute an important target group when focusing on the role of explicit knowledge in ICBT, both when measuring and manipulating knowledge, and is therefore the focus of this thesis. The next section will tell you why.

6. Why focus on adolescents?

Why does this thesis focus on adolescents? My response is that adolescent mental health is a severe issue in need of effective treatments and better understanding of its active change mechanisms.

6.1 Definition of adolescents.

Adolescents can refer to different ages without clear cut-offs from childhood or adulthood, which can be relevant to have in mind when reading and generalizing research on younger populations. Children and adolescents can be studied simultaneously under the label *youths* (Ebert et al., 2015). Some studies have included age spans between, for instance, 12-18 years (Kendall & Peterman, 2015) or up to 25 years (Ebert et al., 2015). The world health organization defines adolescence as 10-19 years old (Patton et al., 2016).

In Sweden, youths are allowed to participate in research without parental consent from the age of 15, and individuals above 19 years old are no longer defined as adolescents within the Swedish child psychiatry system. Therefore, as the trials in this thesis were conducted in Sweden, they included adolescents between 15-19 years of age.

6.2 Adolescent mental health

To combat mental illness in adolescents is one of the important challenges in healthcare today. Adolescent mental illness can severely impact the life and functioning among young individuals worldwide, with the risk of developing chronic conditions that can impair work, health and well-being across the whole lifespan (Collinshaw, 2015). Many mental disorders have their onset in adolescence (Patton et al., 2016) and according to epistemological studies one out of ten youths (5-16 years) are affected by a psychiatric disorder, such as a mood disorder and/or a neuropsychiatric disorder (Collinshaw, 2015).

Two of the most common mental health problems among adolescents are depression and anxiety (Thapar et al., 2012; Kendall & Peterman, 2015). Although estimates vary, the cumulative probability of depression is rising from about 5% to 20% during the course of adolescence (Thapar et al., 2012), with a high female preponderance about twice as much than boys (Kuehner, 2017). And, according to epidemiological studies, about 11% (10-20 %; Kendall & Peterman, 2015) of all

children and adolescents meet the diagnostic criteria of some anxiety disorder (Costello et al., 2005).

Youth depression is characterized by depressed mood, irritability or loss of interest for activities present almost every day for most of the day. Associated symptoms are disturbances in sleep, concentration, appetite, psychomotor activity and thought patterns such as excessive feelings of guilt (American Psychological Association [APA], 2015). To suffer from depression can severely impair levels of functioning in relationships, work and academic performance, and be related to other problems such as substance abuse (Thapar et al., 2012).

Youth anxiety is characterized by uncontrollable or excessive fear, anxiety and worry (APA, 2015). Anxiety disorders includes bodily, cognitive and behavioural disturbances related to perceived and anticipated future threats. The anxiety disorders are distinguished from each other depending on the stimuli that induces the anxious response, for instance: fear for one's own bodily sensations (panic disorder), extensive worry about everyday activities (generalized anxiety disorder), exposure to social situations (social anxiety disorder), or specific objects such as spiders (specific phobia; APA, 2015). Problems with anxiety often include avoidance behaviours that maintain the maladaptive responses. Individuals with one anxiety disorder tend to have several (Rapee et al., 2009).
As with depression, anxiety in adolescence can lead to impairments in functioning in various life areas such as school, work and relationships, and be a risk for anxiety or problems with substance abuse later on in life (Kendall & Peterman, 2015).

The comorbidity between youth depression and youth anxiety is high (Ebert et al., 2015, Balázs et al., 2013). For instance, about 20% of adolescents suffering from depression meet the criteria for generalized anxiety disorder (Thapar et al., 2012), and estimates of lifetime comorbidity between depression and anxiety have been up to 73% (Kessler et al., 2005). Overall, adolescence has been described as a time of vulnerability to both depression and anxiety due to factors such as puberty, brain maturation and increased social and academic pressure (Thapar et al., 2012; Kendall & Peterman, 2015). For example, in pre-pubertal children only about 1% are affected by depression (Kessler et al., 2001), and anxiety often emerge in childhood, but tend to crystallize during adolescence (Kendall & Peterman, 2015).

Further, research suggest that the risk of relapse and recurrence is high for adolescent depression and anxiety (Comptom et al., 2004; Thapar et al., 2012; Kendall & Peterman, 2015). Among adolescents who commit suicide, more than half of them had a depressive disorder at the time of their death (Thapar er al., 2012). Anxiety as well as depression increase the risk for psychiatric problems later on in life (Thapar et al., 2012; Costello et al., 2005; James et al., 2015). Given the

high prevalence rates of depression and anxiety, its potentially devastating consequences for young individuals and the high risk of recurrence, effective treatments are needed. Also, treatments could preferably focus on early knowledge gain, given results indicating that knowledge can have a positive effect on symptom reduction over time (Kronmüller et al., 2007)

6.3 CBT for adolescents.

Among psychological treatments today, CBT is one of the most dominant and empirically studied treatments for both adults and adolescents with depression and anxiety (Cuijpers et al., 2009; Comptom et al., 2004, James et al., 2015, Oud et al., 2019). CBT relies on multiple learning and cognitive theoretical frameworks, with the unified aim to modify maladaptive thoughts and behaviours, and to help clients develop more adaptive responses (Arch & Craske, 2008). Application of CBT and the focus on different interventions vary between treatments but some things are common, such as providing psychoeducation, identification and self-monitoring of symptoms, tailoring the content to the clients unique behavioural and thought patterns using functional behaviour analysis, and providing clients with homework assignments.

In CBT for adolescent depression, the two main interventions are behavioural activation and cognitive restructuring (Oud et al., 2019). Behavioural activation aims to help clients connect their actions to their feelings, and to increase the frequency of behaviours that lead to valued consequences. Cognitive restructuring can help clients to identify and challenge maladaptive thoughts. In CBT for adolescent anxiety, exposure is a main intervention, i.e., to gradually challenge ones fears and replace avoidant behaviours with approaching ones (Arch & Craske, 2008). Other common techniques to manage fear are relaxation, coping with thoughts, and attention focus training (Rapee et al., 2009).

Further, since adolescent depression is often comorbid with adolescent anxiety, transdiagnostic CBT treatments are of interest to evaluate. In transdiagnostic treatments both depression and anxiety can be treated with the same CBT program, using disorder specific interventions of CBT more generically to target underlying symptoms of both conditions simultaneously (Pearl & Norton, 2017). There are studies supporting the effectiveness of using transdiagnostic treatments in adults (Sloan et al., 2017; Clark, 2009) but to our knowledge, this is less well studied in adolescents.

Taken together, CBT is a treatment with growing empirical support for adolescents with depression and anxiety. Unfortunately, not all clients in need of treatment

receive help. Kendall and Peterman (2015) stated that adolescents with anxiety are an underserved population and Holmes et al. (2018) underscored the need to increase availability and scalability of treatments for depression as well as other psychiatric problems. About 80% of youths with mental health issues do not receive the intervention needed (Ebert et al., 2015). Thus, providing CBT in more accessible and available formats is of importance to help adolescents with depression and anxiety receive treatment. This is where internet-based CBT becomes relevant.

6.4 ICBT for adolescents

Administering CBT over the internet is one way to increase access to treatments for those in need. ICBT is based on CBT manuals but delivered in another format and with other forms of therapist contact (G.Andersson, 2016). ICBT is generally delivered through a secure online platform requiring a two-step authentication login procedure. On the platform, psychoeducative self-help texts with homework assignments are available to participants, usually including interactive features such as videos or audio files. Further, the platform enables participants to communicate with an assigned therapist in a closed system without using their private mail. ICBT with therapeutic guidance is more effective than non-guided ICBT (Baumeister et al., 2014) and participants usually receive some kind of therapist support, mainly through email contact focusing on supporting the client and facilitate exercise completion (G.Andersson, 2016). The amount and form of support can vary, however, including usage of phone-calls, video-communication, chat or as brief automated reminders.

ICBT has several advantages compared to traditional CBT such as increased availability, accessibility, and anonymity (Wozney et al., 2017). It is flexible and easy to adjust to individual pace and daily routines. Further, it can reduce costs and travel times (Ebert et al., 2015). Since adolescents are habitual users of internet devices, the advantages of ICBT are arguably greater in younger generations than in adult ones (Ebert et al., 2015).

As with traditional CBT, guided ICBT has thorough empirical support in treating adults with depression and anxiety (G.Andersson et al., 2019), and evidence is growing on its empirical effect on adolescents (Ebert et al., 2015; Vigerland et al., 2016). ICBT studies on adolescents do have some challenges, such as low completion rates. Normally, about 50% of participants are not completing ICBT in research contexts (Radomski et al. 2019).
In a meta-analysis on 13 RCT studies with 796 children and adolescents up to the age of 25, Ebert et al. (2015) found that ICBT was superior to control group with

an overall between-group effect size of *g* = 0.72. Four studies focused on depression and seven on anxiety, with positive effects (*g* = 0.76; *g* = 0.68).

Importantly, two of the studies in Ebert et al. were transdiagnostic, i.e., targeting both depression and anxiety with the same manual, showing large effect sizes (*g* = 0.94). As mentioned, since youth anxiety is associated with youth depression, transdiagnostic approaches are interesting to evaluate further, to confirm results from these two studies. Transdiagnostic ICBT has been evaluated for adults with promising results (Dear et al., 2013), with a meta-analysis on 19 RCTs showing medium to large effect sizes for depression and anxiety (*g* =0.79; *g* = 0.82; Păsărelu et al., 2016).

Another meta-analysis on 25 studies including 1882 children and adolescents (0-18 years) by Vigerland et al. (2016) mainly confirms the positive effects of administering ICBT for adolescents. Their review focused on anxiety and somatic symptoms and found an overall between-group effect size of *g* = 0.63 in favour for the treatment groups compared with controls. Since then, more RCTs on ICBT for adolescents have been conducted. For instance, Topooco with colleagues (2018; 2019) conducted two RCT's on ICBT for adolescents with primary depression and comorbid anxiety. They found that ICBT was superior to control groups in both trials (*d* = 0.71; 0.86).

Interestingly, the two studies of Topooco and colleagues incorporated chat-sessions in their design, i.e., offered weekly chat-sessions in addition to standard therapist support by weekly emails. In the first study, participants were offered 30 minutes long chat-sessions, which were expanded to 45 minutes in the second study. The two trials did show higher adherence rates than can be expected in other studies of internet-based interventions for adolescents (Calear et al., 2009; O'Kearney et al., 2009).
Thus, chat as a form of support is interesting to evaluate further since the role of therapist support is unknown in ICBT for adolescents. As mentioned, we know that ICBT with therapist guidance is more effective than non-guided ICBT (Baumeister et al., 2014), but the amount or type of support in ICBT for adolescents is seldom reported or evaluated and therefore unknown (Vigerland et al., 2016). Chat-sessions can be particularly interesting to evaluate in younger populations since it is a form of support that is suitable and asked for among young participants (Dowling & Rickwood, 2013; Topooco et al., 2018; 2019). Further, chat-sessions might strengthen knowledge and learning, with the possibility for clients to clarify concepts and get real-time help in understanding treatment content. Thus, using and evaluating the role of chat-sessions in ICBT warrants future research.

Taken together, studies show that internet is a suitable format for delivering CBT for adolescents. However, as with adults, the active treatment components in ICBT are still fairly unknown (Andersson, 2018; Watkins et al. 2020). We do not know which ingredients or what kind of support that is needed to obtain optimal effects. By evaluating factors in ICBT such as knowledge and learning, we could learn more about why and how treatment works and subsequently develop better treatments for adolescents with depression and anxiety.

7. Summary: The role of knowledge and learning in ICBT for adolescents

As mentioned throughout this thesis, explicit knowledge and learning could be important ingredients in ICBT treatments for adolescents with depression and anxiety. ICBT is a suitable format for adolescents but its active ingredients are still unknown. Further, the educative components of CBT have rarely been evaluated and we do not know the effect of CBT on participants explicit knowledge and learning. Since ICBT is mainly text-based and relies on the educative components of CBT, its effect on explicit knowledge and learning is of relevance to evaluate further.

Thus, *measurement* of knowledge and learning is needed. Research in general healthcare is emerging on robust knowledge measurement, but ICBT trials that evaluate knowledge gain and its relationship with treatment outcome are scarce. To our knowledge, no study with focus on knowledge gain, neither quantitative or qualitative, exist on ICBT for adolescents with depression and anxiety.

Further, the *manipulation* of explicit knowledge and learning and its effect on knowledge and treatment outcome is a further interesting aspect to evaluate in ICBT. Clients can show poor memory of treatment content and researchers within traditional CBT have begun to evaluate the possibility to strengthen clients' capacity to remember and learn the treatment material. In ICBT, different technological designs are included and used to affect outcome, but without a clear focus and systematic evaluation of learning and knowledge gain. To our knowledge, no study that manipulate and evaluate knowledge gain and its relation to other treatment outcomes exist in ICBT for adolescents.

In order to fill these gaps in the literature, this thesis will focus on how to measure and manipulate explicit knowledge and learning in ICBT for adolescent with depression and anxiety.

AIMS OF THE THESIS

The overarching aim of this thesis is to explore the role of explicit knowledge in ICBT for adolescents with depression and anxiety. To a larger extent, the young probably have their first experience of psychological treatments such as ICBT, and will thus gain knowledge about symptoms, strategies, concepts, and skills previously unknown to them. Thus, their knowledge acquisition within ICBT is of value to explore, measure, and understand.

The focus has been twofold. Initially, the aim was to evaluate knowledge of CBT as an outcome of treatment and thus how to measure it as a construct. Later, as the exploration continued, the purpose was simultaneously directed towards evaluating ways to manipulate knowledge during treatment and thus how to improve ICBT by experimenting with pedagogical elements within a treatment program. The interest has been to evaluate explicit knowledge in CBT as a construct of its own, but also how knowledge about CBT relates to treatment outcome. In particular, the aims have been to:

1. Investigate if explicit knowledge about depression, anxiety and CBT increases during ICBT for adolescents, and its association to treatment outcome.

2. Explore explicit knowledge about CBT principles and concepts as a construct by developing a new knowledge test.

3. Explore if clients explicitly recall and/or use acquired knowledge about treatment content after treatment completion.

4. Evaluate how experimental manipulation of educational components, more specifically if the use of learning strategies, can positively affect treatment outcome of ICBT.

SUMMARY OF THE ARTICLES

Study I

Aim

The aim of this study was to examine if explicit knowledge about depression, anxiety, and CBT increased during ICBT for adolescent with primary depression. A further aim was to evaluate whether knowledge pre-treatment or knowledge gained during treatment related to treatment outcome.

Methods

This study was a part of a randomised control trial in which main symptoms were evaluated (Topooco et al., 2018). Participants were recruited to this clinical trial by means of social media posts and information distributed to schools, youth centres, and clinics across Sweden. Interested individuals could register at the project platform that presented information about the study, the inclusion criteria, and the screening procedure. To be included, participants had to be between the age of 15-19; suffer from depression, with a minimal score of 14 on the Beck Depression Inventory-II (BDI-II; Steer et al., 1998), or according to the Mini International Psychiatric Interview (M.I.N.I.; Sheehan et al., 1998); not currently be in a psychological treatment or suffer from any severe psychiatric condition that could interfere with participation in the present study; have no or low risk of suicide; not fulfilling criteria for current alcohol abuse or addiction; and if on medication, be on stable dosage for the month. Those who met the inclusion criteria based on the initial screening underwent further clinical judgement via M.I.N.I administered over the telephone by four MSc psychology students who had completed their clinical training.

Eligible participants were randomised to the treatment group or an attention control condition through an online randomisation service by a person not involved in the project (www.random.org). When included, participants in the treatment group (n = 34) received access to the treatment programme. Participants assigned to the attention control condition (n = 37) were given restricted access to the treatment platform with the possibility to initiate and receive contact with a therapist during the waiting period, if, for instance, their depressive symptoms would deteriorate (measured by the Patient Health Questionnaire; PHQ-9, administered once a week through the platform, for all included participants).

The treatment programme consisted of eight modules of ICBT, adapted for adolescents, and was administered through a secure platform requiring two-step authorisation, i.e., username, password, and a pin code sent out via SMS (Vlaescu et al., 2016). Module 1 introduced symptoms and causes of depression from a CBT perspective. Module 2 explained functional behaviour analysis. Module 3 and 4 gave a rationale about how our mood is connected to our actions and how to increase engagement with meaningful activities in one's everyday life (i.e., behavioural activation). Modul 5 gave a rationale about the link between thoughts and feelings and how to challenge unhelpful, negative thoughts (i.e., cognitive restructuring). Module 6 gave information about comorbid anxiety and provided a rationale on how to gradually challenge fears (i.e., exposure). Module 7 provided a rationale about our emotions and how to recognise and cope with negative emotions. It also explained how to increase your self-confidence from a CBT perspective. Module 8 contained a treatment summary and provided a rationale about relapse prevention.

All modules included assignments that participants could send to their treatment therapist to receive feedback and support. The therapists were the same four MSc psychology students that performed the pre- and post-treatment M.I.N.I-interviews. They received group supervision once a week by licenced psychologists. Further, as a main feature of the study design, participants were given the possibility to have a weekly chat-session with their assigned therapist, approximately 30 minutes long.

A total of 206 individuals registered interest in the study, which started in February 2015. After screening a total of 71 participants were included. A total of 34 individuals were randomised to the treatment group and 37 to the control group. One participant dropped out before treatment initiation which resulted in 33 individuals in the treatment group. Most of the participants were girls (94 %) and had a mean age of 17.2 years (*SD* = 1.0).

In order to measure knowledge gain, a knowledge test was constructed by the research group. It contained 17 items tapping knowledge about depression, comorbid anxiety and CBT principles. The test construction procedure was inspired by knowledge tests previously used in CBT-treatments (for instance G.Andersson et al., 2012; Scogin et al., 1998). Clinical experts were consulted to ensure item relevance and the items was pilot tested with psychology students and adolescents in the same age as the intended target population (n = 20; 15-19 years old). Seven items were true and false statements and ten were multiple-choice questions, such as "*If you feel irritable and have trouble sleeping, these can*

be symptoms of depression" (Item 2) or "*In the long run, what is a helpful way to deal with anxiety?"* (Item 6).

Each item was also rated in experienced level of certainty (i.e., "*I am guessing*", "*I am pretty certain*" or "*I am totally certain"*). Thus, the test was scored in two ways. First, we calculated a total knowledge score, summarizing the number of correct answers. Second, we calculated a weighted knowledge score where ratings of certainty was combined with raw scores of knowledge. The test had an internal consistency (Cronbach's α) of 0.56 for the raw knowledge scores and 0.64 for the weighted scores.

Depression was primarily evaluated using the Beck Depression Inventory-II (BDI-II; Steer et al., 1998). Further, the Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) was administered at the pre- and post-assessment and, as mentioned, once a week (in order to monitor symptom deterioration for all participants, including the control group).

The analyses were based on complete case analysis, due to the high response rate at the post-treatment assessment (90% completed the knowledge test, 94% completed BDI-II, 91% completed all weekly measurements of PHQ-9). Differences between groups regarding pre-and post-measurements on knowledge levels were tested with ANCOVA, using pre-treatment knowledge scores as covariates. Associations between knowledge scores and depression scores (BDI and PHQ-9) was calculated using Pearson's correlation coefficient. Effect sizes (Cohen's *d*) were calculated between and within groups.

Results and discussion

This study mainly evaluated explicit knowledge gain in ICBT for adolescent with depression. Participants in the treatment group completed an average of 6.48 (81%) of the modules (*SD* = 2.43). A total of 23 participants (70%) in the treatment group completed all modules and attended all chat-sessions.

Overall, as reported elsewhere (Topooco et al., 2018), the treatment had a significant effect on depression for participants in the treatment group, $d = .71$. There were significant increases in raw and weighted knowledge levels in the treatment group compared to the attention control group, $d = .67$, 95% CI [0.14, 1.20]; $d = 1.25$, 95% CI [0.67, 1.79]. The correlation between change scores in knowledge and change scores in depression (BDI and PHQ-9) were non-significant, both for the raw and the weighted knowledge scores. Finally, results showed a significant negative correlation between pre-treatment weighted knowledge and amount of change on depression scores (BDI: $r = -0.38$; $p < .05$). Thus, clients who

were less certain of their knowledge at the beginning of treatment had a higher reduction of depressive symptoms during treatment.

The results show that knowledge levels and certainty of knowledge increases during ICBT for adolescent depression, independent of a reduction in depressive symptoms. The results also suggest that being less certain about your knowledge before treatment initiation can predict a more successful outcome. The findings replicate previous studies on knowledge gain during ICBT for adults, showing that knowledge levels increase during treatment without association to symptom reduction (G.Andersson et al., 2012; Strandskov et al., 2018). We believe increased knowledge about one's specific condition and CBT is a positive outcome since ICBT is based on educational texts providing information about concepts, models, and strategies that we hope our clients know and remember after treatment. The lack of association with symptom reduction indicate that explicit knowledge is a distinct construct, separable from treatment outcome. Meanwhile, the results should be interpreted in light of the small sample size in this study and questions of clinical relevance. Since knowledge gain did not correlate with symptom reduction several questions remain, such as how to measure explicit knowledge in a way that is more closely connected to treatment outcome. Measures of knowledge in ICBT could preferably be more action-oriented, or tap into deeper levels of knowledge. Gumport et al. (2015) highlight the need to measure application or generalization when evaluating what clients learn in therapy.

Taken together, this is the first trial on the role of knowledge in ICBT for adolescents with depression and comorbid anxiety. The significant correlation between pre-treatment knowledge levels (weighted scores) and post-treatment depression levels indicate the potential role of explicit knowledge as a predictor of treatment outcome. Explicit knowledge, and certainty of knowledge in particular (given the high effect size during treatment; d = 1.25), are thus of interest to evaluate further.

Study II

Aim

In this study, the main aim was to illustrate one way of constructing a knowledge test about CBT for adolescents with depression and anxiety. We wanted to construct a test that captured explicit knowledge, general and applied, about core CBT-principles provided in an ICBT treatment, with better psychometric properties than the tests that have been used in previous trials. Further, by developing a new knowledge test, we wanted to theoretically explore explicit knowledge about CBT as a construct, with potential sub-constructs.

Methods

The knowledge test was developed using a literature review, subject matter experts, previous treatment material and a pilot testing with adolescents in upper-secondary school. The theoretical conceptualization of the test was *explicit knowledge about general and applied core CBT-principles*. First, an overinclusive item-pool of 46 multiple-choice items was constructed containing items targeting theoretical facts, concepts and therapeutic instructions in CBT. The items were generated based on treatment content from previous ICBT treatments for youths, a literature review and by consulting three clinical psychologists with clinical experience in treating adolescents with depression and anxiety. Some of the items were constructed as general questions but most of them were phrased as mini-vignettes, since we wanted to tap application of CBT-principles in everyday life situations. Before evaluating the items with an EFA, the items were pilot tested on nine adolescents about 16 years old, recruited via teachers from two different schools. The pilot test contained a cognitive interview (Krosnick, 1999) were the responders are observed and listened to by an observer while they read and reflect upon the items out loud. In this way, the observer can revise or remove items to improve readability, increase item clarity, and strengthen the content validity of the test. Several revisions were made, and 13 items were removed. The revised version contained 33 items. As in Study I, each item was rated in terms of felt certainty with one's response, that is if the responders were "*guessing*", felt "*pretty certain*" or felt "*totally certain*" about their response on the multiple-choice questions. Finally, the test was administered via Limesurvey (https://www.limesurvey.org) in collaboration with teachers from three high schools who asked their students to fill out the test during a class. The teachers informed the students about the purpose of the study and that the results would be reported in an anonymous format.

A total of 93 participants submitted their answers (192 individuals initiated the test without submitting it, 86 answered all items). They were asked three brief questions about their gender, age, and previous knowledge about CBT. Participants had a mean age of 15.59 years, and 50.5 % were girls.

We performed analyses on the weighted knowledge scores, that is, certainty ratings were weighted with the raw scores of knowledge. A correct but uncertain response was given a score of 1, an incorrect but uncertain response was given 0, incorrect but certain was given -1 and correct and certain was given a score of +2. An Explorative Factor Analysis (EFA) using principal axis factoring was performed on SPSS version 24. EFA is a way to explore and detect correlations between responses on items and thus reveal if the items can be clustered into meaningful subfactors of an overarching construct (Fabrigar et al., 1999). Since we wanted to explore theoretically interesting latent constructs, EFA is a suitable method. A principal axis factoring is a way to estimate numbers of factors by creating a factor solution that maximizes the amount of explained variance (De Winter & Dodou, 2012). Further, an orthogonal rotation (varimax) was implemented with an aim to find the factor solution that is the easiest one to interpret. We also used several steps to explore the reliability of the extracted factor solution. Eigenvalues was used to establish factors with an eigenvalue greater than 1 according to the Kaiser criterion, we graphically inspected the number of detected factors before a major drop in eigenvalues via a scree test, and finally we performed a parallel analysis using the syntax by O'Connor (2000).

Importantly, before running the EFA we performed three diagnostic tests (Kaiser-Meyer-Olkin [KMO] measure of sampling adequacy, Bartlett's test of sphericity and the determinant analysis) to ensure that the overall inter-item correlations were on an appropriate level for proceeding with an exploration of sub-constructs. A low level of inter-item correlation was suggested by the determinant analysis, but taken together, the three diagnostic tests affirmed the suitability of proceeding with an EFA. For internal consistency, we used Cronbach's alpha.

Results and Discussion

The results revealed a final factor solution containing three factors that explained 41 % of the variance and included 20 items. Thus, 13 items were removed during the analysis since they did not load above .4 on any of the factors. The first factor was labelled *Act in aversive states* and contained 12 items reflecting the core CBT principle of approaching rather than avoiding valued situations despite the presence of negative thoughts, feelings and situations, for example "*Anna is about to hold a lecture to her class, but she feels very nervous and plans to pretend to have a cold in order to avoid it. How could she perceive this situation, according to*

CBT?" (Item 16). The second factor was labelled *Using positive reinforcement* and contained five items relating to the CBT technique of increasing contact with positive reinforcement (contingent) upon valued behaviour, for example "*Gustav is just about to start studying but feels an urge to check out Instagram and often gets stuck while doing it. What would CBT advise him to do?"* (Item 18). The third factor was labelled *Shifting attention* with five items targeting CBT strategies on how to re-direct ones focus in presence of negative internal states, for example "*Sara worries about her future, she often thinks about what she should do and gets stuck while searching the web for various options on education and travels. What would CBT recommend her to do?"* (Item 17). Reliability analysis showed an internal consistency of $\alpha = .84$ for the whole factor solution, $\alpha = .82$ for Factor 1, and an $\alpha = .73$ for Factor 2 and an $\alpha = .58$ for Factor 3.

The three factors cover broad and well recognized dimensions of CBT. To act in presence of aversive states is a core principle when treating anxiety, knowing that you can challenge your previously avoided fears (i.e., exposure; Arch & Craske, 2008) but also when treating depression, knowing you can challenge depressive states by engaging yourself in meaningful activities (i.e., behavioural activation). The usage of positive reinforces to increase and support valued behaviour is a generic strategy in CBT, most evident in treatments of depression (Dimidjian et al., 2011). Shifting focus is a CBT-principle related to knowing that you can re-direct your attention when stuck with aversive stimuli, a principle most explicitly used when treating social anxiety (Donald et al., 2014).

There are several limitations with this study. The three factors only explained 41% of the variance which indicate that other important dimensions of knowledge about CBT are not captured by the obtained factors. Further, the incorporation of certainty ratings warrants future research. Incorporating certainty was our way to try to distinguish accuracy from beliefs, tapping an aspect of knowledge in CBT beyond recognizing the right answer using "common-sense". There are (certainly) other ways to measure and code these aspects.

The most apparent limitation concerns the issue of generalization of the results presented in this study. Most participants did not experience themselves as being knowledgeable about CBT (64.5%) and they were not answering the questions in a clinical context. Thus, we do not know if the three factors reported here apply for adolescents with depression and anxiety who have participated in an ICBT trial. The participants in this study were, however, high-school students and in the same age as the adolescents who usually are represented in previous studies (15-19 years, see Topooco et al., 2018; 2019). Subsequently, the clinical usage of the instrument needs to be evaluated.

The procedure presented in this study did however result in a knowledge test with higher reliability than previous tests in ICBT trials (compare with Study I; G.Andersson et al., 2012; Strandskov et al., 2018). To my knowledge, this is the first study to develop and evaluate sub-constructs of a knowledge test, assessing explicit knowledge about general and applied CBT-principles connected to adolescent depression and anxiety. We wanted to address issues raised in the research field of knowledge gain by exemplifying one way to construct a knowledge test for adolescents.

Study III

Aim

The aim of this study was to further explore the role of explicit knowledge, by evaluating what participants in an ICBT treatment for adolescent depression with comorbid anxiety explicitly remembered from their treatment and how they used their acquired knowledge about CBT, using qualitative methods, six months after treatment completion.

Methods

In connection to the post assessment of a randomised control study of ICBT for adolescent depression (see results of main outcomes in Topooco et al., 2019), clients were asked to participate in a more thorough examination of the programme later on. Thus, a strategic sampling procedure was used. A total of ten individuals approved and participated in a telephone interview six months later. Before the interview began, participants received information about the purpose of the interview and that results would be presented in an anonymous format. All participants gave verbal informed consent via telephone. The interviews had a mean length of 18 minutes. All interviews were transcribed and analysed using thematic analysis. Thematic analysis is a method were the material is coded and analysed through structured phases, starting with identifying initial codes within the material, continuing with building and labelling themes that reflects meaningful patterns among the initial codes, and ending with creating subthemes within the themes and assuring that the themes still fit the data (Braun & Clarke, 2006).

All interviews were conducted, transcribed and initially coded by me. All names of the participants were replaced with pseudonyms. The identification and analysation of themes were made together with the second and last author (A.M. and G.A). The ten participants had a mean age of 17.6 years (range 15-19), and nine were females. One of the participants was initially randomised to the control group and received treatment after the participants in the treatment group. A semi-structed interview guide was constructed, containing four broad open-ended questions asking what the participants remembered from their treatment and how they applied acquired knowledge in their everyday life.

Results and Discussion

Two overarching themes were identified, with five subthemes. The first theme was labelled *Active agents of CBT principles* with three subthemes: *Explicit recall of CBT principles*, *Active approach during and after treatment* and *Experience of insight.* The other theme was labelled *Passive agents of CBT principles* with two subthemes: *Vague general strategies* and *Passive or reactive application of CBT principles*.

Within the first theme of *Active CBT agents*, clients could explicitly remember concrete CBT strategies from the treatment and expressed how they still used them in their everyday life. They talked about the need of applying the treatment content during and after the treatment period to master them fully, and experienced insights while reading the modules.

Within the first theme of *Passive CBT agents*, clients did not recall specific content from the CBT treatment. They remembered more vague, generic treatment principles and had a more passive approach to the usage of CBT-principles.

The findings thus identified two overarching ways to remember and apply CBT-strategies. Some clients do recall explicit CBT-strategies and actively use them on a daily basis, while others have a more vague and passive relation to treatment content six months after treatment. Metaphorically, it is like the active agents *steer their own CBT* boat, while the passive agents use CBT principles *as a lifebuoy,* if or when needed.
However, as identified in the transcripts, both explicit and vague recalls of CBT-principles can be expressions of successful treatment outcome. In general, clients experienced the treatment as helpful, unrelated to explicit or vague examples of learned CBT principles.

The results should be interpreted in light of several limitations. For instance, the results presented could possibly reflect individual differences in verbal expressivity or nervousness rather than actual differences in recall. Further, as in most qualitative research, we do not know if the results presented here are representative for all adolescents receiving ICBT. There is a risk that the sample in this study involves participants who experienced benefits from their treatment and therefore agreed to participate in an interview. However, the aim of this study, as in most qualitative studies, is not necessarily to generalise the results but to explore how adolescents can remember and use treatment content after treatment completion, and thus to learn more about the role of explicit knowledge in ICBT for this population.

To my knowledge, it is the first study to evaluate explicit memories of an ICBT treatment for adolescents with depression and anxiety. Other qualitative analyses,

such as Halmetoja et al. (2014), did report on content-specific memories of an ICBT treatment for adults with social anxiety disorder but without analysing differences in recall patterns among the participants. Bendelin et al. (2011) did identify groups with different levels of active engagement and experienced benefits with the programme, but did not evaluate explicit recall of treatment content (ICBT for depressed adults). The findings reported here exemplify the unique ways teenagers can engage and use ICBT during and after treatment, and highlights questions such as to which extent explicit knowledge and insights are needed for successful change and maintenance, and whether the lack of explicit recall and recollection of treatment content are a problem that needs to be addressed, as suggested by Harvey et al. (2014). Additionally, the analysis of the transcripts suggests that one CBT principle can have a stronger impact on clients' experience of successful change than a cumulative amount of learned CBT-principles. Thus, how to measure knowledge of personal relevance might be an important aspect in future research.

Study IV

Aim

The aim of this study was to evaluate the role of learning strategies and real-time chat-sessions in a 2x2 factorial design of ICBT for adolescents with anxiety and depressive symptoms. Thus, we wanted to investigate the unique contribution of added pedagogical elements and/or chat-sessions in an traditional ICBT programme with weekly email support and see if either of the factors enhanced treatment outcome and/or knowledge levels.

Methods

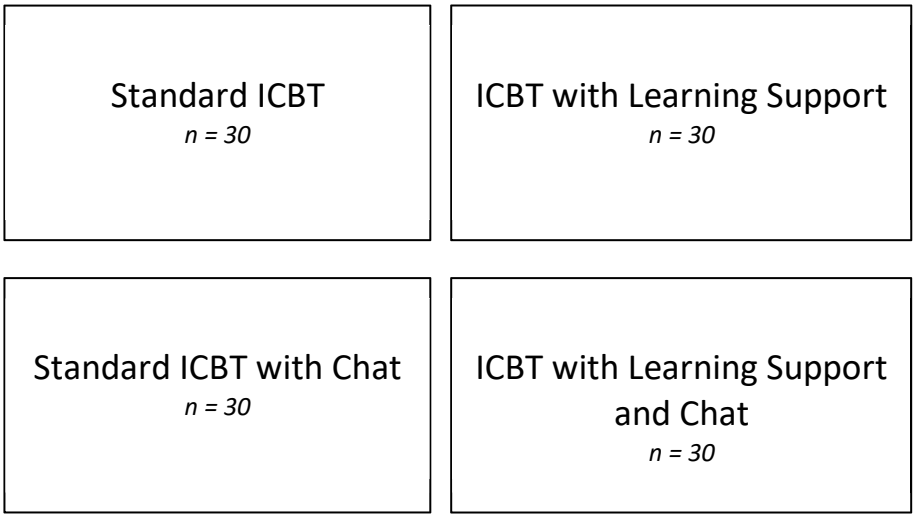
Participants were mainly recruited via Swedish social media platforms and through informational posts in schools via collaboration with teachers. Information about the purpose of the study, the procedure, ethics, and instructions on how to register were available at the project platform. The assessment consisted of a range of self-report questionnaires, e.g. the Beck Anxiety Inventory (BAI; Beck et al., 1988), the Beck Depression Inventory-II (BDI-II; Beck et al., 2005), Penn State Worry Questionnaire for Children (PSWQ-C; Chorpita et al., 1997), Mini-Social Phobia Inventory (Mini-SPIN; Connor et al., 2001), Agoraphobic Cognitions Questionnaire (ACQ; Chambless et al., 1984), Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965), and Satisfaction With Life Scale (SWLS; Diener et al., 1985). The BAI and BDI were primary outcomes of anxiety and depression. Further, a knowledge test was administered, an adapted version of the test developed in Study II. It contained 16 items targeting explicit content in the modules, including certainty ratings for each item. Potentially eligible participants were then assessed through a clinical interview, Mini-International Neuropsychiatric Interview 7.0 for DSM-5 (M.I.N.I 7.0; Sheehan et al., 2015), to establish diagnoses and exclude severe psychiatric problems. Included participants had to be between 15-19 years old; meet the criteria for clinically relevant symptoms of anxiety according to M.I.N.I and/or the cut-off of ≥ 7 points on the BAI; have the ability to read and write in Swedish; have access to internet, and, if on mediation, to be on a stable dosage for the past month, not suffering from any severe psychiatric condition or suicidal ideation, and not participating in any psychological treatment that could interfere with the present study.

A total of 324 participants expressed interest to participate and a total of 120 participants were included in the study. They had a mean age of 16.97 years, 81% were girls and 18% were boys and 1% rated themselves as other. Since this was a 2x2 factorial design evaluating the unique and/or interactive effect of learning

support and real-time chat-sessions, included participants were randomised to one of four conditions: ICBT with learning support or without learning support, and ICBT with or without chat-sessions. See an overview of the four treatment groups in Figure 1.

Figure 1

Illustrating the four treatment conditions



All treatment groups received ICBT adapted for adolescents based on established CBT principles (Silfvernagel et al., 2015; 2017; Topooco et al., 2018; 2019). Module 1 contained an introduction to the treatment programme and explained anxiety from a CBT perspective. Module 2 gave a rationale about cognitive restructuring and explained how to identify and challenge negative thoughts. Module 3 gave a rationale about behavioural activation and instructions on how to identify and incorporate meaningful activates into a mood-diary. Module 4 introduced how to perform applied behaviour analysis. Module 5 and 6 gave a rationale about exposure, first explaining how to gradually face your fears and then how to continue with exposure in presence of difficulties. Module 7 explained affect-regulation and the concept of self-confidence from a CBT perspective. Module 8 was the finale module and gave information about relapse prevention and how to maintain improvements after treatment completion.

The learning strategies were inspired by the work of Harvey et al. (2014), Söderström and Björk (2015), and Hattie and Donoghue (2016). The main focus of the strategies was to encourage deep processing and active retrieval of core treatment content in each module by, for instance, asking the participants to

provide their own treatment summary, administering a quiz at the beginning of each module, applying treatment principles on fictive cases and on situations in their own life, and/or ask them how they would explain what they just read to a significant other. Further, we asked them to relate the new information to what they previously knew about anxiety and management strategies. Further, we provided illustrative pictures, videos, and treatment summaries.

The group receiving Standard ICBT went through modules without added learning strategies and thus received the same content but phrased in a neutral, straightforward manner. They received guidance by weekly email contact from their therapist. The group receiving ICBT with learning support went through modules containing learning strategies (explained above) and weekly email contact with their therapist. The group Standard ICBT with Chat received neutral modules with weekly email guidance and additional chat-sessions with their assigned therapist 30 min per week. The group ICBT with learning support and Chat received both learning strategies and weekly chat-sessions with their assigned therapist, added to the standard weekly email support. See Figure 1.

To estimate the overall treatment effect independent of group, dependent *t*-tests were used. To estimate the effects of the two factors (learning support and chat-sessions), ANCOVAs were applied. We analysed the results with both a Complete Case Analysis and an Intention-To-Treat analysis (ITT). For the ITT analysis we imputed data using multiple imputation (Enders, 2017). We analysed weekly measures of GAD-7 using general mixed models. Improvement and deterioration were calculated, using recommendations from Jacobson and Truax (1991). Associations between knowledge levels and symptoms levels were analysed using Pearson's correlation coefficient. Effect sizes were estimated between and within groups (*d*).

Results and Discussion

At the post-treatment assessment, a total of 104 (87%) participants completed all outcome measures, 106 (88%) completed BAI. Drop-out rates were 12.5%, with 15 participants expressing that they did not want to participate in the study, but nevertheless filled-out the post-treatment assessment and were included in the analysis. In the follow-up assessment at six months, BAI, BDI-II, SWLS, RSES, and the knowledge test were administered, and a total of 82 (66%) participants completed all measures. Participants completed an average of 5.46 (*SD* = 2.82) modules (64%) during the eight weeks of treatment and each therapist spent on average 23.34 (*SD* = 16.17) minutes per participant per week. For clients receiving chat-sessions, therapists spent on average 34.07 minutes per week, and 12.61 minutes on participants without chat-sessions.

As for the general treatment effect, there was an overall decrease in symptoms of anxiety for the whole sample, with a medium treatment effect on the BAI, *d* = 0.72, 95% CI [0.45, 0.98] and a large treatment effect on the BDI-II, *d* = 0.97, 95% CI [0.70, 1.23] (ITT analysis).

Participants in the learning support conditions had significant lower scores at post treatment on the BAI. In the Completers-only analysis, the effect was of medium strength, *d* = 0.41, 95% CI [0.05, 0.77] and when running the ITT-analysis the significant result remained with a somewhat smaller effect size, *d* = 0.38, 95% CI [0.01, 0.73]. For the BDI-II, participants in the learning support conditions had significant lower scores at post treatment in the Completers-only analysis, *d* = 0.37, 95% CI [0.01, 0.73], but the effect were just below significance when analysing the imputed data, *d* = 0.34, 95% CI [-0.02, 0.70]. Participants in the learning support conditions scored significantly higher on the knowledge test, both on the raw scores and the weighted scores (*d* = 0.46, 95% CI [0.09, 0.82]; *d* = 0.49, 95% CI [0.12, 0.85]), with similar results running the ITT analysis. Neither knowledge scores pre-treatment nor changes in knowledge levels during treatment correlated significantly with treatment outcome.

Further, using mixed models, participants who received learning support were significantly more improved on the weekly measure of GAD-7 compared with those who did not receive learning support, -0.32, 95% CI [-0.57, -0.06]. Chat-sessions gave no additional effect on treatment outcome and no interaction effects between chat-sessions and learning support were found in either analysis. The results remained non-significant at six-months follow-up.

At six-month follow-up, however, the initial beneficial effects of receiving learning support were not sustained, neither for anxiety scores, depression scores, or knowledge levels. Analysing all participants, the results showed a close to large general treatment effect on the BAI, *d* = 0.92, 95% CI [0.65, 1.18], and a large treatment effect on the BDI, *d* = 1.17, 95% CI [0.89, 1.44] (ITT analysis), with equal benefits among the treatment groups.

The findings in this study indicate that ICBT can be effective for treating adolescents (15-19 years old) with primary anxiety and comorbid depressive symptoms. It shows that learning support can give initial benefits but that ICBT without additional pedagogical elements can reach equal effects six months later. The initial benefits gained from learning strategies could be interpreted as an important boost for adolescents going through therapy, indicating that pedagogical elements in therapy are of value to examine further (as suggested by research by Zieve et al., 2019). Results also suggest that added chat-sessions does

not improve outcome and indicate that a brief weekly dose of therapeutic contact via mail is enough guidance to obtain optimized results of therapist support.

Knowledge gain during treatment did not correlate with treatment outcome, in line with Study I and previous studies of ICBT (G.Andersson et al., 2012; Strandskov et al., 2018). Pre-treatment knowledge did not correlate with treatment outcome, and thus do not replicate the correlation found in Study I. This indicates that explicit knowledge, as measured in these trials, are a distinct construct, separated from other treatment outcome. Even if clients gain explicit knowledge about core CBT principles, knowing these principles is not enough in itself to improve from treatment. Meanwhile, increased explicit knowledge could arguably be a valuable outcome in CBT since CBT puts great value in educating clients about their symptoms and giving rationales so that clients understand and know how to approach their problems from a CBT perspective.

There are several limitations with this study. For instance, the observed beneficial effect in the learning support conditions is not necessarily due to active learning experiences. Instead, added pedagogical elements might boost treatment outcome by giving the participants a stronger sense of therapeutic presence in the texts. Further, we should find additional ways to measure knowledge, thus try to capture personalized knowledge, deeper knowledge or action-related knowledge (despite our effort to measure applied knowledge by using items constructed as mini-vignettes, the test used here is still a multiple-choice test, requiring recognition only).

To my knowledge, this is the first factorial design examining active components in ICBT for adolescent with anxiety and gives a small glimpse on the potential importance of adding learning support strategies within treatment modules for enhancing treatment effect.

GENERAL DISCUSSION

This thesis was an initial exploration of the role of explicit knowledge in ICBT, and more specifically how to measure and manipulate explicit knowledge in ICBT for adolescents with depression and anxiety. I have described an initial focus on how to measure knowledge as an outcome in association with our ICBT trials, by constructing and evaluating knowledge tests and using qualitative methods (Study I, II, III), and with a continued focus on how to manipulate knowledge by incorporating and evaluating pedagogical learning strategies into treatment modules in an ICBT trial (Study IV).

Measuring knowledge

ICBT is effective for adolescents with depression and anxiety

It might not be surprising that the interventions in this thesis (Studies I and IV) showed positive results in the treatment of depression and anxiety for adolescents. This is in line with previous research on ICBT for adolescents (Topooco et al; 2018; 2019; Ebert et al., 2015; Vigerland et al., 2016). Even so, it is worth mentioning that this thesis replicated these studies by showing that guided ICBT can reduce symptoms of depression and anxiety for young people between 15-19 years of age. Further, results from Study IV supports the effective usage of transdiagnostic treatment manuals to treat adolescent anxiety and depression (Ebert et al., 2015).

Explicit knowledge increases during ICBT

What is less known, and demonstrated within this thesis, is that explicit knowledge about depression, anxiety, and CBT actually increase during ICBT for adolescents. Study I and Study IV show significant increases of explicit knowledge levels, compared to an attention wait-list control group in Study I, and across four treatment groups in Study IV. The participants also became more certain about their knowledge. The qualitative study (Study III) further suggests that adolescents can remember and relate to CBT principles six months after treatment. In the interviews, several adolescents described knowledge gained from the modules as easily accessible and still helpful in their everyday life.

From a clinical point of view, increased explicit knowledge during treatment is arguably a positive outcome since CBT and particularly ICBT emphasises the importance of educating clients about specific facts, concepts and principles to provide successful therapies. Educational components are an inherent part of CBT,

and in ICBT the therapeutic content is mainly delivered through the psychoeducative texts within the program (Andersson, 2016). It is of value to know that clients can gain knowledge and certainty of knowledge about their specific condition and CBT treatment principles by participating in ICBT. This can be regarded as positive result from a pedagogical point of view too, since facts and concepts are relevant aspects within knowledge assessment in educational contexts (Anderson et al., 2001).

Many trials have evaluated the general effect of ICBT (Andrews et al., 2018; Carlbring et al., 2018; Vigerland et al., 2016), but only a few have evaluated knowledge gain. In adults, knowledge levels have been shown to increase during treatment (G.Andersson et al., 2012; Strandskov et al., 2018). This thesis adds to the research field by demonstrating that knowledge also increases for younger populations during ICBT for depression and anxiety.

The importance of measuring and show results of learning (such as increase in declarative knowledge) have been addressed in research evaluating various forms of training programs (Kirkpatrick & Kirkpatrick, 2006). Further, assessing declarative knowledge is emphasised within trials examining training programs for CBT-psychotherapists themselves (Westbrook et al., 2012). Thus, explicit knowledge is reasonable to evaluate in a treatment format such as ICBT with educative goals communicated through psychoeducative texts.

Explicit knowledge gain is not associated with treatment outcome

Further, this thesis revealed that explicit knowledge increases independent from symptom reduction. In Study I and IV increased knowledge levels were unrelated to observed positive changes in depression, anxiety, and to secondary outcomes measures such as quality of life. These results indicate that explicit knowledge might be a distinct construct separate from symptom reduction within ICBT treatments, which is in line with previous studies evaluating knowledge gain in ICBT for adults (G.Andersson et al., 2012; Strandskov et al., 2018). The qualitative analysis (Study III) also implies that some adolescents can experience ICBT as helpful without remembering or expressing knowledge about specific CBT principles when describing what they learned from therapy.
Importantly, lower levels of prior knowledge (certainty) were significantly associated with more reduction in depressive symptoms in Study I (r = .38), indicating that clients who are less certain about the correct answers in the beginning of therapy will improve more during ICBT. This association could not be confirmed in Study IV, however, and more research is needed on the role of prior knowledge on treatment outcome.

Explicit knowing is not necessarily doing

The lack of association between increased explicit knowledge and symptom reduction could possibly question the notion that explicit knowledge is important for therapeutic change in (CBT therapies such as) ICBT. The active mechanisms of change might be due to common factors such as getting support or gaining personal insights beyond CBT concepts (for a more detailed discussion see Wampold, 2015).

On the other hand, the results do not necessarily suggest that explicit knowledge is irrelevant for achieving successful outcomes of ICBT. From a clinical point of view, gaining explicit knowledge could be a necessary but insufficient factor in order to engage in therapeutic change (Scogin et al., 1998). According to theories by CBT clinicians such as Bennett-Levy et al. (2004; 2009) clients need to engage in experiential learning, i.e., test content of therapy in real-life situations, in order to gain knowledge connected to therapeutic change. CBT emphasise procedural, non-declarative knowledge processes through behavioural interventions (Brewin, 1996). This is included in ICBT through the exercises provided within each module.

Knowing what to do explicitly is an essential part of learning, but learning through reading is probably insufficient for learning procedural knowledge (Westbrook et al., 2012). A qualitative study by Bendelin et al. (2011) did find differences among participants in their way of processing the content of their ICBT programme. They identified a group of participants labelled "readers" who experienced less benefits from treatment than participants who expressed active application of the material during therapy. Hypothetically, different participants in our ICBT trials could gain the same amount of explicit knowledge but use it differently and therefore get different outcomes in terms of symptom reduction.

The point is that explicit knowing is not necessarily the same as changing behaviours or doing anything differently. Some clients might be able to recall and verbalise treatment content (Study III) and score higher on knowledge scales (Studies I and IV). However, this does not necessarily result in an application of knowledge or behaving accordingly, and thus do not in itself result in therapeutic change. Binder (1999) refers to the concept of *inert knowledge*, which refers to difficulties in applying knowledge in practice. This means that participants might know what do to or have gained explicit knowledge but still having difficulties to use it in real life.

Thus, gaining explicit knowledge does not equal appropriate behaviour usage of the knowledge learned. With this said, explicit knowledge is not unimportant. Without explicit knowledge there is nothing to apply or test in real-life settings.

The findings showing that explicit knowledge is not always associated with symptom reduction (or possibly behaviour change) is an important topic for future research. Finding ways to strengthen the link between knowing and doing, explicit knowledge and procedural knowledge, transforming inert knowledge to usable knowledge during therapy could possibly help to improve outcomes in ICBT treatments. In line with this, Kirkpatrick and Kirkpatrick (2006) highlight the need to measure both learning (i.e., any increase in knowledge objectives) and behaviours when examining training programmes such as ICBT.

Improvement in knowledge is not necessarily meaningful learning

Another explanation for the lack of association between explicit knowledge and symptom reduction, in line with the distinction between explicit knowledge and procedural knowledge, lies within our way to operationalise and measure explicit knowledge within this thesis. We have mainly focused on objective scales. These types of assessment tools might relate to basic or surface levels of knowledge rather than deeper levels of knowledge (Hattie, 2008). Assessing concepts and facts do cover some relevant aspects of knowledge (Anderson et al., 2001) but might miss deeper levels of understanding. Thus, clients might recognise the right answer, but we do not know if this is connected to understanding the answer in a deeper sense. For instance, Anderson et al. (2001) differentiate *rote learning* from *meaningful learning*. Rote learning, as a contrast to meaningful learning, refers to gained knowledge that individuals are unable to use in relevant situations or generalise to new problems. To increase a total score on a knowledge test during therapy could possibly reflect rote learning rather than meaningful learning and is therefore unrelated to symptom reduction.

After Study I we did attempt to broaden and improve our ways to measure explicit knowledge, by developing a new knowledge test (Study II) and using qualitative methods (Study III). By developing a new knowledge test in Study II, we aimed to be more specific about the knowledge construct (i.e., explicit knowledge about general and applied CBT principles) and to explore potentially interesting sub-constructs within that construct. We also wanted to improve the psychometrics (reliability) compared to previous test. Further, we aimed to tap application of knowledge by formulating most items as mini-vignettes. As discussed above, application might be more relevant for treatment outcome than recognition only (Gumport et al., 2015). We decided to focus on knowledge scores with weighted certainty ratings given the high effect size of increased certainty during treatment in Study I (d = 1.25) and the detected correlation between prior certainty of knowledge and treatment outcome (r = -.38) in the same trial.
Study II gave some food for thought about how we could tap knowledge in future clinical trials, such as focusing and distinguishing between different core strategies

within CBT (rather than specific advices or knowledge about symptoms). An adapted version was used in Study IV and the systematic procedure did result in a more reliable test (α = .79). The test development procedure in Study II is in line with the importance of constructing and evaluating objective scales and validated sub-scales within areas that aim to increase knowledge of mental health (Wei et al., 2013). However, the lack of correlation between knowledge and treatment outcome remained in Study IV. This could be due to the format of multiple-choice questions. Despite our efforts to measure applied knowledge, multiple-choice items might require recognition only rather than active retrieval of CBT knowledge. Multiple-choice scales are an important, objective assessment format that can give more information than free recall questions (Wei et al., 2013; Gumport et al., 2015), but still only assess limited aspects of explicit knowledge.

We complemented the objective scales with qualitative methods using open ended questions (Study III), to gain a deeper understanding about the role of explicit knowledge within CBT after treatment completion. Study III did result in some interesting implications. The interviews suggest that it is not necessarily the amount of explicit knowledge that is of therapeutic value. Instead, many participants talked about a few or single pieces of knowledge about CBT principles that were of high personal relevance and changed their way of managing their problems. Personal relevance could be a valuable aspect to evaluate in future studies when exploring learning in psychotherapy (Zieve et al., 2019). Instead of using a total score of knowledge with weighted certainty ratings as an outcome it could be of interest to evaluate the importance of single items and weigh in personal relevance.

As mentioned, other measures of learning have been used in the work of Harvey and colleagues, and together their studies show that the relation between treatment outcome and outcome of learning are inconsistent (Zieve et al., 2020). For example, Gumport et al. (2015) found that generalisation of treatment content to hypothetical scenarios was associated with less symptoms but accurate thoughts and applications between sessions were not. Gumport et al. (2018) found a contrary result using the same measurements, showing that generalization of treatment content did not predict fewer symptoms, but that accurate thoughts and applications did.

To summarize, it might be that the way that knowledge has been operationalized and measured in the present thesis does not capture a meaningful level of explicit knowledge. This could in turn explain why explicit knowledge does not show a relation to treatment outcome in this thesis. Another explanation, mentioned above, is that explicit knowledge in itself is insufficient for therapeutic gains. This conclusion can be said to be partly strengthened by other studies using other

measures, that also fail to consistently find a relationship between knowledge, learning, and symptom reduction during treatment (Zieve et al., 2019; 2020). Finally, another possibility is that it is not the amount of knowledge, but rather the personal relevance of that knowledge, that is of therapeutic value, as suggested by the same researchers, and Study III in this thesis.

To my understanding, no one has evaluated explicit knowledge gain in an adolescent population, quantitatively or qualitatively, before. This thesis therefore partly adds to a gap in the literature by demonstrating that ICBT do result in one of its intended effects, i.e., to provide clients with facts, concepts and principles they can remember, and thus hopefully use, after treatment completion. This is not associated with treatment outcome and usage of complementary or other measures could be of future importance, as a way to strengthen the focus on the link between explicit knowledge and procedural knowledge. This thesis was a first attempt to study these questions in a youth population and only gives a glimpse in how explicit knowledge can be measured in ICBT.

Manipulating knowledge

Learning strategies resulted in mixed associations with outcome

While measuring and evaluating the construct of explicit knowledge, we simultaneously focused on manipulating knowledge about CBT principles within an ICBT trial. Inspired by Harvey et al. (2014), Hattie & Donoghue (2016), and Björk and Södertstöm (2015), we incorporated learning strategies in an ICBT programme (Study IV), i.e., encouraged active retrieval and repetition of core therapeutic content. This did result in short-term benefits for the participants who received learning strategies. They had larger improvements in anxiety and knowledge at the post-assessment (ITT analyses; $d = 0.38$) compared to the participants who did not receive learning strategies.

According to Hattie (2008) the effect size of $d = 0.40$ is the level where the effect of an intervention can be noticeable in real life. The results are line with other research showing that learning can be improved by incorporating certain strategies from education and cognitive psychology (Gumport et al., 2015; Harvey et al., 2016). Improving learning of treatment content is arguably important since clients can forget a large amount of treatment recommendations (Zieve et al., 2019) and remember CBT skills and concepts incorrectly between sessions (Gumport et al., 2015).

The results showing that learning strategies improved treatment outcome at post-treatment are in line with some results (Dong et al., 2017; Gumport et al., 2015; Lee & Harvey, 2015) but inconsistent with others (Gumport et al., 2018). Further, the beneficial effects of learning support in Study IV did not sustain at the follow-up assessment six months later. At this point, participants in the groups without learning support had gained equal amounts of knowledge and symptom improvement. Thus, the results in this thesis are in line with research showing that using strategies to improve recall and learning of treatment content is not always associated with better recall and learning of treatment content and its correlation with symptom reduction is fairly inconsistent (Zieve et al., 2020).

There are several possible reasons to these mixed findings. One, as discussed previously, is that it might not be that important to remember specific content correctly in order to improve. Rather, exposure to common factors might be the main active mechanism in these studies. Importantly and related to this, we do not know if we can attribute the indicated effects of learning support to active learning processes. An alternative explanation could be that the learning strategies increased a sense of therapeutic presence in the texts which gave the

participants a stronger sense of alliance to the treatment. Richardson et al. (2010) have addressed the potential importance of engaging the reader by incorporating common factors in the context of self-help books on depression.

To clarify the concept of learning strategies and its effect, it could be of interest to do process research, with a design that allows the measurement and evaluation of weekly learning experiences in real-time and how this relates to symptom change. We did measure weekly symptoms of GAD-7 in Study IV and found positive effects in favour of the groups receiving learning support, but did not measure knowledge at the same time. When you measure knowledge, you tend to strengthen knowledge (i.e., the testing effect; Söderström & Björk, 2015). Therefore, we did not want to use weekly tests of knowledge in all groups in this trial, in order to keep the groups without learning support as "clean" as possible. However, it would be an interesting question to evaluate in future trials using other designs.

Second, relating to the issue of the testing effect; all participants independent of treatment group received the knowledge test at post-treatment and answered general questions of important learning take-home-experiences in the last treatment module. This could partly explain why the groups without learning support showed equal knowledge levels as the groups with learning support at six-months follow up.

A third suggested explanation to the inconsistent or weak findings between the support of learning and other outcomes have been the lack of power in previous studies (Zieve et al., 2020). In Study IV we did, however, attain satisfactory power with 120 participants. Further, we used a factorial design which makes it possible to have sufficient power even with fewer participants (Collins et al., 2014). The results from Study IV could be in line with the argument of underpoweredness since we did find an association at post-treatment. On the other hand, since the enhanced effects were gone by the follow-up assessment, the results from Study IV could indicate that the inconsistent findings reflect a lack of thorough clinical relevance rather than lack of power.

Importantly, there are differences between the work in this thesis and the work made by Harvey and colleagues. We focused on some aspects of learning strategies with an overall aim to activate retrieval and deeper-level processing, rather than eight specific memory strategies (Harvey et al., 2014). Further, we used other specific concepts and measures of knowledge and learning. Taken together, despite the differences, the studies together indicate that it is possible to improve learning of therapeutic content and symptom reduction in the short-

term by using strategies to improve learning of treatment content. However, the results are preliminary, and more research is needed.

Finally, as mentioned, the learning strategies used could be viewed as a form of persuasive design, although persuasive designs generally are used without the particular aim to strengthen learning of specific program content. Our results are in line with studies showing that persuasive designs can result in positive results related to aspired changes (Hamari et al., 2014; Radomski et al., 2019). Persuasive designs have also been found to result in higher adherence rates (Kelders et al., 2012), which could not be confirmed here since we found no difference between the treatment groups in amount of completed modules.

With this said, the observed short-term benefits of learning strategies are an interesting result given that ICBT is provided within a high-structured format that itself might facilitate knowledge gain. Further, all participants in the four treatments groups were encouraged to engage in experiential learning (procedural knowledge) through exercises connected to each module. Despite this, a short-term effect of learning support was revealed. Even if the superior effect of learning support did not sustain six months later, shorter periods of enhanced therapeutic effect is probably valuable from the perspective of our young participants. Because of this, we find it important to further evaluate the effects of learning strategies on therapeutic outcome in ICBT.

LIMITATIONS

As mentioned throughout the thesis, the way knowledge is defined and measured in this thesis can be problematised and other (complementary) measures are needed. According to some philosophical and theoretical perspectives, information becomes knowledge only when it is personally integrated or applied in real-life situations, or exists only within the subject who are co-creators of their own knowledge. From this point of view, we might have measured and manipulated something more like "information-units" in this thesis that should not be counted for as knowledge (see Gustavsson, 2000 for a detailed explanation and discussion). Thus, what I label knowledge in this thesis could, according to some perspectives, be labelled information about CBT, rather than knowledge about CBT. Other ways of operationalizing knowledge, in line with these perspectives, could be an interesting starting point in future studies. However, the psychometric properties of the constructed knowledge test in Study II and Study IV was adequate, reliable, and achieved face validity, and can at least with some confidence be regarded as a way to measure some aspects of explicit knowledge about CBT for depression and anxiety.

Another issue associated with measures used in this thesis is the role of context. One theoretical base of CBT, behaviourism, describe learning and knowledge as actions or behaviours in context, i.e., "to learn is to behave in context" (Baum, 2004). Behaviourism is somewhat similar to social constructivist views of knowledge and learning, suggesting that all knowledge and learning is relevant and true in relation to its context (Fox, 2009). This means that when the situation changes, an individual's behaviour and knowledge will change accordingly. In light of these theories, participants in our studies might not be viewed as more knowledgeable about CBT when scoring higher on a multiple-choice scale. To measure knowledge in context, you could preferably use hypothetical vignettes with a predetermined scoring system, where participants can reason and show, verbally or behaviourally, what they know given the situation provided. This would be in line with measures used within mental health literacy (Wei et al., 2013) and psychotherapy Zieve et al. (2019). Alternatively, inspired by Behavioural Approach Test (Norton & Weiss, 2009), find ways to measure approach behaviours in the presences of feared and avoided stimuli, with or without provided rationale. A third option, in line with constructing objective scales and the preliminary work done in Study II is that future studies should continue to develop multiple choice test with focus on practical reasoning and application. A further option would be to measure actual behaviours (i.e., procedural knowledge) perhaps by asking participants to record small videos when a CBT fact, concept or principle is applied in a real-life situation. In line with expanding measurements of knowledge and the

recommendations of Kirkpatrick and Kirkpatrick (2006), both learning and behaviour could be measured simultaneously as outcomes of ICBT.

One relevant aspect that could affect the relationship between knowledge gain and treatment outcome is the targeted psychiatric problem that is treated. It could be that CBT knowledge for depression and anxiety is connected to knowledge that make sense and is intuitive in many ways (such as, "if I activate myself I will feel better"; behavioural activation). CBT for other problems such as sleep restriction in insomnia or response prevention in Obsessive Compulsive Disorder could be more new, non-intuitive knowledge with greater impact. The study on insomnia and bipolar disorder with Lee and Harvey (2015) are one of few studies with a clear significant association between outcome and amount of remembered treatment content.

Another important limitation concerns manipulation of knowledge. The group who received standard ICBT without learning support and chat-sessions did get a somewhat lower treatment effect on BAI (d = 0.63) than can be expected from previous studies (Ebert et al., 2015; Vigerland et al., 2016). Thus, it is questionable whether the standard treatment group in Study IV truly reflect a traditional guided ICBT format. On the other hand, the content and exercises were similar for all treatment groups, and we made a thorough work assuring all participants received an ICBT treatment in line with patient security and ethical standards.

The young and the future of explicit knowledge in ICBT

As argued, knowledge gain within ICBT trials could be of extra importance in younger populations, as adolescents might enter their first (internet-based) treatment experience and learn about strategies that they can remember and use later on. At the end of an online treatment, we want our clients to know more about how their problems can be viewed and managed from a CBT perspective. This thesis shows that ICBT do result in some of these aspects by showing that explicit knowledge increases during the treatment period. To focus on its possible preventive effects would however be of value to study more specifically in future studies. Study IV did not find more benefits for participants receiving learning strategies or having higher scores of explicit knowledge six months later. This is however a research issue that warrants further investigation given the high relapse rate among adolescents (Thapar et al., 2012), and the limitations in this thesis in terms of measurement and timeframes.

As mentioned throughout the discussion, future studies should evaluate alternative ways of measuring explicit knowledge, for instance by using vignettes and/or relating knowledge to unique personal relevance.
Further, we constructed tests on the basis of classical test theory. Insights and implications from modern test theory could be an option for future test construction procedures, i.e., creating tests that differentiates items in levels of difficulty and adjust to characteristics of the respondent (Champlain, 2010; Conrad & Smith, 2004). Perhaps, in the long run, knowledge tests could be used as a guide to different formats of ICBT programs. If a participant knows a lot at treatment initiation, he or she get can get a program containing less information and more application and vice versa.

Overall, this thesis elicits questions about the potential relevance in using outcome measures beyond symptom reduction only, where explicit knowledge is one possible outcome for future evaluations of ICBT given its theoretical emphasis in CBT. Further, the results of this thesis raise further questions of why CBT works and for whom. The findings give a glimpse of the active mechanism of learning support in a short-term perspective, but future research is needed. As mentioned previously, within the focus on manipulating knowledge, process research would be a natural next step to clarify the concept and role of learning support within ICBT.

CONCLUSION

Remember the hypothesized scenario with the "typical" client introduced in the beginning? The 17-year-old with depressive and anxiety symptoms who decided to try out ICBT to handle her difficult situation? Well, it is her and youths like her that has been of interest in this thesis, and not only whether their symptom reduced during treatment. Rather, this thesis focused on whether she and other depressed and anxious youths actually learn something during their treatment, and whether strengthening their learning experiences would make a difference for their clinical outcome. It seems that youths who participate in ICBT programs for depression and anxiety do gain knowledge about CBT facts, concepts and principles and become more certain of their knowledge, which could be regarded as a positive outcome since ICBT emphasize and rely heavily on educative components. However, knowledge gain does not seem to be connected to symptom reduction, at least not as knowledge is operationalized in this thesis. The results could indicate that ICBT principles are necessary but not enough for therapeutic change. Also, immediately after treatment, the youths learn more if the program is designed to support learning of core treatment content and connected to less anxiety after treatment (small effect size; $d = 0.38$). The benefits of learning support are not sustained over time, however, and the results should be interpreted cautiously.

To summarize, I learned some things about the role of explicit knowledge in ICBT for adolescents with depression and anxiety. More is yet to be learned, for instance about the importance of personalized knowledge, the potentially protective role of explicit knowledge over time, how explicit knowledge can be evaluated together with behaviours and how learning can be strengthened during ICBT using process research.

Until then, we may conclude that ICBT reduces symptoms of depression and anxiety for youths, that explicit knowledge about CBT principles increases during therapy and that pedagogy within our ICBT programs are an important aspect that warrants further attention.

REFERENCES

Abramowitz, J. S., Franklin, M. E., Zoellner, L. A., & Dibernardo, C. L. (2002). Treatment compliance and outcome in obsessive-compulsive disorder. *Behavior Modification*, *26*(4), 447-463. https://doi.org/10.1177/0145445502026004001

Addis, M. E., & Carpenter, K. M. (2000). The treatment rationale in cognitive behavioral therapy: Psychological mechanisms and clinical guidelines. *Cognitive and Behavioral Practice*, *7*(2), 147-156. https://doi.org/10.1016/S1077-7229(00)80025-5

Ahmed, M., & Westra, H. A. (2009). Impact of a treatment rationale on expectancy and engagement in cognitive behavioral therapy for social anxiety. *Cognitive Therapy and Research*, *33*(3), 314-322.

American Psychiatric Association. (2015). *Neurodevelopmental Disorders: DSM-5® Selections*. American Psychiatric Pub.

Anderson, L.W., Krathwohl, D.R., Airasian, P.W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., Raths, J., & Wittrock, M. C. (2001). *A taxonomy for learning, teaching, and assessing: a revision of Bloom's taxonomy of educational objectives.* New York: Longman.

Andersson, G. (2016). Internet-delivered psychological treatments. *Annual Review of Clinical Psychology*, *12*, 157-179. https://doi.org/10.1146/annurev-clinpsy-021815-093006

Andersson, G. (2018). Internet interventions: Past, present and future. *Internet Interventions, 12*, 181-188. https://doi.org/10.1016/j.invent.2018.03.008

Andersson, G., Carlbring, P., & Furmark, T. (2012). Therapist experience and knowledge acquisition in internet-delivered CBT for social anxiety disorder: A randomized controlled trial. *PloS ONE, 7*, 1-11. https://doi.org/10.1371/journal.pone.0037411

Andrews, G., Basu, A., Cuijpers, P., Craske, M. G., McEvoy, P., English, C. L., & Newby, J. M. (2018). Computer therapy for the anxiety and depression disorders is effective, acceptable and practical health care: an updated meta-analysis. *Journal of Anxiety Disorders*, *55*, 70-78. https://doi.org/10.1016/j.janxdis.2018.01.001

Arch, J. J., & Craske, M. G. (2008). Acceptance and commitment therapy and cognitive behavioral therapy for anxiety disorders: Different treatments, similar mechanisms?. *Clinical psychology: Science and Practice*, *15*(4), 263-279. https://doi.org/10.1111/j.1468-2850.2008.00137.x

Balázs, J., Miklósi, M., Keresztény, Á., Hoven, C. W., Carli, V., Wasserman, C., ... & Cotter, P. (2013). Adolescent subthreshold-depression and anxiety: Psychopathology, functional impairment and increased suicide risk. *Journal of Child Psychology and Psychiatry*, *54*(6), 670-677.

https://doi.org/10.1111/jcpp.12016
Bartholomew, L. K., Gold, R. S., Parcel, G. S., Czyzewski, D. I., Sockrider, M. M., Fernandez, M., ... & Swank, P. (2000). Watch, discover, think, and act: evaluation of computer-assisted instruction to improve asthma self-management in inner-city children. *Patient Education and Counseling*, *39*(2), 269-280. https://doi.org/10.1016/S0738-3991(99)00046-4
Baum, W. M. (2004). *Understanding behaviorism: behavior, culture, and evolution* (2. ed.). Malden, MA: Blackwell Pub.
Baumeister, H., Reichler, L., Munzinger, M., & Lin, J. (2014). The impact of guidance on Internet-based mental health interventions - A systematic review. *Internet Interventions, 1,* 205-215. https://doi.org/10.1016/j.invent.2014.08.003
Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology, 56,* 893–897. http://dx.doi.org/10.1037/0022-006X.56.6.893
Beck, A.T., & Steer, R.A. (2005). *BAI - Beck Anxiety Inventory: Manual, svensk version*. Stockholm: Pearson Sweden.
Bendelin, N., Hesser, H., Dahl, J., Carlbring, P., Nelson, K. Z., & Andersson, G. (2011). Experiences of guided Internet-based cognitive-behavioural treatment for depression: a qualitative study. *BMC Psychiatry*, *11*(1), 107. https://doi.org/10.1186/1471-244X-11-107
Bennett-Levy, J., McManus, F., Westling, B. E., & Fennell, M. (2009). Acquiring and refining CBT skills and competencies: which training methods are perceived to be most effective?. *Behavioural and Cognitive Psychotherapy, 37*(5), 571-583. https://doi.org/10.1017/S1352465809990270
Bennett-Levy, J. E., Butler, G. E., Fennell, M. E., Hackman, A. E., Mueller, M. E., & Westbrook, D. E. (2004). *Oxford guide to behavioural experiments in cognitive therapy*. Oxford University Press. https://doi.org/10.1093/med:psych/9780198529163.001.0001
Beshai, S., Watson, L. M., Meadows, T. J., & Soucy, J. N. (2019). Perceptions of cognitive-behavioral therapy and antidepressant medication for depression after brief psychoeducation: examining shifts in attitudes*. Behavior Therapy, 50*(5), 851-863. https://doi.org/10.1016/j.beth.2019.01.001
Binder, J. L. (1999). Issues in teaching and learning time-limited psychodynamic psychotherapy. *Clinical Psychology Review*, *19*(6), 705-719. https://doi.org/10.1016/S0272-7358(98)00078-6
Björk, B. (2016). *Desirable Difficulties Perspective on Learning*. Downloaded 2020-08-20, from https://bjorklab.psych.ucla.edu/research/#idd
Bouton, M. E. (2007). *Learning and behavior: A contemporary synthesis*. Sinauer Associates.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Brewin, C. R. (1996). Theoretical foundations of cognitive-behavioral therapy for anxiety and depression. *Annual Review of Psychology*, *47,* 33-57. https://doi.org/10.1146/annurev.psych.47.1.33

Burns, J. R., & Rapee, R. M. (2006). Adolescent mental health literacy: Young people's knowledge of depression and help seeking. *Journal of Adolescence*, *29*(2), 225-239. https://doi.org/10.1016/j.adolescence.2005.05.004

Campbell, F. A., Goldman, B. D., Boccia, M. L., & Skinner, M. (2004). The effect of format modifications and reading comprehension on recall of informed consent information by low-income parents: a comparison of print, video, and computer-based presentations. *Patient Education and Counseling*, *53*(2), 205-216. https://doi.org/10.1016/S0738-3991(03)00162-9.

Calear, A. L., Christensen, H., Mackinnon, A., Griffiths, K. M., & O'Kearney, R. (2009). The YouthMood Project: A cluster randomized controlled trial of an online cognitive behavioral program with adolescents. *Journal of Consulting and Clinical Psychology, 77(6*), 1021-1032. https://doi.org/10.1037/a0017391

Cash, T. F., & Hrabosky, J. I. (2003). The effects of psychoeducation and self-monitoring in a cognitive-behavioral program for body-image improvement. *Eating Disorders*, *11*(4), 255-270. https://doi.org/10.1080/10640260390218657

Chambless, D. L., Caputo, G. C., Bright, P., & Gallagher, R. (1984). Assessment of fear of fear in agoraphobics: The Body Sensations Questionnaire and the Agoraphobic Cognitions Questionnaire. *Journal of Consulting and Clinical Psychology, 52*, 1090-1097. http://dx.doi.org/10.1037/0022-006X.52.6.1090

Chorpita, B. F., Tracey, S. A., Brown, T. A., Collica, T. J., & Barlow, D. H. (1997). Assessment of worry in children and adolescents: An adaptation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 35(6),* 569-581. https://doi.org/10.1016/S0005-7967(96)00116-7

Christensen, H., Griffiths, K. M., Korten, A. E., Brittliffe, K., & Groves, C. (2004). A comparison of changes in anxiety and depression symptoms of spontaneous users and trial participants of a cognitive behavior therapy website. *Journal of Medical Internet Research*, *6*(4), e46. https://doi.org/10.2196/jmir.6.4.e46

Clark, D. A. (2009). Cognitive behavioral therapy for anxiety and depression: possibilities and limitations of a transdiagnostic perspective. *Cognitive Behaviour Therapy*, *38*(1), 29-34. https://doi.org/10.1080/16506070902980745

Coles, M. E., Ravid, A., Gibb, B., George-Denn, D., Bronstein, L. R., & McLeod, S. (2016). Adolescent mental health literacy: young people's knowledge of depression and social anxiety disorder. *Journal of Adolescent Health*, *58*(1), 57-62.

Collins, L. M., Dziak, J. J., Kugler, K. C., & Trail, J. B. (2014). Factorial experiments: efficient tools for evaluation of intervention components. *American Journal of Preventive Medicine*, *47*(4), 498-504. https://doi.org/10.1016/j.amepre.2014.06.021

Collishaw, S. (2015). Annual research review: secular trends in child and adolescent mental health. *Journal of Child Psychology and Psychiatry*, *56*(3), 370-393. https://doi.org/10.1111/jcpp.12372

Compton, S. N., March, J. S., Brent, D., Albano, A. M., Weersing, V. R., & Curry, J. (2004). Cognitive-behavioral psychotherapy for anxiety and depressive disorders in children and adolescents: an evidence-based medicine review. *Journal of the American Academy of Child & Adolescent Psychiatry*, *43*(8), 930-959. https://doi.org/10.1097/01.chi.0000127589.57468.bf

Connor, K. M., Davidson, J. T., Churchill, L. E., Sherwood, A., Foa, E., & Weisler, R. H. (2000). Psychometric properties of the Social Phobia Inventory (SPIN): New self-rating scale. *The British Journal Of Psychiatry, 176,* 379-386. https://doi.org/10.1192/bjp.176.4.379

Conrad, K., & Everett V. Smith, Jr. (2004). International conference on objective measurement: applications of rasch analysis in health care. *Medical Care, 42*(1), I1-I6. Retrieved September 10, 2020, from http://www.jstor.org/stable/4640696

Costello, E. J., Mustillo, S., Erkanli, A., Keeler, G., & Angold, A. (2003). Prevalence and development of psychiatric disorders in childhood and adolescence. *Archives of General Psychiatry, 60*(8), 837–844. https://doi:10.1001/archpsyc.60.8.837

Costello, E. J., Egger, H. L., & Angold, A. (2005). The developmental epidemiology of anxiety disorders: Phenomenology, prevalence, and comorbidity. *Child and Adolescent Psychiatric Clinics of North America, 14*(4), 631-648. https://doi.org/10.1016/j.chc.2005.06.003

Cuijpers, P., Karyotaki, E., Eckshtain, D., Ng, M. Y., Corteselli, K. A., Noma, H., ... & Weisz, J. R. (2020). Psychotherapy for depression across different age groups: a systematic review and meta-analysis. *JAMA Psychiatry, 77*(7), 694-702. https://doi:10.1001/jamapsychiatry.2020.0164

Dear, B. F., Staples, L. G., Terides, M. D., Fogliati, V. J., Sheehan, J., Johnston, L., & ... Titov, N. (2016). Transdiagnostic versus disorder-specific and clinician guided versus self-guided internet-delivered treatment for Social Anxiety Disorder and comorbid disorders: A randomized controlled trial. *Journal of Anxiety Disorders, 42,* 30-44. https://doi.org/10.1016/j.janxdis.2016.05.004

De Champlain, A. F. (2010). A primer on classical test theory and item response theory for assessments in medical education. *Medical Education*, *44*(1), 109-117. https://doi.org/10.1111/j.1365-2923.2009.03425.x

De Winter, J. C., & Dodou, D. (2012). Factor recovery by principal axis factoring and maximum likelihood factor analysis as a function of factor pattern and sample size. *Journal of Applied Statistics*, *39*(4), 695-710. https://doi.org/10.1080/02664763.2011.610445

Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, *49*(1), 71-75. https://doi.org/10.1207/s15327752jpa4901_13

Dimidjian, S., Barrera Jr, M., Martell, C., Muñoz, R. F., & Lewinsohn, P. M. (2011). The origins and current status of behavioral activation treatments for depression. *Annual Review of Clinical Psychology*, *7*, 1-38. https://doi.org/10.1146/annurev-clinpsy-032210-104535

Donald, J., Abbott, M. J., & Smith, E. (2014). Comparison of attention training and cognitive therapy in the treatment of social phobia: a preliminary investigation. *Behavioural and Cognitive Psychotherapy, 42*(1), 74. https://doi:10.1017/S1352465812001051

Donker, T., Griffiths, K. M., Cuijpers, P., & Christensen, H. (2009). Psychoeducation for depression, anxiety and psychological distress: a meta-analysis. *BMC Medicine, 7*(1), 1-9. https://doi.org/10.1186/1741-7015-7-79

Dong, L., Lee, J. Y., & Harvey, A. G. (2017). Memory support strategies and bundles: A pathway to improving cognitive therapy for depression?. *Journal of Consulting and Clinical Psychology*, *85*(3), 187-199. https://doi.org/10.1037/ccp0000167.

Dowling, M., & Rickwood, D. (2013). Online counseling and therapy for mental health problems: A systematic review of individual synchronous interventions using chat. *Journal of Technology in Human Services*, *31*(1), 1-21. https://doi.org/10.1080/15228835.2012.728508

Ebert, D. D., Zarski, A-C., Christensen, H., Stikkelbroek, Y., Cujipers, P., Berking, M., & Riper, H. (2015). Internet and computer-based cognitive behavioral therapy for anxiety and depression in youth: A meta-analysis of randomized controlled outcome trials. *Public Library of Science, 10*, 1-15. https://doi.org/10.1371/journal.pone.0119895

Enders, C. K. (2017). Multiple imputation as a flexible tool for missing data handling in clinical research. *Behaviour Research and Therapy*, *98*, 4-18. https://doi.org/10.1016/j.brat.2016.11.008

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*(3), 272. https://doi.org/10.1037/1082-989X.4.3.272

Farmer, R. F., & Chapman, A. L. (2016). *Behavioral interventions in cognitive behavior therapy: Practical guidance for putting theory into action (2nd ed.)* American Psychological Association. https://doi.org/10.1037/14691-000

Forand, N. R., Barnett, J. G., Strunk, D. R., Hindiyeh, M. U., Feinberg, J. E., & Keefe, J. R. (2018). Efficacy of guided iCBT for depression and mediation of change by cognitive skill acquisition. *Behavior Therapy*, *49*(2), 295-307. https://doi.org/10.1016/j.beth.2017.04.004

Fox, E. (2006). Constructing a pragmatic science of learning and instruction with functional contextualism. *Educational Technology Research and Development, 54*(1), 5- 36. https://doi.org/10.1007/s11423-006-6491-5

Fox, M. P. (2009). A systematic review of the literature reporting on studies that examined the impact of interactive, computer-based patient education programs. *Patient Education and Counseling*, *77*(1), 6-13. https://doi.org/10.1016/j.pec.2009.02.011

Friedberg, R. D., Viglione, D. J., Fidaleo, R. A., Celeste. B. L., Lovette, J., Street, G., Yerka, E., Bieraugel, M., Dumas, M., & Beal, K. G. (1998). Measuring how we preach what we practice: psychoeducational change in depressed inpatients. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 16*(1), 45-59. https://doi.org/10.1023/A:1024998323708

Goh, T.-T., Seet, B.-C., & Chen, N.-S. (2012). The impact of persuasive SMS on students' self-regulated learning. *British Journal of Educational Technology 43*(4), 624–640. https://doi.org/10.1111/j.1467-8535.2011.01236.x

Gonzalez-Pinto, A., Gonzalez, C., Enjuto, S., Fernandez de Corres. B., Lopez, P., Palomo, J., Gutierrez, M., Mosquera, F., & Perez de Heredia, J. L. (2004). Psychoeducation and cognitive-behavioral therapy in bipolar disorder: an update. *Acta Psychiatrica Scandinavia, 109*, 83-90. https://doi.org/10.1046/j.0001-690X.2003.00240.x

Griffiths, K. M., Christensen, H., & Jorm, A. F. (2009). Mental health literacy as a function of remoteness of residence: an Australian national study. *BMC Public Health*, *9*(1), 92. https://doi.org/10.1186/1471-2458-9-92

Griffiths, K. M., Christensen, H., Jorm, A. F., Evans, K., & Groves, C. (2004). Effect of web-based depression literacy and cognitive–behavioural therapy interventions on stigmatising attitudes to depression. *The British Journal of Psychiatry*, *185*(4), 342-349. https://doi.org/10.1192/bjp.185.4.342

Gumport, N. B., Dong, L., Lee, J. Y., & Harvey, A. G. (2018). Patient learning of treatment contents in cognitive therapy. *Journal of Behavior Therapy and Experimental Psychiatry, 58*, 51–59. https://doi.org/10.1016/j.jbtep.2017.08.005

Gumport, N. B., Williams, J. J., & Harvey, A. G. (2015). Learning cognitive behavior therapy. *Journal of Behavior Therapy and Experimental Psychiatry*, *48*, 164-169. https://doi.org/10.1016/j.jbtep.2015.03.015

Gustavsson, B. (2000). *Kunskapsfilosofi: tre kunskapsformer i historisk belysning*.

Wahlström & Widstrand.
Haladyna, T.M. (1994). *Developing and validating multiple-choice test items.* Lawrence Erlbaum Associates, Inc: Hillsdale, New Jersey.
Halmetoja, C. O., Malmquist, A., Carlbring, P., & Andersson, G. (2014). Experiences of internet-delivered cognitive behavior therapy for social anxiety disorder four years later: a qualitative study. *Internet Interventions*, *1*(3), 158-163. https://doi.org/10.1016/j.invent.2014.08.001
Hamari, J., Koivisto, J., & Pakkanen, T. (2014). Do persuasive technologies persuade?-a review of empirical studies. In *International conference on persuasive technology* (pp. 118-136). Springer, Cham. https://doi.org/10.1007/978-3-319-07127-5_11
Harvey, A., Lee, J., Williams., Hollon, S., Walker, M., Thompson, M., & Smith, R. (2014). Improving outcome of psychosocial treatments by memory and learning. *Perspectives on Psychosocial Science, 6,* 161-179. https://doi.org/10.1177/1745691614521781
Harvey, A. G., Lee, J., Smith, R. L., Gumport, N. B., Hollon, S. D., Rabe-Hesketh, S., Hein, K., Dolsen, M., Haman, K., Kanady, J., Thompson, M., & Abrons, D. (2016). Improving outcome for mental disorders by enhancing memory for treatment. *Behaviour Research and Therapy, 81*, 35-46. https://doi.org/10.1016/j.brat.2016.03.007
Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* Routledge.
Hattie, J. A., & Donoghue, G. M. (2016). Learning strategies: A synthesis and conceptual model. *npj Science of Learning, 1*, 16013. https://doi.org/10.1038/npjscilearn.2016.13
Holmes, E. A., Ghaderi, A., Harmer, C. J., Ramchandani, P. G., Cuijpers, P., Morrison, A. P., Roiser, J. P., Bockting, C. L. H., O'Connor, R. C., Shafran, R., Moulds, M. L., & Craske, M. G. (2018). The Lancet Psychiatry Commission on psychological treatments research in tomorrow's science. *Lancet Psychiatry, 5*(3), 237-286. https://doi.org/10.1016/s2215-0366(17)30513-8
Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Clinical and Consulting Psychology*, *59*, 12-19. https://doi.org/10.1037/10109-042
James, A. C., James G., Cowdrey, F. A., Soler, A., & Choke, A. (2013). Cognitive behavioural therapy for anxiety disorders in children and adolescents. *Cochrane Database of Systematic Reviews 3 (6),* 1-106, *CD004690.* https://doi.org/10.1002/14651858.CD004690.pub3
Jarrett, R. B., Vittengl, J. R., Clark, L. A., & Thase, M. E. (2011). Skills of Cognitive Therapy (SoCT): a new measure of patients' comprehension and use. *Psychological Assessment, 23*(3), 578. https://doi.org/10.1037/a0022485
Jones, R. B., Thapar, A., Stone, Z., Thapar, A., Jones, I., Smith, D., & Simpson, S. (2018). Psychoeducational interventions in adolescent depression: a

systematic review. *Patient Education and Counseling*, *101*(5), 804-816. https://doi.org/10.1016/j.pec.2017.10.015

Kim, C., & Mueser, K. T. (2011). The effects of Social Skills Training vs. psychoeducation on negative attitudes of mothers of persons with schizophrenia: a pilot study. *Psychiatry Investigation*, *8*(2), 107-112. https://doi:10.4306/pi.2011.8.2.107

Kelders, S. M., Kok, R. N., Ossebaard, H. C., & Van Gemert-Pijnen, J. E. (2012). Persuasive system design does matter: A systematic review of adherence to web-based interventions. *Journal of Medical Internet Research, 14*(6). e152. https://doi.org/10.2196/jmir.2104

Kendall, P. C., & Peterman, J. S. (2015). CBT for adolescents with anxiety: mature yet still developing. *American Journal of Psychiatry, 172*(6), 519–530. https://doi.org/10.1176/appi.ajp.2015.14081061

Kessler, R. C., Berglund, P. A., Bruce, M. L., Koch, J. R., Laska, E. M., Leaf, P. J., ... & Wang, P. S. (2001). The prevalence and correlates of untreated serious mental illness. *Health Services Research*, *36*(6), 987-1027.

Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*(6), 617-627. https://doi:10.1001/archpsyc.62.6.593

Keulers, B. J., Welters, C. F., Spauwen, P. H., & Houpt, P. (2007). Can face-to-face patient education be replaced by computer-based patient education? A randomised trial. *Patient Education and Counseling*, *67*(1), 176-182. https://doi.org/10.1016/j.pec.2007.03.012

Kirkpatrick, D., & Kirkpatrick, J. (2006). *Evaluating Training Programs: the four levels* (3rd ed.). San Francisco: Berrett-Koehler Publisher.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606-613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Kronmüller, K-T., Victor, D., Schenkenbach, C., Postelnicu, I., Backenstrass, M., Schröder, J., & Mundt, C. (2007). Knowledge about affective disorders and outcome of depression. *Journal of Affective Disorders, 104,* 155–160. https://doi.org/10.1016/j.jad.2007.02.010

Krosnick, J. A. (1999). Survey research. *Annual Review of Psychology*, *50*(1), 537-567. https://doi.org/10.1146/annurev.psych.50.1.537

Kuehner, C. (2017). Why is depression more common among women than among men?. *The Lancet Psychiatry*, *4*(2), 146-158. https://doi.org/10.1016/S2215-0366(16)30263-2

Lucero A., Zuloaga R., Mota S., Muñoz F. (2006) Persuasive Technologies in Education: Improving Motivation to Read and Write for Children. In: IJsselsteijn W.A., de Kort Y.A.W., Midden C., Eggen B., van den Hoven E. (eds) Persuasive Technology. PERSUASIVE 2006. Lecture Notes in Computer

Science, vol 3962. Springer, Berlin, Heidelberg. https://doi.org/10.1007/11755494_20

Lukens, E. P., & McFarlane, W. R. (2004). Psychoeducation as evidence-based practice: Considerations for practice, research and policy. *Brief Treatment and Crisis Intervention, 4,* 205–225. https://doi.org/10.1093/brief-treatment/mhh019

Macrodimitris, S. D., Hamilton, K. E., Backs-Dermott, B. J., & Mothersill, K. J. (2010). CBT basics: A group approach to teaching fundamental cognitive-behavioral skills. *Journal of Cognitive Psychotherapy, 24*(2), 132–146. http://dx.doi.org/10.1891/0889-8391.24.2.132

Macrodimitris, D., Wershler, J., Hatfield, M., Hamilton, K., Backs-Dermott, B., Mothersill, K., Baxter, C., & Wiebe, S. (2011). Group cognitive-behavioral therapy for patients with epilepsy and comorbid depression and anxiety. *Epilepsy & Behavior, 20*, 83–88. http://dx.doi.org/10.1016/j.yebeh.2010.10.028

McCall, H., Arnold, V., & Sutton, S. G. (2008). Use of knowledge management systems and the impact on the acquisition of explicit knowledge. *Journal of Information Systems, 22*(2), 77-101. https://doi.org/10.2308/jis.2008.22.2.77

Newby, J. M., Smith, J., Uppal, S., Mason, E., Mahoney, A. E., & Andrews, G. (2018). Internet-based cognitive behavioral therapy versus psychoeducation control for illness anxiety disorder and somatic symptom disorder: A randomized controlled trial. *Journal of Consulting and Clinical Psychology, 86*(1), 89-98. https://doi.org/10.1037/ccp0000248

Norton, P. J., & Weiss, B. J. (2009). The role of courage on behavioral approach in a fear-eliciting situation: A proof-of-concept pilot study. *Journal of Anxiety Disorders*, *23*(2), 212-217. https://doi.org/10.1016/j.janxdis.2008.07.002

O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instruments, & Computers*, *32*(3), 396-402. https://doi.org/10.3758/BF03200807

O'Connor, M., & Casey, L. (2015). The Mental Health Literacy Scale (MHLS): A new scale-based measure of mental health literacy. *Psychiatry Research*, *229*(1-2), 511-516. https://doi.org/10.1016/j.psychres.2015.05.064

O'Connor, M., Casey, L., & Clough, B. (2014). Measuring mental health literacy–a review of scale-based measures. *Journal of Mental Health*, *23*(4), 197-204.

Oud, M., De Winter, L., Vermeulen-Smit, E., Bodden, D., Nauta, M., Stone, L., ... & Engels, R. (2019). Effectiveness of CBT for children and adolescents with depression: A systematic review and meta-regression analysis. *European Psychiatry, 57*, 33-45. https://doi.org/10.1016/j.eurpsy.2018.12.008

Păsărelu, C. R., Andersson, G., Bergman Nordgren, L., & Dobrean, A. (2017).

Internet-delivered transdiagnostic and tailored cognitive behavioral therapy for anxiety and depression: a systematic review and meta-analysis of randomized controlled trials. *Cognitive Behaviour Therapy, 46*(1), 1-28. https://doi.org/10.1080/16506073.2016.1231219

Patel, S., Akhtar, A., Malins, S., Wright, N., Rowley, E., Young, E., ... & Morriss, R. (2020). The acceptability and usability of digital health interventions for adults with depression, anxiety, and somatoform disorders: Qualitative systematic review and meta-synthesis. *Journal of Medical Internet Research*, *22*(7), e16228. https://doi.org/10.2196/16228.

Patton, G. C., Sawyer, S. M., Santelli, J. S., Ross, D. A., Afifi, R., Allen, N. B., ... & Kakuma, R. (2016). Our future: a Lancet commission on adolescent health and wellbeing. *The Lancet*, *387*(10036), 2423-2478. https://doi.org/10.1016/S0140-6736(16)00579-1.

Parikh, S. V., Zaretsky, A., Beaulieu, S., Yatham, L. N., Young, L. T., Patelis-Siotis, I., ... & Velyvis, V. (2012). A randomized controlled trial of psychoeducation or cognitive-behavioral therapy in bipolar disorder: a Canadian Network for Mood and Anxiety treatments (CANMAT) study [CME]. *Journal of Clinical Psychiatry*, *73*(6), 803-810.

Pearl, S. B., & Norton, P. J. (2017). Transdiagnostic versus diagnosis specific cognitive behavioural therapies for anxiety: A meta-analysis. *Journal of Anxiety Disorders, 46*, 11-24. https://doi.org/10.1016/j.janxdis.2016.07.004

Radomski, A. D., Wozney, L., McGrath, P., Huguet, A., Hartling, L., Dyson, M. P., ... & Newton, A. S. (2019). Potential reduction of symptoms with the use of persuasive systems design features in internet-based cognitive behavioral therapy programs for children and adolescents With Anxiety: A Realist Synthesis. *JMIR mental health*, *6*(10), e13807. https://doi.org/10.2196/13807

Rapee, R. M., Schniering, C. A., & Hudson, J. L. (2009). Anxiety disorders during childhood and adolescence: Origins and treatment. *Annual Review of Clinical Psychology*, *5*, 311-341. https://doi.org/10.1146/annurev.clinpsy.032408.153628.

Reavley, N. J., Morgan, A. J., & Jorm, A. F. (2014). Development of scales to assess mental health literacy relating to recognition of and interventions for depression, anxiety disorders and schizophrenia/psychosis. *Australian & New Zealand Journal of Psychiatry*, *48*(1), 61-69. https://doi.org/10.1177/0004867413491157

Richardson, R., Richards, D. A., & Barkham, M. (2010). Self-help books for people with depression: The role of the therapeutic relationship. *Behavioural and Cognitive Psychotherapy, 38*, 67-81. https://doi.org/10.1017/S1352465809990452

Rosenberg, M. (1965). *Society and the Adolescent Self-Image.* Princeton, NJ: Princeton University Press.

Rouget, B. W., & Aubry, J. M. (2007). Efficacy of psychoeducational approaches on bipolar disorders: a review of the literature. *Journal of Affective Disorders, 98*(1-2), 11-27. https://doi.org/10.1016/j.jad.2006.07.016

Ryhänen, A. M., Siekkinen, M., Rankinen, S., Korvenranta, H., & Leino-Kilpi, H. (2010). The effects of Internet or interactive computer-based patient education in the field of breast cancer: a systematic literature review. *Patient Education and Counselling, 79,* 5–13. https://doi.org/10.1016/j.pec.2009.08.005

Sajatovic, M., Chen, P., Dines, P., & Shirley, E. R. (2007). Psychoeducational approaches to medication adherence in patients with bipolar disorder. *Disease Management & Health Outcomes, 15*, 181-192. https://doi.org/10.2165/00115677-200715030-00006

Scaturo, D. J. (2010). A tripartite learning conceptualization of psychotherapy: The therapeutic alliance, technical interventions, and relearning. *American Journal of Psychotherapy*, *64*(1), 1-27.

Scogin, F., Jamison, C., Floyd, M., & Chaplin, W. (1998). Measuring learning in depression treatment: A cognitive bibliotherapy test. *Cognitive Therapy Research*, *22*, 475–482. https://doi.org/10.1023/A:1018773632550

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R., & Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychology, 59*, 22-57.

Silfvernagel, K., Gren-Landell, M., Emanuelsson, M., Carlbring, P., & Andersson, G. (2015). Individually tailored internet-based cognitive behavior therapy for adolescents with anxiety disorders: A pilot effectiveness study. *Internet Interventions, 2*, 297-302. https://doi.org/10.1016/j.invent.2015.07.002

Silfvernagel, K., Wasserman, C., & Andersson, G. (2017). Individually tailored internet-based cognitive behavioural therapy for young adults with anxiety disorders: A pilot effectiveness study. *Internet Interventions, 8,* 48-52. https://doi.org/10.1016/j.invent.2017.03.002

Sloan, E., Hall, K., Moulding, R., Bryce, S., Mildred, H., & Staiger, P. K. (2017). Emotion regulation as a transdiagnostic treatment construct across anxiety, depression, substance, eating and borderline personality disorders: A systematic review. *Clinical Psychology Review*, *57*, 141-163. https://doi.org/10.1016/j.cpr.2017.09.002

Stafford, N., & Colom, F. (2013). Purpose and effectiveness of psychoeducation in patients with bipolar disorder in a bipolar clinic setting. *Acta Psychiatrica Scandinavica, 127*, 11-18. https://doi.org/10.1111/acps.12118

Steer, R. A., Kumar, G., Ranieri, W. F., & Beck, A. T. (1998). Use of the Beck Depression Inventory-II with adolescent psychiatric outpatients. *Journal of Psychopathology and Behavioral Assessment, 20,* 127-137.

https://doi.org/10.1023/A:1023091529735
Strunk, D. R., Adler, A. D., & Hollon, S. D. (2016). Cognitive Therapy of Depression. In R. J. DeRubeis & D. R. Strunk (Eds.), *The Oxford Handbook of Mood Disorders* [Elektronisk resurs]. Oxford: Oxford University Press.
Strunk, D. R., Hollars, S. N., Adler, A. D., Goldstein, L. A., & Braun, J. D. (2014). Assessing patients' cognitive therapy skills: Initial evaluation of the competencies of cognitive therapy scale. *Cognitive Therapy and Research*, *38*(5), 559-569.
Squire, L. R. (1992). Declarative and nondeclarative memory: Multiple brain systems supporting learning and memory. *Journal of Cognitive Neuroscience*, *4*(3), 232-243. https://doi.org/10.1162/jocn.1992.4.3.232
Söderström, N. C., & Björk, R. A. (2015). Learning versus performance: An integrative review. *Perspectives on Psychological Science, 10*(2), 176-199. https://doi.org/10.1177/1745691615569000
Terides, M. D., Dear, B. F., Karin, E., Jones, M. P., Gandy, M., Fogliati, V. J., ... & Titov, N. (2016). The frequency of actions and thoughts scale: development and psychometric validation of a measure of adaptive behaviours and cognitions. *Cognitive Behaviour Therapy*, *45*, 196-216. https://doi.org/10.1007/s10608-014-9617-9
Thapar, A., Collishaw, S., Pine, D. S., & Thapar, A. K. (2012). Depression in adolescence. *The Lancet*, *379*, 1056-1067. https://doi.org/10.1016/S0140-6736(11)60871-
Tiedens, L. Z., & Linton, S. (2001). Judgment under emotional certainty and uncertainty: the effects of specific emotions on information processing. *Journal of Personality and Social Psychology*, *81*(6), 973. https://doi.org/10.1037/0022-3514.81.6.973
Topooco, N., Berg, M., Johansson, S., Liljethörn, L., Radvogin, E., Vlaescu, G., ... & Andersson, G. (2018). Chat-and internet-based cognitive–behavioural therapy in treatment of adolescent depression: randomised controlled trial. *BJPsych Open*, *4*(4), 199-207. https://doi.org/10.1192/bjo.2018.18
Topooco, N., Byléhn, S., Nysäter, E. D., Holmlund, J., Lindegaard, J., Johansson, S., ... & Andersson, G. (2019). Evaluating the efficacy of internet-delivered cognitive behavioral therapy blended with synchronous chat sessions to treat adolescent depression: randomized controlled trial. *Journal of Medical Internet Research*, *21*(11), e13393. https://doi.org/10.2196/13393
Tursi, M. F., von Werne Baes, C., de Barros Camacho, F. R., de Carvalho Tofoli, S. M., & Juruena, M. F. (2013). Effectiveness of psychoeducation for depression: A systematic review. *Australian And New Zealand Journal of Psychiatry*, *47*, 1019–1031. https://doi.org/10.1177/0004867413491154
Vakil, E., Wasserman, A., & Tibon, R. (2018). Development of perceptual and conceptual memory in explicit and implicit memory systems. *Journal of Applied Developmental Psychology, 57*, 16-23.

https://doi.org/10.1016/j.appdev.2018.04.003
Vigerland, S., Lenhard, F., Bonnert, M., Lalouni, M., Hedman, E., Ahlen, J., Olén, O., Serlachius, E., & Ljótsson, B. (2016). Internet-delivered cognitive behavior therapy for children and adolescents: A systematic review and meta-analysis. *Clinical Psychology Review, 50*, 1-10. https://doi.org/10.1016/j.cpr.2016.09.005
Vlaescu, G., Alasjö, A., Miloff, A., Carlbring, P., & Andersson, G. (2016). Features and functionality of the Iterapi platform for internet-based psychological treatment. *Internet Interventions*, *6*, 107-114. https://doi.org/10.1016/j.invent.2016.09.006
Watkins, E. R., & Newbold, A. (2020). Factorial designs help to understand how psychological therapy works. *Frontiers in Psychiatry*, *11*. https://doi.org/10.3389/fpsyt.2020.00429
Wampold, B. E. (2015). How important are the common factors in psychotherapy? An update. *World Psychiatry, 14*(3), 270-277. https://doi.org/10.1002/wps.20238
Wei, Y., Hayden, J. A., Kutcher, S., Zygmunt, A., & McGrath, P. (2013). The effectiveness of school mental health literacy programs to address knowledge, attitudes and help seeking among youth. *Early Intervention in Psychiatry*, *7*(2), 109-121. https://doi.org/10.1111/eip.12010
Weineland Strandskov, S., Ghaderi, A., Andersson, H., Parmskog, N., Hjort, E., Svanberg Wärn, A., Jannert, M., & Andersson, G. (2018). Effects of tailored and ACT-Influenced Internet-based CBT for eating disorders and the relation between knowledge acquisition and outcome: A randomized controlled trial. *Behavior Therapy*, *48*(5), 624-637. https://doi.org/10.1016/j.beth.2017.02.002
Wenzel, A. (2017). Basic strategies of cognitive behavioral therapy. *Psychiatric Clinics*, *40*(4), 597-609. https://doi.org/10.1016/j.psc.2017.07.001
Westbrook, D., McManus, F., Clark, G., & Bennett-Levy, J. (2012). Preliminary evaluation of an online training package in cognitive behaviour therapy: Satisfaction ratings and impact on knowledge and confidence. *Behavioural and Cognitive Psychotherapy*, *40*(4), 481-490. https://doi.org/10.1017/S1352465811000701
Wilson, M. (2004). *Constructing measures: An item response modeling approach.* Routledge.
Wozney, L., Huguet, A., Bennett, K., Radomski, A. D., Hartling, L., Dyson, M., ... & Newton, A. S. (2017). How do eHealth programs for adolescents with depression work? A realist review of persuasive system design components in internet-based psychological therapies. *Journal of Medical Internet Research*, *19*(8), e266. https://doi.org/10.2196/jmir.7573
Wright, J. H., Wright, A. S., Salmon, P., Beck, A. T., Kuykendall, J., Goldsmith, L. J., & Zickel, M. B. (2002). Development and initial testing of a multimedia

program for computer-assisted cognitive therapy. *American Journal of Psychotherapy*, *56*(1), 76-86. https://doi.org/10.1176/appi.psychotherapy.2002.56.1.76

Zieve, G. G., Dong, L., & Harvey, A. G. (2019). Patient memory for psychological treatment contents: assessment, intervention, and future directions for a novel transdiagnostic mechanism of change. *Behaviour Change*, *36*(1), 1-11. https://doi:10.1017/bec.2019.1

Zieve, G. G., Woodworth, C., & Harvey, A. G. (2020). Client memory and learning of treatment contents: An experimental study of intervention strategies and relationship to outcome in a brief treatment for procrastination. *Journal of Behavior Therapy and Experimental Psychiatry*, 101579. https://doi.org/10.1016/j.jbtep.2020.101579

Studies

The studies associated with this thesis have been removed for copyright reasons. For more details about these see:

http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-173553

LINKÖPING STUDIES IN BEHAVIOURAL SCIENCE

201. VERNMARK, KRISTOFER. Therapeutic alliance and different treatment formats when delivering internet-based CBT for depression. 2017. ISBN: 978-91-7685-436-5

202. FRANKL, MY. Psychotherapy for Substance Use Disorder – the importance of affects. 2017. ISBN: 978-91-7685-429-7

203. ABDULLA, AFRAH. Readiness or resistance? – Newly arrived adult migrants' experiences, meaning making, and learning in Sweden. 2017. ISBN: 978-91-7685-428-0

204. OLSSON, LINDA. "Count on me!". Mathematical development, developmental dyscalculia and computer-based intervention. 2018. ISBN: 978-91-7685-409-9

205. COLLIANDER, HELENA, Being and Becoming a Teacher in Initial Literacy and Second Language Education for Adults. 2018. ISBN: 978-91-7685-304-7

206. TOPOOCO, NAIRA. Blended Cognitive Behavior Therapy. Efficacy and Acceptability for Treating Depression in the Adult and Adolescent Population. 2018. ISBN: 978-91-7685-297-2

207. SOLÍS MARCOS, IGNACIO. Challenges in Partially Automated Driving: A Human Factors Perspective. 2018. ISBN: 978-91-7685-296-5

208. THORSTEN, ANJA. Berättelseskrivande i skolan. Att studera, beskriva och utveckla ett kunnande. 2018. ISBN: 978-91-7685-258-3

209. ELEONOR, BREDLÖV EKNOR. Shaped for beauty. Vocational and gendered subjectivities in private education for the beauty industry. 2018 ISBN: 978-91-7685-248-4

210. VESTERGREN, SARA. Psychological change as an outcome of participation in collective action. 2018. ISBN:978-91-7685-242-2

211. MÖLLER, CLARA. Mentalizing. Competence and process. 2018. ISBN: 978-91-7685-189-0

212. SÖDERBERG GIDHAGEN, YLVA. Psychological treatment of outpatients with substance use disorders in routine care – attachment style, alliance, and treatment outcome. 2018. ISBN: 978-91-7685-197-5

213. HAGMAN, WILLIAM. When are nudges acceptable? Influences of beneficiaries, techniques, alternatives and choice architects. 2018. ISBN: 978-91-7685-160-9

214. RAHM, LINA. Educational imaginaries: a genealogy of the digital citizen. 2019. ISBN: 978-91-7685-158-6

215. HALVARSSON LUNDQVIST, AGNETA. Learning Dynamics of Workplace Development Programmes. Studies in Swedish national programmes. 2019. ISBN: 978-91-7685-124-1

216. HOLMQVIST LARSSON, MATTIAS. Rupture and Repair in the Working Alliance: Relation to Psychotherapy Outcome and Within-Session Interaction. 2019. ISBN: 978-91-7685-111-1

217. LINDQVIST, HENRIK. Student teachers' and beginning teachers' coping with emotionally challenging situations. 2019. ISBN: 978-91-7685-078-7

218. GRÖNLUND, AGNETA. Återkoppling i analoga och digitala klassrum. Spänningsfyllda verksamheter i samhällskunskapsundervisning. 2019. ISBN: 978-91-7685-074-9

219. ÅKERBLOM, ERIKA. Utbildning och hälsa i nationens intresse. Styrningsteknologier och formering av en förädlad befolkning. 2019. ISBN: 978-91-7685-053-4220.

220. ÖSTERBORG WIKLUND, SOFIA. Folkbildning i global (o)rättvisa. Makt och motstånd i folkhögskolans internationalisering och transnationella kurser. 2019. ISBN: 978-91-7519-002-0

221. DAHLIN, MATS. Development and evaluation of an internet-based treatment for generalized anxiety disorder. An acceptance-based approach. 2020. ISBN: 978-91-7929-793-0

222. ERIKSSON, ELISABETH. Återkoppling i lågstadieklassrum. 2020. ISBN: 978-91-7929-769-5

223. KÖPSÉN, JOHANNA. Knowledge in VET curricula and power in society and labour market: Policy and practice: demands-based and employer-driven Swedish higher vocational education. 2020. ISBN: 978-91-7929-768-8

224. SJÖGREN, BJÖRN. Bystander behaviors in peer victimization: Associations with moral disengagement, efficacy beliefs, and student-teacher relationship quality. 2021. ISBN: 978-91-7929-728-2

225. PERSSON-ASPLUND, ROBERT. Learning how to recover from stress-related disorders via internet-based interventions. 2021. ISBN: 978-91-7929-722-0

226. UCKELSTAM, CARL-JOHAN. Looking into the Future: How to Use Advanced Statistical Methods for Predicting Psychotherapy Outcomes in Routine Care. 2021. ISBN: 978-7929-709-1

FACULTY OF ARTS AND SCIENCES

Linköping Studies in Arts and Sciences No 806
Linköping Studies in Behavioural Science No 227
Department of Behavioural Sciences and Learning
Linköping University
SE-581 83 Linköping, Sweden

www.liu.se

LINKÖPING UNIVERSITY