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Treatment Adherence in Internet-Based CBT

The Effects of Presentation, Support and Motivation

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Abstract
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Homework assignments that patient work with between sessions is a key component in both face-to-face and Internet-based Cognitive Behavior Therapy (CBT). However, adherence to assignments is often low and it is largely unclear what factors predict or affect treatment adherence, and in the end, treatment outcomes. The overall aim of this thesis was to investigate if treatment presentation and therapist support can affect adherence and treatment outcome in internet-based CBT, whether adherence can be predicted by motivation variables and to compare differences in face-to-face and online conditions in this regard.

A randomized controlled trial with a brief online relaxation program for people with stress and anxiety symptoms was conducted (n = 162). Participants in the enhanced support conditions completed a larger proportion of the online treatment but adherence was not affected by enhanced treatment presentation (Study I). Participants reported reduced symptoms of stress and anxiety after the relaxation program but there were no significant additional effects of enhanced presentation or support (Study II). Participants who adhered to the prescribed assignments reported lower symptom levels at study end, regardless of treatment conditions. Adherence to the online treatment was predicted by subject factors such as treatment credibility prior to the treatment and intrinsic motivation during the treatment (Study III). To further elucidate how motivation may affect adherence, an experiment with a one-session psychotherapy model was subsequently conducted (n = 100). Participants who were randomized to the face-to-face condition reported higher motivation for the assignment and completed significantly more of the homework compared to participants in the online condition (Study IV). Self-reported intrinsic motivation could predict adherence in both conditions while new motivational variables were identified specifically for the online condition.

The results from these studies confirm that adherence to assignments in Internet-based CBT is difficult to affect with treatment features but can be predicted early in treatment by subject factors such as treatment credibility and motivation. How such motivational variables can be affected to improve treatments is still unclear.

Keywords: Cognitive Behavior Therapy, Internet, Treatment adherence, Compliance, Motivation

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Two

List of Papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.

I   Alfonsson, S., Olsson, E., Linderman, S., Winnerhed, S., Hursti, T. (2016). Motivation and treatment credibility predicts dropout, treatment adherence, and clinical outcomes in an Internet-based cognitive behavioral relaxation program: A randomized controlled trial. *Computers in Human Behavior, 60*:550-558.

II   Alfonsson, S., Olsson, E., & Hursti, T. (2015). The effects of therapist support and treatment presentation on the clinical outcomes of an Internet based applied relaxation program. *Internet Interventions*, *2*(3):289-296.

III   Alfonsson, S., Olsson, E., & Hursti, T. (2016). Motivation and treatment credibility predicts dropout, treatment adherence, and clinical outcomes in an internet-based cognitive behavioral relaxation program: A randomized controlled trial. *Journal of Medical Internet Research, 18*(3):e52.

IV   Alfonsson, S., Johansson, K., Uddling, J., & Hursti, T. Differences in motivation and adherence to a prescribed assignment after face-to-face and online psychoeducation: A randomized experiment. Manuscript submitted for publication.

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Contents

Abbreviations

ANOVA	Analysis of Variance
CBT	Cognitive Behavior Therapy
CSQ	Client Satisfaction Questionnaire
DASS	Depression Anxiety and Stress Scale
HRS	Homework Rating Scale
ICBT	Internet-based CBT
IMI	Intrinsic Motivation Inventory
MI	Motivational Interviewing
MMRM	Mixed Models Repeated Measures
PHQ	Patient Health Questionnaire
PSS	Perceived Stress Scale
SDT	Self-determination Theory
SIMS	Situational Motivation Scale
STAI-S	State-Trait Anxiety Inventory State
STTS	Satisfaction with Therapy and Therapist Scale
TCS	Treatment Credibility Scale
TSRQ-EM	Treatment Self-Regulation Questionnaire External Motivation
TSRQ-IM	Treatment Self-Regulation Questionnaire Internal Motivation
VAS	Visual Analogue Scale
WAI-SR	Working Alliance Inventory Short Form
ZTPI	Zimbardo Time Perspective Inventory

Introduction

Treatment adherence in CBT

Treatment with behavioral psychotherapy such as Cognitive Behavior Therapy (CBT) is dependent on active cooperation between therapist and patient in forming treatment goals, treatment content and a treatment plan (Kuyken, Padesky, & Dudley, 2009). This collaboration serves several goals, one of which is to increase patients' adherence to the treatment (Lambert, 2013). Adherence in psychotherapy has many layers, from showing up at appointments to sharing information, engaging in the treatment and ultimately taking responsibility for behavior change (Eysenbach, 2005; Joosten et al., 2008). Historically, adherence has primarily been conceptualized at the level of attending the therapy sessions. Attendance is a behavioral variable that has the benefit of being easy to measure accurately across various treatments and settings but may also mirror a view of the patient as a passive receiver of treatment (van Dulmen et al., 2007). Given the active nature of CBT, attendance has been critizied for being a crude measure of treatment adherence and a poor proxy for treatment engagement (Taylor, Abramowitz, & McKay, 2012).

Adherence, compliance or engagement

The term adherence used in psychotherapy research comes from medical science where it is often used to describe patients' tendency to follow medical or behavioral prescriptions (Blackwell, 1992). The term compliance is also used when the emphasis is on following expert recommendations or medical plans (Julius, Novitsky, & Dubin, 2009). There are two major problems in using the same approach in psychotherapy research (Rollnick, Miller, Butler, & Aloia, 2008). First, recommendations are seldom as clear cut and universal in psychotherapy as they may be in medicine. In CBT, therapist and patient conduct a case conceptualization or a functional analysis of the patient's current problem that is based on psychological models but that encompass the individual's specific goals, needs and difficulties (Eccles & Wigfield, 2002; Kuyken et al., 2009). The treatment prescription is thus flexible as well as goal driven and could be altered continuously to best fit the patient's needs and values (K. Wilson & Murrell, 2004). The recommendations are thus changing in nature and relative to each patient's goals rather

than static and universal. Second, providing an expert prescription may lead to resistance even when given with the best of intentions (Miller & Rose, 2009). When we are given a instructions or told to change our behavior we typically respond with defending our current behavior and we become less inclined to change (Martins & McNeil, 2009). It has been found that initiating behavior change may instead be facilitated by appealing to a person's own values or goals (Westra, 2004). A concrete example of this is the principles used in Motivational Interviewing (MI), a treatment method developed for abuse disorders, where therapists are very careful not to provide answers, recommendations or suggestions but instead let patients themselves articulate their need and intent for behavior change (Burke, Arkowitz, & Menchola, 2003; Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010). The goal is to bring forth the patients' own motivation for behavior change in collaboration on equal grounds and without rising resistance.

While adherence or compliance are the terms commonly used when describing the degree to which a patient's behaviors are in line with treatment recommendations, some object to this authoritarian view of the therapist-patient relationship. If psychotherapy is a true collaboration, the goal should instead be to achieve the patient's active engagement in the treatment (Joosten et al., 2008). While adherence typically corresponds to a behavior, engagement means that a person is also cognitively and emotionally committed to the purpose of the behavior (Chalofsky & Krishna, 2009; Deci & Ryan, 2000). The benefit of treatment engagement is that behavior change is guided by the patient's inherent goals and not dependent on outside factors such as the therapist (Tryon & Winograd, 2011). This may lead away from a strict view of compliance to prescriptions to a more flexible approach where patients on their own initiative use the therapeutic principles and strategies in their everyday life as obstacles or problematic situations occur.

It is difficult to specifically measure treatment engagement since the overt behavior is very similar to that of treatment adherence. Engagement may instead be measured indirectly through self-report of the conscious reasons people state for their behavior (Fulmer & Frijters, 2009). Unfortunately, some studies suggest that people are often unaware of the stimuli and operant contingencies that affect their behavior and the stated motivations of people should therefore be interpreted with caution (Custers & Aarts, 2010). While behavioral variables are preferable, mentalistic variables such as motivations may provide clues and guidance when investigating the processes that lead to behavior change.

Motivation

In psychology, motivation may be defined as the verbal or conscious goal that guide an individual's behavior (Bouton, 2007; Brown, 2007). According

to learning theory, behavior is explained by classical and operant conditioning where conscious goals or motivations can be seen as verbalized operant contingences (McClelland, 1987; Shah & Gardner, 2008). Patients' treatment goal is an important factor in psychotherapy research and treatment motivation is therefore very important to investigate and work with in psychotherapy (Holtforth, Grawe, Egger, & Berking, 2005; Michalak & Holtforth, 2006). The benefit of using the concept of motivation in addition to operant principles is that models of motivation have been developed to explain the different effects seen between different kinds of operant contingencies. For example, motivation dependent on extrinsic or intrinsic factors may result in different behavioral patterns (Ryan, 2012). Extrinsic factors are part of the environment, such as the people around us, while intrinsic factors comprise of our thoughts, feelings and physical sensations. Extrinsic factors are always indirect since they need to be perceived and interpreted internally to affect motivation. Intrinsic factors have a more direct effect on motivation and are the primary target in efforts to promote behavior change (Zuroff et al., 2007). Both extrinsic and intrinsic factors may be aversive, decreasing motivation for a behavior, or rewarding, increasing motivation (Bouton, 2007). One model that has been developed and empirically evaluated for investigating and explaining intrinsic and extrinsic motivation and behavior is Self-determination theory (SDT).

Self-determination theory

Self-determination theory is a model that describes different forms of motivation that may have different behavioral outcomes and characteristics (Deci & Ryan, 2011). SDT focuses on the division between autonomous and controlled motivation (Deci & Ryan, 2008). This division is based on the individual's perception of the intrinsic and extrinsic factors that influence her behavior (Stone, Deci, & Ryan, 2009). In the experiment that lay the ground for SDT, it was found that people who were asked to complete a challenging but interesting task perceived it as less enjoying if they also received a small payment (Deci, 1971). This indicated that extrinsic motivational factors might hamper intrinsic motivation and counteract target behaviors. Later, more detailed studies have shown that the type of extrinsic motivation is very important and that reinforcement from different sources may actually have additive effects (Cameron & Pierce, 1994).

In recent conceptualizations, SDT postulates that the individual can internalize external motivation, a process that will make the motivation much stronger (Sluijs & Knibbe, 1991). The internalization can result in three types of internal motivation: introjected, identified or integrated motivation. In contrast to the internalizing of external motivation, there is also intrinsic motivation that is endogenous to the person. Intrinsic motivation comes from

inner perceptions or experiences that are independent of external factors, such as basic emotions (Ryan & Deci, 2008a).

Self-determination theory is congruent with both operant learning principles and the model of Motivational Interviewing (MI) while at the same time showing some important differences to these (Markland, Ryan, Tobin, & Rollnick, 2005; Patrick & Williams, 2012). In operant conditioning, the operant function is dependent on the resulting overt behavior while in SDT motivation form is dependent on report of covert behavior. This makes SDT a useful complement when trying to understand the mechanisms behind a behavior that is under complex operant control. The goal is to gain a better understanding of the processes behind similar behaviors.

Motivational Interviewing is purposefully an atheoretical and empirically driven method that can be used in evaluative studies but is difficult to use in explorative research since it provides little guidance concerning important factors for behavior change. In contrast, SDT offers a model for investigating important factors that are difficult to conceptualize or measure accurately using only learning theory and MI principles. Other researchers have identified the usefulness of SDT and the model has been used in many different fields, including sport psychology and health promotion (Ng et al., 2012). The overall SDT model has been supported in numerous experimental studies but has seldom been used directly in behavioral psychotherapy research (Ryan & Deci, 2008b; Ryan, Patrick, Deci, & Williams, 2008). This is not surprising since psychotherapy process research is rather scarce in the CBT context.

Psychotherapy process research and operant conditioning

Modern Cognitive Behavior Therapy is mainly based on the science of operant conditioning (Hupp, Reitman, & Jewell, 2008). Operant conditioning constitutes a functional approach to analyzing behavior with a focus on how consequences affect behavior (Domjan, 2014). The consequences of a behavior may either increase (reinforce) or decrease (punish) the likelihood of the behavior. Further, the consequences can either be something that is added/increased (positive) or removed/decreased (negative) (Domjan, 2014). While operant conditioning can be used to explain the processes in psychiatric disorders and problems, there is relatively little research on how to use learning theory during therapy sessions to help patients change their behaviors (Bouton, 2014; Spiegler, 2015). Functional Analytic Psychotherapy is one of few therapeutic schools that essentially builds on learning theory in direct clinical work (Kohlenberg & Tsai, 1991; Tsai et al., 2009). This relative lack of interest in investigating operant principles in psychotherapy may have some unwanted consequences. For example, therapists are themselves subject to operant principles and there is a risk that they too often rely on providing information to patients, which is easy, rather than using other

more cumbersome but effective methods for behavior change (Detweiler-Bedell & Whisman, 2005).

While information is essential, it does not seem to be effective for changing behavior in situations governed by negative reinforcement, which is arguably the most common characteristic of psychological problems (Donker, Griffiths, Cuijpers, & Christensen, 2009; Elder, Ayala, & Harris, 1999). Understanding behavior, i.e., to know what classical and operant contingencies are present, can trigger behavior change but this is rather difficult to explain with traditional learning theory (Bouton, 2007; Kirsch, Lynn, Vigorito, & Miller, 2004; Pierce & Cheney, 2013). One solution is offered by Relational Frame Theory that explains how information can promote verbal behaviors that have the same function as overt behaviors and follows the principles of learning theory (Hayes, Barnes-Holmes, & Roche, 2001). This may be a step towards a better understanding of how knowledge and other verbal behaviors affect behavior but there is much left to explain (Baum, 2005). Still, CBT protocols for specific disorders or problems typically start with the therapist explaining the models of CBT and of the disorder or problem, i.e. psychoeducation, as part of the treatment planning (Lukens & McFarlane, 2006).

Providing information

The purpose of psychoeducation is typically two-fold. The first step is to help the patient understand the contingences that governs her behavior (Kuyken et al., 2009). The second step is to help the patient use this understanding to identify how to change her behavior in order to reach desired goals. As mentioned above, learning theory has had some difficulties in explaining how information affects behavior, especially goal driven behavior that is punished by immediate effects. Such behavior may seem explicable for an observer that is unaware of long-term goals or motivation. It may therefore be valuable to complement observations of behaviors with asking people their conscious motivations for the behavior. For example, it may help in differentiating between beneficial coping strategies and avoidance behaviors. However, information typically affects behavior to a very limited degree and must probably be delivered in a way that suggests behavioral strategies to be effective. Information may thus affect motivation for behavior change for some people but is only one of several components in effective psychotherapy.

Although commonly used, there is not much research on the impact and value of psychoeducation as a specific component in CBT (Donker et al., 2009). It is evident from research on self-help treatments, that psychoeducation sometimes have effect sizes on par with therapist-lead treatments (Den Boer, Wiersma, & Van den Bosch, 2004). However, adherence in self-help treatments seems to benefit from personal support from either a therapist or peers (McKendree-Smith, Floyd, & Scogin, 2003).

Supportive behaviors

Major CBT textbooks stress that a good working alliance is important for positive treatment outcome (e.g., Barlow, 2014). Therapists are instructed to listen to and validate patients as well as provide encouragement and praise, ask questions, follow up assignments and show other kinds of supportive behavior. These behaviors are seldom elaborated upon and, apart from the field of homework assignment, research is scarce (Kazantzis, Deane, & Ronan, 2006). The relative lack of research is surprising considering that such behaviors constitute a large part of what is called working alliance, a concept that has drawn a lot of research attention (Elvins & Green, 2008).

There is substantial empirical research showing that working alliance is an important factor in therapeutic behavior change (Cook & Doyle, 2002; Martin, Garske, & Davis, 2000). Working alliance is often defined as mutual trust and shared goals and views between therapist and patient (Elvins & Green, 2008). Human interaction arguably works through behaviors and therefore working alliance should be possible to analyze in behavioral terms. However, there is little behavioral research in how to build a working alliance and there is a lack of concrete guidelines to therapists (Baldwin, Wampold, & Imel, 2007; Kohlenberg, Kanter, Bolling, Parker, & Tsai, 2002). In order to use working alliance to improve treatment adherence a starting point is the well-known principles of operant conditioning.

Using reinforcement to support behavior change

Learning theory explains how problematic behavior is often triggered by negative stimuli such as unpleasant bodily states (e.g., negative emotions) and then maintained by avoidance behaviors that are negatively reinforced (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). In contrast, behavior change in a more goal-driven direction is often followed by negative reactions (e.g. aversive emotions) and then later by subsequent reductions in these negative effects. The pattern of immediate unpleasant effects and postponed positive effects is largely what makes behavior change difficult. The goal for a therapist in CBT is to provide support during the transition when a behavior goes from being negatively reinforced to being positively punished to being positively reinforced and in the end intrinsically maintained. A good working alliance with the therapist can in this context be seen as acting as a source of artificial reinforcement that can help balancing out the unpleasant effect of a new behavior until it declines (Krasner, 1962). How this can be done most effectively has seldom been investigated in detail in psychotherapy research but relevant therapist behaviors can be identified by using learning theory (Castonguay, Constantino, McAleavey, & Goldfried, 2010).

Inter-personal behaviors like praise, smiles and nods are among the most common stimuli with a function of positive reinforcement (Krasner, 1962). However, these reinforcements are extrinsic and cannot fully match the im-

pact of intrinsic reinforcement, e.g. emotional reactions, of the goal behavior (Follette, Naugle, & Callaghan, 1996). For positive reinforcers to be effective they should be specific and come immediately after the behavior (Mazur, 1997). General praise can be used to reinforce general therapeutic behavior, such as attending a therapy session, but reinforcement of specific therapeutic behaviors will probably be more effective in helping the patient to change problematic behaviors (Follette et al., 1996). This could be one of the reasons why peer support seems to be effective in improving emotional states but somewhat less effective in helping behavior change than trained therapist support (Hogan, Linden, & Najarian, 2002). Peers are familiar with the situation, the emotions and problems that fellow patients experience and can provide emotional support as well as practical advice but may have less knowledge of specific therapeutic behaviors that can facilitate behavior change in patients (Solomon, 2004).

Providing both specific and well-timed reinforcement may be very difficult in psychotherapy; typically a patient reports some past behavior and the therapist reinforce the report, not the actual behavior. This problem has long been identified and, as mentioned above, lead to the development of Functional Analytic Psychotherapy where the goal is to identify and work with key behaviors directly in the therapy session (Kohlenberg & Tsai, 1991). Besides timing, behavior change may also be facilitated if the therapist could reinforce the behavior in the natural setting outside of therapy, e.g. during in vivo exposure in the patient's home, but there are often practical difficulties to do this and there is further a concern that the patient may become too reliant on the therapist (Williams & Chambless, 1991). At the same time, much of the patient's therapeutic behaviors occur between sessions and in situations where positive reinforcement may be lacking.

Ex-session communication

Cognitive Behavior Therapy typically rely on in-session communication but some CBT treatment protocols, notably Dialectical Behavior Therapy, include between session communication specifically to support behavior change in difficult situations (also, see Killen et al., 2008). This may be important especially for patients who experience high degrees of emotional distress or who lack adequate coping skills or executive strategies. Some therapists probably use e-mail, telephone appointments or scheduled hours when patient can call in and ask questions, but the clinical effects of such arrangements have only drawn limited research attention (Cucciare & Weingardt, 2007). The use of e-mail communication in CBT has instead been mostly studied in the field of Internet-based CBT.

Internet-based CBT

Initially, many Internet-based Cognitive Behavior Therapy (ICBT) programs evolved from self-help books and several of the earliest studies investigated the effect of a self-help book combined with therapist support through e-mail (Ström, Pettersson, & Andersson, 2000). Self-help books using CBT has shown to be somewhat less effective than live CBT with a therapist, at least on a group level (Scogin, Bynum, Stephens, & Calhoon, 1990). The same pattern has later emerged for ICBT; therapist guided ICBT, where the patient has some form of contact with a therapist during the treatment, has proven to be at least marginally more effective than pure self-help ICBT where the patient is working alone with the treatment (Furmark et al., 2009). Today, ICBT programs often include interactive features to foster engagement in the treatment and to mimic some of the therapist interaction but there have not been many studies on the mechanisms and effects of such features (Ritterband, Thorndike, Cox, Kovatchev, & Gonder-Frederick, 2009; Webb, Joseph, Yardley, & Michie, 2010). Investigating technical and pedagogical features of online interventions is important because it may help in developing more effective internet-based treatments, treatments that can possibly go beyond traditional CBT in terms of availability and effectiveness (Amichai-Hamburger, Klomek, Friedman, Zuckerman, & Shani-Sherman, 2014; McMain, Newman, Segal, & DeRubeis, 2015). Since it is possible to control exactly what information is provided and to measure both communication and interaction with high precision, ICBT can be very suitable for psychotherapy research.

Providing information online

The Internet makes it possible to use much more potent visual tools, e.g. images, slide shows or video clips, in order to show and explain the models used in psychotherapy (Street, Gold, & Manning, 2013). Video clips showing people in typical situations and their reactions can provide examples and clarify the treatment rationale and how certain behaviors and emotions are associated. We know from studies on education that people prefer different learning mediums (e.g., Fleming, 2001) and preferences may be better catered for by using a range of multimedia tools (E. Wilson et al., 2012). One of the greatest benefits of ICBT is the possibility for the patient to work on her own with this kind of media material independent of any therapist. In recent years ICBT programs more often use video, audio and animations to make the learning more efficient and easier for more people with diverse preferences and backgrounds (Aronson, Marsch, & Acosta, 2013). It may be that information that is presented in more elaborate ways and using different forms of examples and contexts is more easily internalized and therefore affects motivation to a higher degree. For example, the use of case vignettes in psychoeducation is promoted partly because the hypothesized effect of

modeling behavior while the use of quizzes and study material is motivated by facilitated learning. Whether psychoeducation can become more readily available and whether this affects treatment motivation and adherence has not yet been extensively evaluated (Kelders, Kok, Ossebaard, & Van Gemert-Pijnen, 2012).

Supportive behaviors in ICBT

Since ICBT is typically asynchronous, the therapist expresses supportive behaviors not when both are online but in ex-session communication with the patient. A recent development in ICBT is the introduction of automatic reminders and prompts that are designed to mimic individual contact with the therapist (Kelders, Bohlmeijer, Pots, & van Gemert-Pijnen, 2015). This more automatized approach to support behavior change show some promise and could be a way to enhance ICBT (Fjeldsoe, Marshall, & Miller, 2009).

Even when asynchronous, communication between therapist and patient may be more frequent and well-timed in ICBT compared to CBT. In therapist guided ICBT, patients can e-mail therapists at any time and at off hours, typically when they come across problems or when questions arise (Zabinski, Celio, Wilfley, & Taylor, 2003). Such ex-session communication seems to be positive for treatment outcome (Cavanagh, 2010; Hilvert-Bruce, Rossouw, Wong, Sunderland, & Andrews, 2012). However, similar to live CBT, ICBT often provide a structure and time frames for when patients should do work with the treatment, when to report on assignments, etc., that is probably beneficial (Nordin, Carlbring, Cuijpers, & Andersson, 2010; Richards & Timulak, 2012). The structure may work in tandem with therapist feedback and support since ICBT without therapist support is somewhat less effective than ICBT with support (Spek et al., 2007). As stated above, the emotional bond between patient and therapist is important for treatment outcomes and the therapeutic alliance is often comparable in ICBT and CBT. However, there are differences in the relationship in the two treatment formats and it may for example be more difficult to express or detect feelings in e-mails and other digital communication lacking visual cues (Mallen, Day, & Green, 2003). If this is indeed a problem and an obstacle in psychotherapy it is not evident from research on online therapeutic alliance (Sucala et al., 2012). The function of therapist communication in ICBT has just recently begun to be explored but this research may shed further light on critical therapist behaviors (Holländare et al., 2016).

In conclusion, there seem to be no major obstacles to providing support and creating a positive working alliance in ICBT. But alliance and therapist support are not in themselves enough for successful treatment outcomes. The goal of all psychotherapy is behavior change and in contrast to more insight-oriented models, behavior change is in CBT typically promoted in the form of homework assignments.

Assignments in CBT

Prescribed homework, or assignments, between sessions is a crucial component of most CBT protocols and completion of assignments is associated with positive treatment outcomes (Addis & Jacobson, 2000; Mausbach, Moore, Roesch, Cardenas, & Patterson, 2010). The goal of assignments is to increase patients' therapeutic behaviors in other contexts than the therapy session and to help with the generalization of new behaviors (Kazantzis & Lampropoulos, 2002). To be successful, assignments should follow logically from psychoeducation so that patients understand the rationale behind the assignment, as this increases the likelihood of completing the task (Scheel, Hanson, & Razzhavaikina, 2004). It is thus important that therapists design assignments in collaboration with patients and that the therapist follows up on assigned tasks and exercises (Cox, Tisdelle, & Culbert, 1988; Tompkins, 2002). Given the major role that assignments have in CBT, relatively few studies have examined the therapeutic mechanisms and processes through which assignments are associated with treatment outcome. It is hypothesized that treatment effect is mediated through completion of assignments, but this has not been investigated thoroughly (Kazantzis, Whittington, & Dattilio, 2010). Few clinical studies report patients' adherence to assignments in detail but in those who do, adherence to assignments is often moderate while higher adherence is associated with better results (Edelman & Chambless, 1995; Simpson, Marcus, Zuckoff, Franklin, & Foa, 2012). The patients' reasons for less than optimal adherence to assignments in CBT include time restraints, reading difficulties and competing priorities and motivations (Helbig & Fehm, 2004). Whether similar obstacles for adherence are present in ICBT is unclear and warrants further study.

Motivation, operant conditioning and assignments

As described above, SDT can be used to describe how behaviors that are not intrinsically reinforced, such as many homework assignments, can be motivated by factors such as accountability or long term goals. When a therapist describes the rationale for an assignment, and the patient understands that it is consistent with her long-term goals, motivation for the behavior should shift from external to internal motivation. In general, if assignments are perceived as interesting and consistent with long-term goals they will be intrinsically positively reinforced and behavior change will be facilitated. Extrinsic positive reinforcement, such as the therapist's praise, may be very useful when intrinsic reinforcement is difficult to identify for a behavior. Also, if patients perceive that they are accountable for completing assignments this behavior may be extrinsically negatively reinforced which also facilitate behavior change. One example of this effect would be the deadline effect seen when it comes to completing assignments (Paxling et al., 2013). Intrinsic and extrinsic reinforcement may be used in tandem to increase the likeli-

hood of behaviors such as completing assignments. Working alliance in psychotherapy includes a personal bond and a feeling of mutual interest that makes it possible to use both positive as well as negative reinforcement for therapy adherence. In contrast, an extensive use of extrinsic reinforcement that is not clearly associated with the goals and values of the patient may lead to drop out from treatment (Bouton, 2007). These important processes in psychotherapy have not been investigated in detail and not within a behavioral theoretical framework.

Treatment adherence in ICBT

While the results from studies on internet-based psychotherapy are often positive, some people may find it difficult to engage in a treatment that is often burdensome (Gerhards et al., 2011; Waller & Gilbody, 2009). The same difficulties with time restraints and practical obstacles that are reported in CBT may be relevant for patients in ICBT as well (Hadjistavropoulos et al., 2014). While a group of patients may terminate treatment with ICBT prematurely because they experience ameliorated symptoms, treatment adherence, including completing assignments, is one of the best predictors of positive treatment outcomes (de Graaf, Huibers, Riper, Gerhards, & Arntz, 2009; Donkin et al., 2011; Kelders, Bohlmeijer, & Van Gemert-Pijnen, 2013). It is therefore important to investigate the reasons for dropout and low adherence in order to identify ways in which ICBT may be improved. There is a need to better understand what factors affect patients' adherence to treatment and the effect of different treatment features (Hilvert-Bruce et al., 2012; Melville, Casey, & Kavanagh, 2010). Technical features, such as automatic prompts and reminders as well as interactive design, has shown to be effective in enhancing treatment adherence in some studies (Kelders et al., 2012; Titov et al., 2013). However, such features will only work if patients have motivation for engaging in treatment and building engagement and motivation prior to treatment start may therefore be important. The reason why guided ICBT is more effective may be that patients typically complete the treatment to a larger extent than patients in unguided treatments (Mewton, Smith, Rossouw, & Andrews, 2014). However, the reasons why therapist support increase treatment adherence have not been studied in detail (Cavanagh, 2010).

There is thus a need for more experimental studies on factors that may affect treatment motivation and treatment adherence as well the associations behind these variables. A better understanding of how different forms of reinforcement can be used in psychotherapy may lead to improved treatments and in the end better help for more patients.

The current thesis

Improving adherence in ICBT

Therapist support may improve adherence and outcomes of ICBT but the exact mechanisms behind these effects are unclear (Gellatly et al., 2007). The contingencies that result in increased adherence in therapist guided ICBT have not been investigated to any extent but there are a few suggestions (Paxling et al., 2013; Richards & Timulak, 2012). There are several studies that indicate that in structured interventions, the online therapist does not need to be a highly trained psychologist (Titov et al., 2010). This implies that the effect is driven primarily by social factors such as encouragement and accountability rather than by psychological expertise (Holländare et al., 2016). A theory for adherence in internet interventions that emphasized the social effect of therapist-patient relationship is the model of Supportive Accountability (Mohr, Cuijpers, & Lehman, 2011). This model is based on theories from workplace psychology and states that contact with a therapist makes patients feel accountable and more likely to adhere to an intervention due to an unspoken social contract. While this would explain the increased adherence seen in guided ICBT, the model does not fully acknowledge a fundamental difference between work place adherence and psychotherapy adherence. In contrast to many work-related tasks, psychotherapy is more dependent on patients being engaged in their treatment in order to benefit fully from it. Increasing the external social control that promotes accountability, while playing an important part, may not be the most effective method to increase engagement and in the end, clinical outcomes of psychotherapy (Deci, Koestner, & Ryan, 1999).

One alternative strategy to improve treatment adherence is to foster engagement in psychotherapy by employing methods and principles that are designed to avoid the resistance produced by external demands and instead build motivation and engagement for behavior change from the individual's own goals and values. One well-researched method that has shown to increase adherence in psychotherapy is Motivational Interviewing (Lancee, van den Bout, Sorbi, & van Straten, 2013). At its core, MI states a set of principles that should guide the interaction between therapist and patient, see Figure 1 (Miller & Rollnick, 2012). The potential effect of using these principles on adherence in ICBT has not been studied thoroughly (Lancee et al., 2013).

> **Core guidelines for therapists using Motivational Interviewing**
>
> Express empathy
> Show that you try to understand the client by using reflexive listening and taking a non-judgmental stance. Validate and normalize what the client is expressing.
>
> Support self-efficacy
> Express that you are confident in that the client can make changes and support any such statements from the client. Focus on previous successes and the client's strengths.
>
> Roll with resistance
> Acknowledge the client's difficulties and ambivalence for change instead of arguing or trying to convince.
>
> Develop discrepancy
> Help the client identify goals or values and the changes the client needs to do in order to follow these, without neglecting the other guidelines of Motivational Interviewing.

Figure 1. Core guidelines in Motivational Interviewing (shortened from Miller & Rollnick, 2012).

In another model of behavior change in internet interventions, Ritterband et al (2009) put a larger emphasis on the technological aspects of web-based interventions. They suggest that while therapist guidance is important, some aspects of the interaction can be automatized and using digital multimedia and pedagogical tools may improve adherence and promote behavior change. The exact mechanisms for these effects are unclear but pedagogical research suggests that information presented through different media and forms of communication may be easier to comprehend and digest for some people, especially those not used to working with written information (Aronson et al., 2013). Also, consuming multimedia content may be more intrinsically reinforcing than reading a text and this may help patients work with extensive pieces of information (M. Lee, Cheung, & Chen, 2005). Unfortunately, research on the learning and motivational effects of different media formats for providing information is scarce and even more so in the psychotherapy context (Monshat, Vella-Brodrick, Burns, & Herrman, 2012).

Predictors of adherence

Patients adhere to internet interventions to varying degrees but whether the level or variance in adherence is different in guided ICBT compared to face-to-face CBT is unclear (Donkin et al., 2011; van Ballegooijen et al., 2014). A few studies have tried to identify variables that predict adherence to inter-

net-based CBT and it seems that both background variables and subject variables are important (El Alaoui et al., 2015). Higher age, female gender, and longer education have in several studies been identified as background variables associated with higher levels of adherence (Christensen, Griffiths, & Farrer, 2009). Whether these variables are associated with cognition or personality factors has not been investigated in this context, but it is probable that overarching variables such as executive function and conscientiousness may play a role. Of the subject factors, treatment credibility seems to be an important factor which is unsurprising given that trust or belief in treatment is essential for adherence and outcome (El Alaoui et al., 2015).

Treatment credibility may be problematic in pharmaceutical studies where the goal is to separate the physiological treatment effect from the psychological treatment effect (Mayberg et al., 2014). This placebo effect is the reason why pharmaceutical studies must use active control conditions, something that is often valuable in psychotherapy studies as well. However, in contrast to pharmaceutical treatments, psychotherapy actively strives to make patients engage and believe in the treatment in order to facilitate behavior change and generalization (Borkovec & Sibrava, 2005). While the effects of treatment expectations and behavior change should be kept separated in psychotherapy research, it is often critical to increase expectations and credibility in order to increase motivation and engagement in the treatment.

Another stable predictor for treatment adherence in both face-to-face and internet-based psychotherapy is initial symptom improvement (Schibbye et al., 2014; G. T. Wilson, 1999). There is typically a large drop out early in treatment and this indicates that there is a change in operant contingencies, or motivations, compared to prior to treatment (Cavanagh, 2010; Ryan, 2012). How patients initially perceive treatment may be an important variable for attrition but this has not been investigated previously. In conslusion, what therapists can do to minimize drop out and improve treatment adherence is an important but understudied area of research.

Alliance and adherence in face-to-face CBT and ICBT

Working alliance is a central concept in psychotherapy and has continuously shown to be an important factor in successful treatment outcomes (Andersson et al., 2012). Working alliance is somewhat difficult to conceptualize but often defined as the perceived mutual benevolence between therapist and patient and a common view on therapy goals and procedures (Castonguay et al., 2010). Contact with a supportive therapist is probably intrinsically reinforcing for a patient but research on bibliotherapy shows that therapist contact is not necessary to achieve treatment effects (Gellatly et al., 2007). Whether contact with a therapist online, as in guided ICBT, is reinforcing for the patient has not been investigated but the increased adher-

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ence in guided compared to unguided ICBT implies that it may be. There is only a few studies investigating working alliance using the theoretical frameworks of operant conditioning or SDT and it is unclear how working alliance should be best understood in operant principles or in motivational terms (Zuroff et al., 2007). For example, whether the processes of working alliance may act through negative reinforcement as well as positive reinforcement to initiate and maintain behavior change needs to be identified. Using the SDT-framework, it is also important to investigate whether a positive working alliance is intrinsically motivating and whether internal or external motivation is affected (Patrick & Williams, 2012). If the processes at work in the social context of psychotherapy were better understood it may be possible to develop more effective treatments, both in face-to-face and online settings (Britton, Williams, & Conner, 2008).

Aims

The aims of this thesis were to investigate factors that are associated with patients' treatment adherence and outcomes in internet-based psychotherapy and to start comparing results with face-to-face conditions. More specifically, the aims were to elucidate whether adherence and outcomes of an internet-based intervention were affected by an engaging treatment presentation and by motivational support from a therapist and whether treatment adherence and outcomes could be predicted by subject factors such as motivation and personality. A further aim was to investigate whether different treatment motivations could predict treatment adherence after face-to-face compared to online psychoeducation.

Hypotheses

In study I, the hypothesis was that participants randomized to the intervention group that received enhanced treatment presentation or therapist support would show a higher degree of treatment adherence compared to those who received normal treatment presentation or therapist support.

In Study II, the hypothesis was that participants randomized to the intervention groups that received enhanced treatment presentation or therapist support would report a higher degree of symptom reduction regarding stress and anxiety compared to those who received normal treatment presentation or therapist support.

In Study III, the hypothesis was that treatment adherence and outcomes could be predicted by background variables such as education and personality as well as subject variables such as treatment credibility, treatment motivation and working alliance.

In Study IV, the hypothesis was that there would be a difference in reported motivation and adherence to the prescribed assignment between participants randomized to the face-to-face and those randomized to online psychoeducation.

Method

Design

Study I-III were conducted on a dataset collected from a study on internet-based applied relaxation. The study had a randomized controlled 2 × 2 full factorial design with four groups, see Figure 2. After a power analysis incorporating both regression analysis and analysis of variance for medium effect sizes, it was decided to include 40 participants per group for a total of 160 participants. Data were collected pre-, mid-, post- and at four week follow-up after the intervention.

	Normal presentation	Enhanced presentation
Normal support	Group 1 n = 40	Group 2 n = 40
Enhanced support	Group 3 n = 40	Group 4 n = 40

Figure 2. Design and independent variables for Study I-III.

Study IV was an experiment with a randomized controlled design with two conditions: face-to-face and online psychoeducation. A power analysis based on regression analysis and analysis of variance for medium effect sizes suggested that a total of 100 participants should be included in the study. Data were collected at pre- and post-intervention.

Procedure and participants

Study I-III

Participants for Study I-III were recruited using advertisement on public billboards as well as online advertisement on www.studie.nu and the Facebook social network. People who showed interest in the study were referred to a web-page with additional information about the study, an online application form and contact information to the responsible researcher. The inclusion- and exclusion criteria for the study can be seen in Figure 3.

| Inclusion criteria |
| • Self-perceived symptoms of stress and/or worry. |
| Exclusion criteria |
| • Under 18 years old. |
| • Insufficient mastery of the Swedish language. |
| • Elevated symptoms of depression that warrant clinical care. |
| • Other medical or mental illness that need immediate clinical attention. |
| • No daily access to computer, internet and mobile phone. |

Figure 3. Inclusion and exclusion criteria for participants in Study I-III.

Those who completed the application were contacted by study staff and received a consent form by mail. Those who returned the signed consent form were randomized to one of the four conditions and received an e-mail with login information to the web portal containing the intervention. Before starting the intervention each participant completed a set of self-report instruments as part of the pre-treatment assessment. Participants who scored above the cut-off for severe depression on the Patient Health Questionnaire-9 (see below) were contacted by telephone by a study psychologist in order to assess eligibility. After completing the pre-measurement assessment participants had immediate access to the online intervention. After two weeks they were asked to complete the mid-treatment assessment and after four weeks the post-treatment assessment. They were contacted by e-mail four weeks later for a follow-up assessment. Participants who did not complete the post- or follow-up assessments after receiving e-mails were contacted by telephone by study staff. A flow chart of the procedure and participants can be seen in Figure 4. In the end, a total of 162 participants were included in the study. The study procedure was approved by the regional ethics committee board.

Study IV

Participants to Study IV were recruited on a university campus area by the study staff. Students who showed interest in the study could sign up for further information and were later contacted by telephone and informed about the study. The only inclusion criterion was having an interest in learning more about psychological models regarding emotions. The exclusion criteria were insufficient mastery of the Swedish language, elevated symptom levels of anxiety or depression on the Depression Anxiety and Stress Scale (see below) or other psychological problems that warranted clinical care, currently attending psychotherapy or previous knowledge or experience of working with the affect model. Those who were eligible for the study and agreed to

participate were included and randomized to either face-to-face psychoedu-
cation or online psychoeducation.
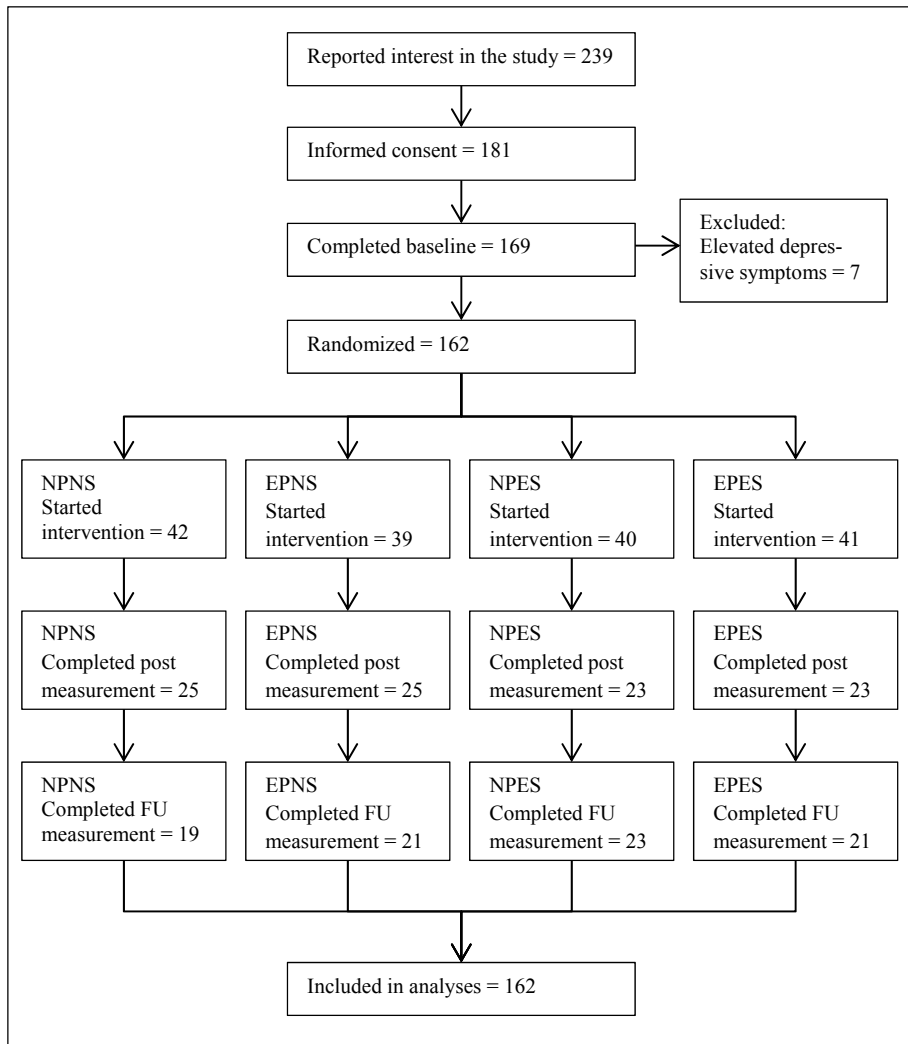
Figure 4. CONSORT flow chart for Study I-III. Note. NPNS= Normal Presentation
Normal Support, EPNS = Enhanced Presentation Normal Support, NPES = Normal
Presentation Enhanced Support, EPES = Enhanced Presentation Enhanced Support,
FU = Follow-up.

Participants in the face-to-face condition were appointed to a meeting with a
therapist within one week. At the start of the appointment, they completed a
set of self-report instruments. They then received the psychoeducation and
were prescribed an assignment for the coming week. Before leaving they
filled out a set of instruments regarding their motivation for the given as-
signment. The instruments were completed without the therapist present and

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put in an envelope in order to decrease social influence on the answers. After the psychoeducation, participants received an e-mail with log in information and were instructed to register their assignment on a secure web page. After one week they were contacted by telephone for post-intervention assessment.

Participants in the online condition were sent an e-mail with log in information to a secure web page. When they first logged in they were asked to complete the pre-intervention instruments. They then received access to the internet-based psychoeducation which included the prescribed assignment. Participants were thereafter asked to complete a set of instruments regarding their motivation for completing the assignment. They were instructed to register the assignment on the web page and were then followed up after one week by the study staff.

The study procedure was approved by the regional ethics committee board.

Outcome variables and measures

Study I-III

The construct of treatment adherence was operationalized in three different ways. First, adherence to the online intervention was assessed by measuring how much of the intervention material each participant had accessed (i.e., by clicking on a link or file) at study end. The intervention consisted of 25 core items, so this measure ranged from 0 (not started the intervention) to 25 (accessed all items of the intervention). Second, adhering to the prescribed exercises was assessed by self-report by each participant on the intervention web page. The intervention prescribed 14 exercises of relaxation each week of the program, so this variable ranged from 0 (not completed any exercises) to 14 (completed all prescribed exercises). Participants were encouraged to complete as many exercises they wanted, but the variable was capped at 14 exercises per week in order to accord with the intervention instructions. Each week of the intervention, participants were asked to register all relaxation exercises they had completed, and the mean weekly number of exercises was calculated at study end. Third, participants were asked to do a self-assessment of the degree to which they had adhered to the overall ideas and prescriptions of the intervention on a scale from 0 (not adhered at all) to 6 (completely adhered to the ideas and prescriptions). This last variable was included in order to try and capture instances where participants conducted relaxation training outside the formal prescribed exercises of the treatment program.

Data regarding symptoms, motivation and treatment evaluation was collected by self-report instruments prior-, mid-, post-, and at four weeks follow-up.

Screening

The short form version of the Depression Anxiety and Stress Scale (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998) was used to screen for symptoms of depression, anxiety and stress. The DASS-21 has previously shown adequate psychometric properties and is widely used in research (Henry & Crawford, 2005). The DASS-21 consists of 21 items and three subscales, Depression, Anxiety and Stress. Each item is scored on a scale from 0 to 3 providing a score between 0 and 21 for each subscale with a higher score indicating a higher symptom level.

Stress, anxiety, and depression

Symptoms of stress were measured with the Perceived Stress Scale (PSS; S. Cohen, Kamarck, & Mermelstein, 1983). The PSS comprised 14 items that are scored on a scale from 0 to 4 providing a total score between 0 and 56 with a higher score corresponding to a higher level of stress symptoms. The PSS has shown adequate psychometric properties in previous studies (E.-H. Lee, 2012).

Symptoms of anxiety were measured with the State-Trait Anxiety Inventory State (STAI-S; Spielberger, Gorsuch, & Lushene, 1970) which has 20 items scored between 1 and 4 providing a total score between 20 and 80. The STAI-S has shown adequate psychometric properties in previous studies (Novy, Nelson, Goodwin, & Rowzee, 1993). Worry was also measured with the GAD-7 (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006). The GAD-7 comprises seven items, which are scored on a scale between 0 and 3 that provides a total score of 0-21. The GAD-7 has shown adequate psychometric properties (Kroenke, Spitzer, Williams, & Löwe, 2010).

Symptoms of depression were measured with the Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) which includes 9 items and provides a total score between 0 and 27. The cut-off score for moderate depressive symptoms is 10 and for severe depressive symptoms 20 (Manea, Gilbody, & McMillan, 2012). The PHQ-9 has shown adequate psychometric properties (Kroenke et al., 2010).

Treatment satisfaction

Three different instruments were used to evaluate participants' satisfaction with the treatment and the therapist contact. The Client Satisfaction Questionnaire (CSQ-8; Attkisson & Zwick, 1982) was used as an overall evaluation of the treatment. The CSQ-8 consists of eight items and provides a score between 8 and 32 with a higher score representing higher satisfaction with the intervention. The CSQ-8 has shown to have adequate psychometric properties in previous studies (Attkisson & Greenfield, 1999).

Treatment satisfaction was further evaluated with the Satisfaction with Therapy and Therapist Scale (STTS; Oei & Shuttlewood, 1999) which comprises 12 items scored on a scale between 0 and 5 providing two subscales,

Satisfaction with therapy and Satisfaction with therapist, each with a score between 0 and 30. The wording of the STTS was somewhat adapted to better suit the internet-based treatment format (Oei & Green, 2008).

The quality of the therapist contact and support was measured with the Working Alliance Inventory Short Revised form (WAI-SR; Hatcher & Gillaspy, 2006) which comprises 12 items scored on a scale between 1 and 5. The WAI-SR has three subscales: Goal, Task and Bond and a higher score on each corresponds to a better working alliance between therapist and patient in that domain. The WAI-SR has been extensively used in research and has shown adequate psychometric properties (Munder, Wilmers, Leonhart, Linster, & Barth, 2010).

Motivation

Internal (i.e., Identified and Integrated regulation) and external motivation were measured with the Treatment Self-Regulation Questionnaire (TSRQ; Deci & Ryan, 1985). The TSRQ comprises two subscales, Internal motivation (IM) and External motivation (EM), each measured with 6 items that were adapted to suit the internet intervention used in the present study. Each subscale provides a score between 6 and 42 with a higher score corresponding to a higher degree of motivation. The TSRQ has been used in studies on motivation and health behaviors and has shown adequate psychometric properties (Levesque et al., 2007).

Intrinsic motivation was measured with the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989). The IMI aims at measuring how pleasant, interesting and meaningful a task is perceived and has nine items scored on a scale between 1 and 7, which provides a total score of 9 and 63 with a higher score indicating a more positive experience of the task. The IMI was developed in sports psychology but has since been used in diverse areas of health psychology and was in this study adapted to suit the context of internet-based psychotherapy. Due to mixed findings concerning the factor structure of the IMI, only the total score was used (Markland & Hardy, 1997).

Secondary outcome measures

Somatic symptoms were assessed with the Patient Health Questionnaire-15 (PHQ-15; Kroenke, Spitzer, & Williams, 2002) which lists 15 different symptoms and provides a general picture of physical complaints on a scale between 0 and 28 (with the item about menstrual problems excluded to facilitate data analyses) (Han et al., 2009).

Personality factors were measured with the Zimbardo Time Perspective Inventory Short Form (ZTPI; Carelli, Wiberg, & Wiberg, 2011; Zimbardo & Boyd, 1999) The ZTPI was specifically used to measure personality traits that may be associated with executive function and the ability to postpone reward. The short version of the ZTPI used in this study has three subscales;

Future, Hedonistic and Fatalistic, and comprise 22 items scored on a scale from 1 to 5 (D'alessio, Guarino, De Pascalis, & Zimbardo, 2003). The ZTPI has been evaluated for research in health psychology and shown adequate psychometric properties (Crockett, Weinman, Hankins, & Marteau, 2009).

Treatment credibility was measured with the Treatment Credibility Scale (TCS) which is often used in internet intervention studies and is an adaptation from Borkovec and Nau (1972). The TCS comprises five items scored on a scale from 1 to 10 with a higher score indicating more trust in the presented treatment.

There is a lack of valid instruments for measuring variables of legitimacy and accountability, so these constructs were measured by two self-report instruments designed for this study. Each instrument comprised five items, which were scored on a scale from 0 to 10. The items for each scale were derived from the definitions of these constructs given by Mohr (Mohr et al., 2011). Legitimacy was operationalized as the participant's assessment of the treatment provider's expertise, engagement, trust, benevolence, and availability. Accountability was operationalized as the participant's perception of being monitored, having a clear picture of what was being expected of her, how logical the intervention seemed for reducing stress, how clear the goals of the intervention was, and how possible it seemed for the participant to affect outcomes. Each scale provided a score between 0 and 50. These two scales have not been used previously, and their psychometric properties were unknown.

Evaluating the quality of therapist support

The quality of the therapists' supportive communication was assessed by a third party senior psychologist who was blinded to support conditions and the identity of therapists. The assessor was provided with a random sample of 200 messages between therapists and participants, with 50 messages from each condition, and the guidelines for normal support and enhanced support. The psychologist then rated the degree to which the content of each message corresponded to the normal and enhanced support guidelines on a scale from 0 to 8. The instructions for therapists in the normal support condition corresponded to the first four points and the instructions in the enhanced support condition corresponded to all eight points. The quality score should therefore range from 0-4 in the normal support condition and 0-8 in the enhanced condition.

Study IV

The main outcome measure in this study was treatment adherence, operationalized as two variables. First, whether a participant started the intervention as agreed was measured dichotomously (yes/no). For participants in the face-to-face condition, showing up and participating in the psychoeducation

was considered having started the intervention. For participants in the online condition, logging in to the web page and opening any of the psychoeducation material was considered having started the intervention. Second, the number of prescribed assignments that each participant had registered on the webpage was measured at study end. This variable ranged from 0 (not registered any assignment) to 13 (registered all assignments). Participants had 9 days to complete the assignments, and all received an automatic e-mail reminder after 7 days.

Symptoms of psychological distress

To screen for psychological distress among participants, the short form version of the Depression, Anxiety and Stress Scale (DASS-21) was used, see above. A score above 11 (> 50% of maximum score) on any subscales was considered elevated symptom levels in the respective domain.

Motivation

Motivation was measured with the Situational Motivation Scale (SIMS) and VAS-scales designed for this study. The SIMS was developed based on the Self-determination theory to measure motivation in experimental tasks (Guay, Vallerand, & Blanchard, 2000). The SIMS comprises four subscales; intrinsic motivation, identified regulation, external regulation and amotivation, corresponding to the analogue constructs described in SDT. The SIMS contains 16 items, and each subscale is scored on 4 items on a scale from 1 to 7 providing a score between 4 and 28 for each subscale. It has primarily been used in sports psychology and shown adequate psychometric properties (Lonsdale, Sabiston, Taylor, & Ntoumanis, 2011).

In order to explore the factors that Kazantzis suggests are important for homework adherence, the SIMS was complemented by VAS-scales created for this study and based on the Homework Rating Scale (HRS; Kazantzis, Deane, Ronan, & L'Abate, 2005). The HRS could not be used since it is specifically designed to measure patients' views on assignments used in common face-to-face CBT treatment protocols, which made several of the items irrelevant for this study. Instead, six VAS-scales were designed to measure the relevant constructs measured by the HRS but adopted to the intervention format used in this study. The six scales were: therapist expertise and benevolence, accountability, sense of pleasure and mastery, relevance, encouragement and collaboration, and obstacles. Therapist expertise and benevolence was conceptualized as perceived therapist expertise, therapist effort, trust in the therapist, therapist benevolence and therapist friendliness. Accountability included items about responsibility, feelings of guilt, being monitored, embarrassment for not completing the assignment and negative expectancies. Sense of pleasure and mastery was conceptualized as experiencing interest, personal development, meaningfulness, pleasantness and appreciation from working with the assignment. Relevance was conceptualized as the intervention's ability to be helpful, to lead to better self-

understanding, importance, being an interesting experience and lead to personal development. Encouragement and collaboration was conceptualized as experiencing encouragement, practical support, constructive feedback, praise and appreciation from the study staff. Obstacles were conceptualized as the perceived burden or cost of working with the intervention, including time, frustration, unpleasantness, complexity and practical difficulties. Each VAS-scale had five items scored between 0 and 100 resulting in a score between 0 and 100 for each variable as well as an index for the whole instrument. The score of the Obstacles scale was reversed when calculating the index so that a higher index score would unanimously correspond to a more positive view of the assigned homework. These scales were designed for this study, and the psychometric properties were therefore unknown.

Treatment credibility has shown to be an important factor regarding motivation for psychotherapy adherence and the Treatment Credibility Scale (TCS) was used to measure this construct as per Study I-III, please see above.

Interventions

Study I-III

The intervention in Study I-III consisted of a four-week program with applied relaxation shortened and adapted from an existing treatment protocol that has previously been empirically evaluated (Carlbring, Björnstjerna, Bergström, Waara, & Andersson, 2007). The program comprised four steps with separate themes. The first step included an introduction to applied relaxation and tense-release relaxation, the second step introduced release-only relaxation, the third step continued with rapid relaxation while the fourth step focused on everyday relaxation training. Each step included prescribed relaxation exercises at least twice a day, but the exact training schedule was individualized for each participant. In addition to relaxation exercises, the first two steps comprised psychoeducation about stress, worry and muscle tension. The third step included a simple exercise with positive imagery as a complement to muscle relaxation. The fourth step contained strategies for maintaining everyday relaxation exercises after study end. Please see Table 1 for an overview of the intervention content. No other treatment components were used in the program.

Table 1. Overview of intervention content in Study I-III.

Step 1	Introduction to the treatment program and psychoeducation about stress and muscle tension. Muscle tensing-relaxing exercises introduced and prescribed.
Step 2	Introduction to release-only relaxation training. Continued psychoeducation about stress and muscle tension and relaxation. Release only relaxation exercises prescribed.
Step 3	Introduction to fast relaxation and everyday exercises. Imagery relaxation exercises introduced as a complement to muscle relaxation exercises. Everyday relaxation exercises prescribed.
Step 4	Maintenance of everyday relaxation training. Planning for the future and continued stress reduction behaviors.

Treatment conditions

In order to compare the effect of enhancing the treatment presentation on adherence and outcomes, the treatment material was presented differently in the normal- and enhanced conditions. To mimic previous internet-based self-help treatments in previous studies, the intervention in the normal presentation condition was presented in plain black-and-white texts with no use of enriched media or interactivity. In contrast, the presentation in the enhanced presentation condition was influenced by persuasive system design and e-learning (Clark & Mayer, 2011; Torning & Oinas-Kukkonen, 2009) and utilized full-color texts with images and figures to highlight important topics, see Figure 5. Each treatment step in the enhanced condition was presented in a video presentation, and audio instructions were supplied for the relaxation exercises. Summaries, quizzes and case vignettes were further used to facilitate learning and increase engagement in the treatment in the enhanced presentation condition.

In order to compare the effect of enhancing therapist support on treatment adherence and outcomes, different levels of support was provided in the normal and enhanced support conditions. In the normal support condition, therapists were instructed to follow specific guidelines regarding the quantity and quality of the support. Therapists should answer questions and provide feedback on completed exercises within 24 hours during weekdays. They should contact participants who did not log in during a week up to three times and to prompt participants who did not respond to messages. Further, they should provide encouragement to participants and praise completed exercises. They were instructed to be friendly and supportive but were not allowed to use specific therapeutic skills or techniques. These instructions were provided in writing to the therapists who also received supervision from senior psychologists.
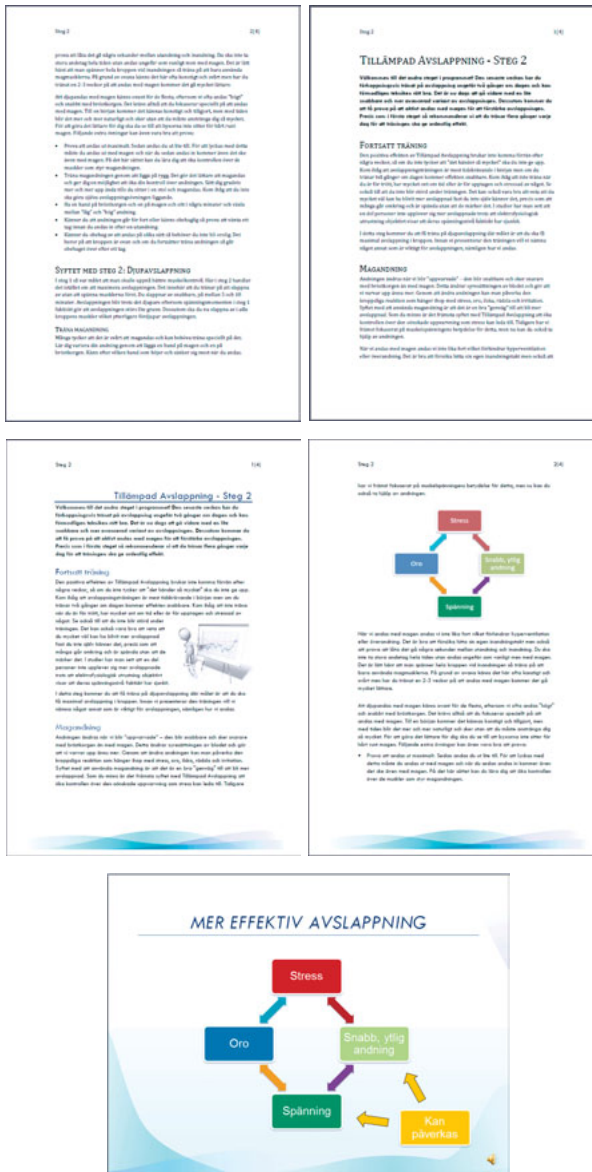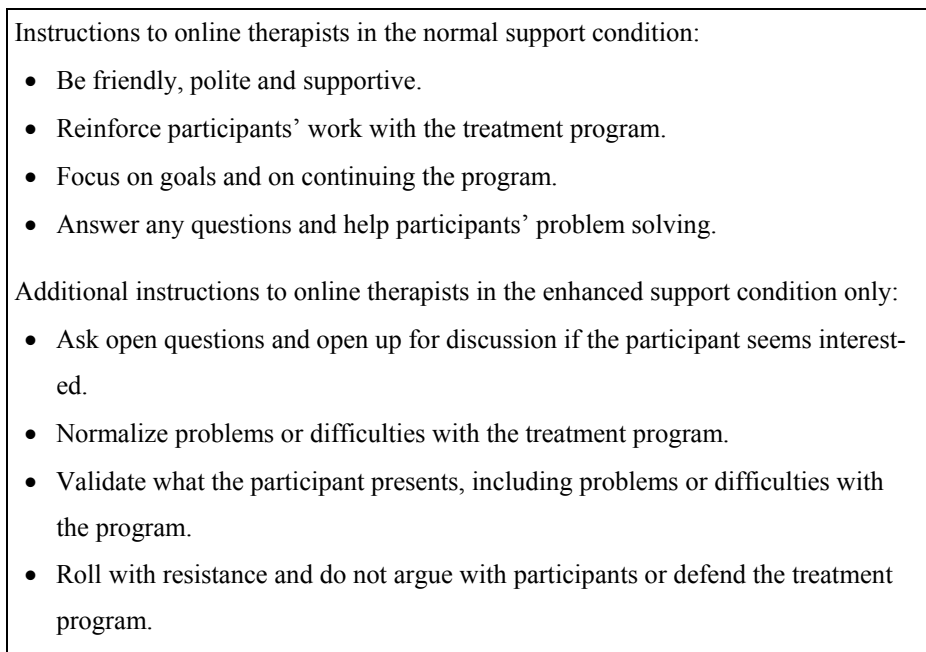
Figure 5. Examples of the corresponding text pages in the normal (top) and enhanced (middle) presentation conditions as well as an image from the corresponding video presentation (bottom).

In the enhanced support condition, support was designed to be more available, frequent and of therapeutic higher quality than in the normal condition. Therapists were instructed to answer questions and provide feedback within 12 hours, including weekends. They should contact participants who did not log in during a week or did not respond to messages within three days and were free to contact participants as many times and as often as they deemed

necessary in order to foster adherence. They were further instructed to follow the same guidelines for positive feedback as used in the normal support conditions but also to use specific therapeutic techniques derived from Motivational Interviewing (Miller & Rollnick, 2012). These techniques included asking open questions and opening up for discussion, normalizing and validating problems or obstacles in the intervention and to roll with resistance to change. Please see Figure 6 for a summary of the instructions to therapists. Therapists' contacts with participants were logged and monitored by the web system and a senior psychologist. Master grade psychology students and clinical psychologists provided all support.

Instructions to online therapists in the normal support condition:

- Be friendly, polite and supportive.

- Reinforce participants' work with the treatment program.

- Focus on goals and on continuing the program.

- Answer any questions and help participants' problem solving.

Additional instructions to online therapists in the enhanced support condition only:

- Ask open questions and open up for discussion if the participant seems interested.

- Normalize problems or difficulties with the treatment program.

- Validate what the participant presents, including problems or difficulties with the program.

- Roll with resistance and do not argue with participants or defend the treatment program.

Figure 6. The instructions to the online therapists in the normal and enhanced support conditions in Study I-III (shortened).

Study IV

The intervention in Study IV consisted of a psychoeducation component from affect-focused psychotherapy (Berg & Enlöf, 2014; McCullough & Magill, 2009). The aim of the intervention was to provide information about the Malan affect model, which includes the six basal emotions and how these influence everyday behaviors and well-being. The psychoeducation included information about what emotions are and how to understand them better, see Figure 7. The psychoeducation included several case vignettes and asked the participant to fill in their own examples of emotional situations they had experienced. The psychoeducation ended with an assignment that instructed each participant to record six previous situations where they had experienced

an emotion that affected their behavior or well-being and also to register one emotional situation each day the coming week. In total, each participant was thus asked to register 13 emotional situations after the psychoeducation. Both groups were asked to complete the assignment by filling out work-sheets provided on a web page.

What are emotions?
- The physiological and neurological basis of emotions.
- Emotions as automatic reactions.
- The cognitive and behavioral consequences of emotions.

Why do we have emotions?
- Emotions help communication.
- Emotions help guide attention and to prioritize.
- Emotions help survival and facilitate everyday life.

What basal emotions are there?
- Emotions are innate.
- Emotions are universal.
- Emotions are often at the center of psychological problems.

When can emotions be a hindrance?
- Controlling emotions.
- Ignoring emotions.
- Fear and shame of having emotions.

How to understand emotions better
- What emotions do you have?
- What functions do your emotions have?
- How do your emotions affect your cognitions?
- How do your emotions affect your behaviors?

Figure 7. Overview of the topics in the affect model psychoeducation in Study IV.

Intervention conditions

In the face-to-face condition, the psychoeducation was provided by one psychologist and two psychology master students. The intervention was manualized in writing, and the therapists met and discussed their presentations in order to ensure adequate reliability and intervention integrity. Each therapist was instructed to follow the written manuscript but was allowed to check in with participants, to ask questions and to provide feedback. They were not allowed to stray from the manuscript or to provide information not included in the manuscript. The psychoeducation took approximately 50 minutes for each participant.

In the online condition, the same written manuscript for psychoeducation as in the face-to-face condition was used. This was presented both as a video presentation as well as text on a web page. There was also an online therapist who greeted each participant the first time they logged in and was available to answer any questions but who did not to provide feedback or reminders for assignments.

Analyses

Study I

Since the primary aim of Study I was to investigate the effects of presentation and support on different outcome variables, group differences were analyzed on each of the independent variables separately (i.e., normal condition versus enhanced condition). The factorial design allowed both analyses of main effects as well as interaction effects for each outcome variable. The parametric primary outcome variables were assessed with Mixed Models Repeated Measures (MMRM) with restricted maximum likelihood estimation and unstructured covariance matrices. In the MMRM analyzes, the main effects of time (three levels), presentation (two levels) and support (two levels) and the interaction effects between all three independent variables were analyzed. Analyses with MMRM were chosen for outcome variables since this method is less sensitive concerning missing data and also make no assumption of independence in the data. While MMRM produces estimates for missing values in the dataset and uses these in the analyses, only non-estimated descriptive data was reported.

Group differences between parametric demographical variables were investigated with Analyses of Variance (ANOVA) while isolated comparisons between pairs of variables were made with t-tests. Non-parametric demographical and outcome variables were analyzed with Mann-Whitney and Kruskal-Wallis tests. Correlation analyses of parametric and non-parametric variables were conducted with Pearson's r and Spearman's rho respectively. A p-value of .05 was used as a threshold for statistical significance in all tests. r was used as a measure of effect size with $r > .1$ equals a small effect, $r > .3$ equals a medium effect, and $r > .5$ equals a large effect (J. Cohen, 1992; McGrath & Meyer, 2006).

Study II

Cross section differences between groups of participants at baseline were analyzed with t-tests and ANOVA for parametric variables and with Mann-Whitney and Kruskal-Wallis tests for non-parametric variables. Jonkheere-Terpstra tests were used to assess trends over ordinal groups in non-parametric variables. Treatment effects were analyzed with Mixed Models Repeated Measures (MMRM) using restricted maximum likelihood estimation with both fixed and random effects (Hesser, 2015). No patterns could be found regarding missing data, so data missing at random was assumed. All statistical analyzes with MMRM were conducted using the complete intention-to-treat sample while descriptive statistics were reported for participants with complete data only. Covariance structure for each model was chosen for best model fit, using the Chi^2 likelihood ratio test. Following this procedure, the First Order Autoregressive covariance structure was chosen for each outcome variable. In the MMRM analyzes, the main effects of time (three levels), presentation (two levels) and support (two levels) and the interaction effects between all three independent variables were analyzed. Background variables that were significantly different between the groups or between participants that dropped out or completed the intervention were included as covariates in the MMRM.

Analyses of predictor variables were conducted using multiple regression analysis while the moderation effects were analyzed in accordance with the guidelines by Kraemer et al. (2002). In the moderation analyses, treatment condition was a predictor variable, the main treatment outcome scale PSS was the dependent variable and treatment adherence (treatment progress and registered exercises) were the moderation variables. Since variables progress and registered exercises were considered constants and only measured once, they were analyzed as moderator variables rather than mediator variables. MMRM was used to analyze any interaction effects between predictor and moderation variables on outcome variables.

A *p*-value of .05 was considered the threshold for statistical significance in all analyses. Effect sizes were assessed with Cohen's *d* for parametric tests where $d > 0.2$ equals a small, $d > 0.5$ equals medium and $d > 0.8$ equals a large effect size and with *r* for non-parametric tests where $r > .1$ equals small, $r > .3$ equals medium and $r > .5$ equals a large effect size (J. Cohen, 1992).

Reliable change, improvement and deterioration between pretreatment and post-treatment were analyzed using the procedures described by Jacobsen and Truax (1991; Wise, 2004). In this analysis, Reliable change was

calculated by dividing the difference between the pretreatment and post-treatment scores by the standard error of the difference between the two scores. A Reliable Change Index greater than 1.96 indicates that the change is not be expected due to the unreliability of the measure and thus deemed reliable (Bauer, Lambert, & Nielsen, 2004). Using this procedure, the reliable change criterion for each outcome instrument used in Study II was calculated. A positive change between pre- and post-measurement exceeding these criteria was interpreted as reliable improvement while a negative change was interpreted as reliable deterioration.

Study III

Prior to any analyses, normality, linearity, and homeosedacity of data were evaluated by scrutinizing the residual scatter plots between predicted variables and errors of prediction and found adequate. Multicollinearity between subscales was also assessed by analyzing the variance inflation factor for each predictor variable.

Similar to Study II, reliable improvement was computed by dividing the difference between the pretreatment and posttreatment scores by the standard error of the difference between the two scores. If the Reliable Change Index was greater than 1.96, a change of that magnitude would not be expected due to the unreliability of the measure. Using this procedure, the reliable improvement criterion for PSS was a change score of 10 or more in the present study.

Modeled after de Graaf, Hollon and Huibers (2010), bivariate regression analysis was first used to identify candidate ($p < .10$) predictor variables for each outcome variable. All identified predictor variables were included in subsequent multiple regression analyses using a backward deletion process for each outcome variable. Logistic regression was used for the dichotomous outcome variables drop out and attrition and linear regression was used for continuous outcome variables. Cox & Snell R^2 (R^2_{CS}) and Nagelkerke R^2 (R^2_N) were used as a measure of overall model fit in the logistic regression analyses and R^2 was used in the linear regression analyses. Since some of the variables had distributions that deviated somewhat from normality, the final regression models were confirmed using robust regression analyses with bootstrap and bias correction. The sample size of 157 was deemed adequate for regression analysis of a maximum of eight predictor variables for each outcome variable except stress symptoms and reliable improvement for which the sample size of 96 was deemed adequate for six predictor variables.

Single missing values ($n < 1\%$) were imputed using multiple imputation and expectation-maximization estimates. A *p*-value of .05 was considered the threshold for statistical significance if not stated otherwise while exact *p*-values were reported for the final analyzes.

Study IV

Normality of data was investigated prior to analyses, and several variables were found to be skewed. Since transformation of data did not improve distributions substantially, it was decided to use non-parametric statistical testing. Differences in variables between study conditions were analyzed with Chi^2 and Mann-Whitney tests. *r* was used as a measure of effect size with $r >$ .1 equal small, $r > .3$ equal medium and $r > .5$ equal large effect sizes.

The associations between background variables, the SIMS and the VAS-scales on the one hand and the outcome variables, on the other hand were investigated using correlation analyses (Spearman's *rho*). A *p*-value of .05 was considered the threshold for statistical significance in all analyzes. Missing values ($n < 1\%$) were imputed using multiple imputation and expectation-maximization procedures.

Results

Demographical data in Study I-III

During nine months of recruitment, a total of 239 persons reported interest in the study of which 181 (76%) returned a signed consent form and 169 (71%) completed the baseline measurement and were included in the study. Sixteen participants reported elevated depressive symptoms and were contacted by telephone. Seven of them were subsequently excluded from the study and referred to other care. In the end, data from 162 participants were included in the analyses. One hundred and fifty-five (96%) started the intervention, 94 (58%) completed the post measurement and 84 (52%) completed the follow up assessment.

The sample consisted of 122 women and 40 men and the mean age was 35.3 (SD = 12.0) years. Eighty-one (50%) of the participants were married or cohabitant and slightly more than half (58%) had attended university. Half (50%) of the participants were working at the time of the study, about a third (29%) were studying and a tenth (11%) were on sick leave. A majority (70%) of the participants reported doing physical exercise at least once a week while a fifth (19%) used nicotine and a small group (4%) reported drinking alcohol at risk levels. A quarter (28%) of the participants had some kind of psychiatric treatment at the time of the study while a majority (58%) had had previous treatment.

There were no significant differences on any of the background or out-come variables between participants in the different conditions at pre-measurement.

Demographical data in Study IV

A total of 131 persons showed interest in the study and 105 were contacted by telephone. Of these, three were excluded due to currently attending psychotherapy, one was excluded for not having a viable mobile phone or access to the internet, and one was excluded due to reporting psychological problems and being referred to standard care. A total of 100 participants were included in the study and randomized to conditions. Of these, all had a

university education, 68 (68%) were women, 55 (55%) were cohabitant, 45 (45%) were single, and 8 (8%) had previous experience of psychological treatment. The mean age was 24.9 ($SD = 7.1$) years. There were no significant differences between participants in the two conditions regarding any of the background variables.

Study I: Adherence in ICBT

The medians and means of the main outcome variables treatment progress, registered exercises and self-reported adherence, can be seen in Table 2. There was no significant difference in median progress between the two levels of presentation. Regarding support, the median progress through the intervention was significantly higher ($Z = 2.11$, $p = .035$, $r = .17$) in the enhanced condition ($Md = 22$) compared to the normal condition ($Md = 9$). The mean number of registered exercises per step was 8.46 ($SD = 3.99$) across conditions, which corresponds to 60% of the prescribed number of exercises in the treatment. There were no significant differences between the numbers of registered exercises between conditions. The mean self-reported adherence was 2.49 ($SD = 1.43$) and the correlation between registered exercises, and self-reported adherence was $rho = .55$ ($p < .01$) across the conditions with no significant differences between the groups.

Table 2. Progress through the intervention, registered exercises and self-reported adherence for each level of the independent variables ($N = 162$).

Adherence	Normal presentation (n = 81)	Enhanced presentation (n = 81)			Normal support (n = 82)	Enhanced support (n = 80)		
	Md *(Q1-Q3)*	*Md* *(Q1-Q3)*	*Z*	*p*	*Md* *(Q1-Q3)*	*Md* *(Q1-Q3)*	*Z*	*p*
Progress through intervention	16 (4-25)	16 (4-25)	.38	.71	9 (4-25)	22 (4.25-25)	2.11	.04
	M (SD)	*M (SD)*	*F*	*p*	*M (SD)*	*M (SD)*	*F*	*p*
Registered exercises	8.9 (4.31)	8.0 (3.60)	1.42	.24	8.6 (4.02)	8.4 (4.00)	0.06	.80
Self-reported adherence	2.6 (1.50)	2.3 (1.36)	1.57	.21	2.5 (1.48)	2.5 (1.37)	.01	.98

The therapist sent significantly more messages per treatment step ($t_{(160)}$ = 2.07, p = .04, r = .16) to participants in the enhanced support conditions (m = 3.2, SD = 2.2) than to participants in the normal support conditions (m = 2.6, SD = 1.4). The assessed quality of messages was also significantly higher (Z = 2.57, p = .01, r = .15) in the enhanced support conditions (m = 2.8, SD = 1.42) compared to the normal support conditions (m = 2.3, SD = 1.30).

Treatment adherence

There were no significant presentation × support interaction effects on any of the three main outcome variables. Across all conditions, 44 (24%) participants did not complete the first step, 27 (15%) completed the only the first step, 25 (14%) completed only the first two steps, 16 (9%) completed only three steps and 50 (27%) completed all four steps of the intervention, see Figure 8. The participants that completed the whole intervention had a significantly higher level of education (Z = 2.30, p = .02, r = .24) and were more often in a relationship or married/cohabitant (Z = 2.07, p = .04, r = .22) than participants that did not complete even the first step of the intervention. No other differences or associations regarding background variables and adherence were found.
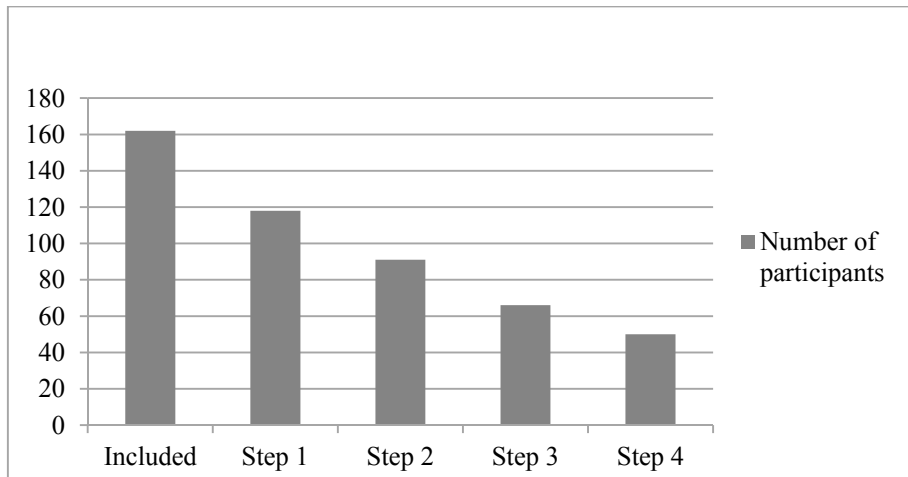

Figure 8. Number of participants included and completing each step of the intervention in Study I-III.

Study II: Adherence and treatment effects

Participants who dropped out of the study and did not provide data at the post or follow-up measurements more often ($Z = 2.82$, $p = .005$) reported previous treatment with psychotherapy at baseline compared to other participants so this variable was used as a covariate in all subsequent analyzes. Since 18 (11%) participants reported being in psychological treatment at baseline, all analyzes were repeated with these participants excluded, but as this did not change the overall conclusions, results were not reported. No other variables were significantly different between treatment completers and dropouts.

Treatment outcomes

The mean values of all outcome variables at pre, post and follow-up measurements can be seen in Table 3. There was a significant main effect of time ($F = 10.23 - 25.56$, $p < .003$, $d = 0.51 - 0.80$) on all outcome variables with medium effect sizes. There were no main effects of presentation ($F = 0.23 - 2.40$, $p = .12 - .63$) or support ($F = 0.62 - 2.50$, $p = .12 - .43$), nor any Group $\times$ Time interaction effects ($F = 0.01 - 1.16$, $p = .28 - .99$) on any outcome variable. There was a quadratic effect of Time (Time^2) on all outcome variables except the PHQ-15. Post-hoc analyzes showed that participants in the enhanced presentation conditions reported significantly lower scores on the PSS, STAI-S, GAD-7 and PHQ-9 ($F_{(1,94)} = 3.95 - 9.93$, $p = .002 - .049$, $d = 0.45 - 0.71$) at the post measurement but not at the follow-up measurement compared to the Normal presentation. There were no analogue significant differences between the groups in the two support conditions.

Moderation effects

There were no significant main effects of treatment progress ($F_{(1,132.163)} = 0.21$, $p = .65$) or registered exercises ($F_{(1,185.157)} = 0.35$, $p = .56$) on the PSS and no significant Time $\times$ Progress ($F_{(1,81.153)} = 3.33$, $p = .07$) interaction effect. There was a significant Time $\times$ Exercises ($F_{(1,126.042)} = 4.66$, $p = .03$) interaction effect but not a significant Group $\times$ Time $\times$ Exercises ($F_{(1,160.496)} = 0.36$, $p = .78$) interaction effect. This indicates that treatment outcome regarding stress symptoms was moderated by the level of registered exercises but that this effect was independent of treatment condition. There was no moderation effect of treatment progress.

Table 3. Outcome variables at pre, post and follow-up assessment for the presentation conditions.

Scale	Pre (n = 162)		Post (n = 94)		Four week follow-up (n = 84)	
	Normal presentation M (SD)	Enhanced presentation M (SD)	Normal presentation M (SD)	Enhanced presentation M (SD)	Normal presentation M (SD)	Enhanced presentation M (SD)
PSS	35.1 (7.55)	34.3 (7.70)	30.5 (8.92)	26.2 (8.17)	27.5 (9.28)	25.9 (7.81)
STAI-S	56.4 (11.45)	53.9 (9.98)	50.1 (13.49)	44.7 (10.41)	45.2 (12.23)	42.8 (9.76)
GAD-7	11.6 (5.27)	10.2 (4.87)	9.2 (5.52)	5.7 (4.20)	6.9 (5.01)	5.5 (3.09)
PHQ-9	13.2 (6.23)	12.3 (6.43)	10.9 (6.67)	8.1 (5.80)	8.9 (6.70)	7.1 (5.22)
PHQ-15	11.5 (5.25)	10.1 (4.26)	9.3 (5.19)	7.3 (4.93)	8.9 (5.31)	6.6 (4.41)

Scale	Normal support M (SD)	Enhanced support M (SD)	Normal support M (SD)	Enhanced support M (SD)	Normal support M (SD)	Enhanced support M (SD)
PSS	35.4 (7.67)	34.0 (7.54)	27.7 (9.08)	28.8 (8.55)	25.9 (9.39)	27.2 (7.96)
STAI-S	56.4 (11.95)	53.9 (9.45)	48.0 (13.92)	47.0 (10.99)	44.7 (12.83)	43.4 (9.59)
GAD-7	11.6 (5.32)	10.2 (4.84)	7.5 (5.64)	7.4 (4.86)	6.2 (4.85)	6.2 (3.65)
PHQ-9	13.4 (6.45)	12.1 (6.18)	9.8 (7.31)	9.3 (5.58)	8.2 (6.33)	7.8 (5.86)
PHQ-15	11.4 (5.04)	10.2 (4.53)	8.8 (5.53)	8.0 (4.82)	7.7 (5.50)	7.7 (4.63)

Note. Data is from participants with complete data only. PSS = Perceived Stress Scale, STAI-S = State Trait Anxiety Inventory State, PHQ-9 = Patient Health Questionnaire 9, PHQ-15 = Patient Health Questionnaire 15.

Reliable improvement and deterioration

In the whole sample, reliable improvement was reported by 21 (22%) participants on the PSS and by 28 (30%) participants on the STAI-S. The proportions that reported reliable improvement were smaller on the other outcome measurements and lowest for the PHQ-15. There were no significant differences in the proportions of participants reporting reliable change, deterioration or improvement, between the treatment conditions. There were no significant differences in background variables between participants who achieved reliable improvement on the PSS or the STAI-S and the other par-

ticipants. A small number of participants (0 - 3%) reported reliable deterioration on the outcome measurements. Three participants deteriorated according to the PSS, three deteriorated according to the STAI, two deteriorated according to the GAD-7 and two deteriorated according to the PHQ-9. In the open section of the post measurement, two participants reported elevated perceived stress due to the demands of the intervention.

Study III: Predictors of adherence

There were no significant differences on any of the predictor variables between the treatment groups at baseline measurement. Of the background variables, only education and occupation were significant predictors for any outcome variable in the initial bivariate regression analyses. Of the self-reported psychological variables, the TSRQ-IM showed markedly higher standard deviation compared to other variables and it was the only variable that failed to significantly predict any outcome variable, so it was removed from further analyses.

Drop out and attrition
The multivariate logistic regression analyses showed that early drop out could be significantly negatively predicted by the TCS (B = -0.14, χ^2 = 10.53, p = .001) with R^2_{CS} = .18 and R^2_N = .39 while attrition to post measurement was predicted by baseline PSS (B = 0.08, χ^2 = 3.18, p = .05), the ZTPI Hedonistic subscale (B = 0.32, χ^2 = 10.31, p = .001) and the IMI (B = -0.06, χ^2 = 5.71, p = .017) with R^2_{CS} = .19 and R^2_N = .28, see Table 4. Early dropout was thus associated with a low belief in the treatment model while dropout during the course of the treatment was associated with having elevated stress symptoms, being more focused on the immediate consequences of behaviors and finding the treatment uninteresting or unengaging.

Treatment adherence
After controlling for level of support, treatment progress was positively predicted by level of education (β = 0.24, t = 2.33, p = .023) and by the TCS (β = 0.35, t = 3.36, p = .001) with R^2 = .36 while registered exercises was significantly predicted only by the IMI (β = 0.29, t = 2.43, p = .018) with R^2 = .13. All other predictor variables were non-significant in the multiple regression analyses for treatment adherence. Accessing more of the online treatment material was in other words associated with a priori belief in the treat-

ment model while complying with the prescribed homework assignments was associated with reporting interest and engagement in the treatment.

Table 4. Significant predictor variables for treatment dropout and attrition after backward deletion ($n = 157$).

Predictor	B (SE)	χ^2	p	OR (95% CI)
Early drop out				
TCS	-0.14 (0.04)	10.53	.001	0.87 (0.80-0.95)
Attrition				
Baseline PSS	0.08 (0.05)	3.18	.050	1.08 (1.00-1.18)
ZTPI Hedonistic	0.32 (0.10)	10.31	.001	1.37 (1.13-1.66)
IMI	-0.06 (0.03)	5.71	.017	0.94 (0.90-0.99)

Note. TCS = Treatment Credibility Scale, PSS = Perceived Stress Scale, ZTPI = Zimbardo Time Perspective Inventory, IMI = Intrinsic Motivation Inventory.

Treatment outcome

Post treatment stress symptoms were significantly and positively predicted by the baseline PSS ($\beta = 0.47$, $t = 4.43$, $p < .001$) and by the TSRQ-EM ($\beta = 0.25$, $t = 2.40$, $p = .020$) while negatively predicted by the TCS ($\beta = -0.28$, $t = 3.53$, $p = .001$) with model $R^2 = .42$, see Table 5. Reliable improvement was positively predicted by baseline stress symptoms ($B = 0.11$, $\chi^2 = 4.47$, $p = .034$, $OR = 1.12$), by the TCS ($B = 0.09$, $\chi^2 = 3.25$, $p = .050$, $OR = 1.10$) and by the WAI ($B = 0.14$, $\chi^2 = 3.87$, $p = .049$, $OR = 1.15$) with model $R^2_{CS} = .32$ and $R^2_N = .47$, see Table 6. Reporting external pressure to complete the treatment was thus associated with worse treatment outcome while in contrast a good therapeutic bond was associated with a substantial positive treatment effect. Treatment credibility predicted both post treatment symptom levels and substantial improvement.

Associations between treatment adherence and outcomes

In bivariate regression analyses and after controlling for baseline PSS score, post treatment stress symptoms was significantly predicted by both treatment progress ($\beta = -31$, $t = 3.29$, $p = .001$) and registered exercises ($\beta = -.21$, $t = 1.98$, $p = .05$). The same pattern was seen for reliable improvement, which was significantly predicted by both treatment progress ($B = 0.26$, $\chi^2 = 7.96$, $p = .005$, $OR = 1.29$ (1.08 - 1.55)) and registered exercises ($B = 0.20$, $\chi^2 = 7.45$,

p = .006, *OR* = 1.23 (1.06 - 1.42)). Whether treatment effect was mediated through treatment adherence could not be further investigated in this study since the power calculations had not accounted for this type of analyzes.

Table 5. Significant predictor variables for post treatment stress symptoms after stepwise deletion (n = 96).

Predictor	B (*SE*)	β	t	p
Baseline PSS	0.53 (0.12)	0.47	4.43	<.001
TSRQ-EM	0.48 (0.20)	0.25	2.40	.021
TCS	-0.28 (0.08)	-0.35	3.53	.001

Note. PSS = Perceived Stress Scale, TSRQ-EM = Treatment Self-regulation Questionnaire Extrinsic Motivation, TCS = Treatment Credibility Scale.

Table 6. Significant predictor variables for reliable improvement after stepwise deletion (n = 96).

Predictor	B (*SE*)	χ^2	p	*OR* (95% *CI*)
Baseline PSS	0.11 (0.05)	4.47	.034	1.12 (1.01-1.25)
TCS	0.09 (0.05)	3.25	.050	1.10 (1.00-1.20)
WAI Total score	0.14 (0.07)	3.87	.049	1.15 (1.01-1.32)

Note. PSS = Perceived Stress Scale, TCS = Treatment Credibility Scale, WAI = Working Alliance Inventory.

Study IV: Adherence after face-to-face and online psychoeducation

The number of participants who dropped out from the study before completing any of the assignments was significantly higher (χ^2 = 5.32, p = .021) in the online condition (n = 11, 22%) than in the face-to-face condition (n = 3, 6%). In the whole sample, participants logged in a mean number of 4.6 times during the week of the intervention, and they spent a mean number of 89.2 (*SD* = 85.0) minutes on the web page, i.e. close to 1.5 hours. The mean number of completed treatment items was 2.1 (*SD* = 1.6) in the online condition which corresponded to about half of the intervention material. The mean number of log in occasions, the mean total number of minutes being logged

in and the mean number of completed assignments for each condition can be seen in Table 7.

Table 7. Descriptive statistics of the outcome variables and statistical differences between the two conditions ($n = 86$).

Adherence	All M (SD)	Online M (SD)	Face-to-face M (SD)	Z	p	r
Log in occasions	4.6 (3.1)	4.1 (2.9)	5.0 (3.3)	1.25	.210	.14
Log in occasions for assignments	4.2 (3.3)	3.7 (2.0)	5.0 (3.3)	2.51	.012	.27
Total time on web page	89.2 (85.0)	91.3 (77.0)	86.4 (95.8)	0.60	.56	.06
Completed assignments	7.6 (4.8)	4.2 (4.5)	9.2 (4.1)	3.36	.001	.37

Participants in the face-to-face condition had significantly more log in occasion to work with the assignments ($Z = 2.51$, $p = .012$) and also completed significantly more assignments ($Z = 3.36$, $p < .001$) than participants in the online condition but there were no significant differences between the groups concerning the total number of log in occasions or total time spent on the web page.

Assignment motivation
Participants in the online condition scored significantly lower on the SIMS Intrinsic ($Z = 4.50$, $p = .001$, $r = .49$) and higher on the Amotivation ($Z = 2.04$, $p = .042$, $r = .22$) subscales as well as lower on the TCS ($Z = 5.19$, $p = .001$, $r = .57$) compared to participants in the face-to-face condition. On the complementary VAS-scales, participants in the online condition scored lower on the Expertise and benevolence ($Z = 3.02$, $p = .003$, $r = .33$), Pleasure and mastery ($Z = 2.07$, $p = .041$, $r = .23$) and Encouragement ($Z = 2.77$, $p = .006$, $r = .30$) scales as well as higher on the Obstacles ($Z = 2.17$, $p = .039$, $r = .24$) scale compared to participants in the face-to-face condition. The results from the motivation variables and the differences between the groups can be seen in Table 8.

Table 8. Self-reported motivation after receiving the intervention but prior to starting the assignment (*n* = 86).

Scale	All M (SD)	Online M (SD)	Face-to-face M (SD)	Z	p	r
SIMS Intrinsic	16.16 (4.6)	13.9 (5.0)	17.9 (3.5)	4.50	.001	.49
SIMS Identified	19.1 (4.7)	19.4 (3.7)	18.9 (5.4)	0.59	.554	.06
SIMS Extrinsic	6.2 (2.3)	5.8 (2.7)	6.2 (2.3)	0.71	.475	.08
SIMS Amotivation	7.0 (2.9)	7.4 (2.4)	6.7 (3.2)	2.04	.042	.22
TCS	33.1 (6.6)	29.3 (4.9)	36.0 (6.2)	5.19	.001	.57
Expertise and be-nevolence	79.0 (11.4)	68.8 (13.7)	84.2 (9.8)	3.02	.003	.33
Accountability	65.2 (15.4)	57.7 (15.9)	68.1 (17.1)	1.50	.135	.16
Pleasure and mastery	67.3 (16.8)	55.2 (20.8)	72.0 (16.5)	2.07	.041	.23
Relevance	65.3 (19.1)	57.5 (19.7)	66.0 (24.6)	1.16	.247	.13
Encouragement	54.6 (14.6)	44.8 (14.4)	59.0 (16.8)	2.77	.006	.30
Obstacles	34.0 (13.6)	39.5 (11.6)	29.9 (13.7)	2.17	.030	.24
Index	65.5 (12.1)	58.9 (12.0)	70.6 (12.0)	4.53	.001	.49

Note. SIMS = Situational Intrinsic Motivation Scale, TCS = Treatment Credibility Scale.

Motivation and adherence

None of the background variables was significantly correlated with any of the outcome variables. In the whole sample, the SIMS Intrinsic subscale was correlated with the number of log in occasions for working with the assignment (*rho* = .27, *p* = .014) and the number of completed assignments (*rho* = .25, *p* = .022). The TCS was correlated only with the number of completed assignments (*rho* = .22, *p* = .048). Analyzing each condition separately yielded only non-significant correlations between the SIMS and the TCS on the one hand and outcome variables on the other. Of the VAS-scales, the Pleasure and mastery, the Relevance and the Index score were significantly correlated with number of log in occasions and number of completed assignments in the online condition but not in the face-to-face condition, see Table 9. Only the Index score of the VAS-scales was significantly correlated with number of log in and completed assignments in the face-to-face condition. This indicates that while intrinsic motivation is important for adherence in both conditions, the specific variables associated with adherence in the online condition was captured only by the VAS-scales.

Table 9. Correlations (Spearman's *rho*) between the VAS-scales and the outcome variables (*n* = 86).

Scale	Expertise and benevolence	Accountability	Pleasure and mastery	Relevance	Encouragement	Obstacles	Index
Online							
Total number of log in	.04	.23	.42*	.49**	.10	-.17	.32*
Log in for assignments	.04	.21	.43*	.48**	.10	-.16	.34*
Total time on webpage	.07	-.25	.10	.27	.10	-.14	.22
Completed assignments	.12	.17	.37*	.41*	.18	-.21	.55**
Face-to-face							
Log in for assignments	.09	.13	.14	.05	.24	-.19	.21*
Total time on webpage	.22	.09	.02	.16	.03	-.04	.03
Completed assignments	.15	.10	.17	.01	.05	-.07	.13*

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

Discussion

Main findings

The results from Study I showed that enhancing the quality and quantity of therapist support could help people to progress further through an internet-based intervention but not necessarily to adhere to the behavioral prescriptions to a larger degree. Enhancing the treatment presentation with multimedia content and interactive components did not affect either progress through the intervention nor adherence to the prescribed exercises. In Study II the results suggests that the online treatment program with applied relaxation may have been effective in reducing stress symptoms among the participants but there were no significant differences in treatment effects between the conditions. Across groups, participants who completed more exercises reported higher reductions of stress symptoms over time. Study III showed that treatment credibility and personality traits can be predictors for treatment dropout while treatment credibility and intrinsic motivation can predict treatment progress and adherence to prescribed exercises respectively. Positive treatment outcome was predicted by lower external pressure, higher treatment credibility and better working alliance. Overall, treatment credibility measured prior to treatment showed to be a stable predictor for several outcome variables. Finally, the results in Study IV confirmed that there can be significant differences in dropout and treatment adherence between two similar face-to-face and online interventions. This may partly be explained by the fact that participants in the online condition reported significantly lower levels of treatment credibility and motivation compared to participants in the face-to-face condition.

Adherence in ICBT

As hypothesized, enhancing therapist support resulted in improved adherence to the internet intervention program. This result is in line with previous studies showing that support is important for making people complete a treatment program (Kleiboer et al., 2015). However, since adherence was divided into three different variables, it became evident that participants who received enhanced support only adhered better to the online program and not to the prescribed exercises. This is a major find and shows the importance of carefully selecting and defining research variables. In previous studies of

internet interventions, adherence has often been defined as login in to a web page or taking part of treatment content (Holtforth et al., 2005). At the same time, the theoretical models behind most CBT protocols state that everyday behavior (i.e., completing assignments or exercises) is the important mechanism for improvement, not attending the treatment per se (Kazantzis & Lampropoulos, 2002). The results from Study I showed that increasing adherence to an internet intervention does not automatically lead to increased adherence to behavioral prescriptions outside of the online environment.

The second hypothesis of Study I, that enhancing the treatment presentation with multimedia content and interactivity would increase the adherence, was not supported, and the reasons for this are unclear. It is possible that the quality of the media content was not high enough or at least that the difference between the conditions was not large enough. It is interesting to note that historically, many internet interventions have relied on very basic presentations but never the less shown to be effective (Andersson et al., 2008). This supports the notion that treatment presentation is of relatively minor importance when it comes to helping people adhere to an internet intervention. On the other hand, like many other internet-based studies the sample in Study I-III was rather well educated and it may be argued that enriched media content may be helpful for people who are not used to working with written texts (Spek, Nyklíček, Cuijpers, & Pop, 2008). Unfortunately, the sample was too small to investigate any such effects in the subsample of participants with shorter education. It is also possible that online interactivity was not employed to its fullest extent. The quizzes, case vignettes and writing exercises used may have been too simple or unengaging to affect treatment adherence. It is also possible that interactivity may have a larger effect in treatments with less therapist support and that even the normal support condition in this study was sufficient to offset any effects of treatment interactivity (Titov et al., 2013).

Adherence and treatment effects

The results from Study II are in line with previous studies that show that relaxation programs can be provided effectively online (Carlbring et al., 2007). While the lack of a control condition prevents any further conclusions, the results never the less provides some support for this treatment approach. Contrary to the hypotheses, enhancing treatment presentation and support did not affect clinical treatment outcomes to any significant degree. All conditions fared equally well in this regard and 20-30% of participants reported reliable improvement on the self-report outcome scales. Unfortunately, only a few studies of internet-based CBT report indexes such as reliable change but the effects found in Study II seem to be in the lower end compared to those found in other studies (Carlbring, Ekselius, & Andersson, 2003). The reasons for this are unclear but it may have to do with the un-

specified problem of stress and the general inclusion criteria, or that relaxation training is a treatment approach that does not target specific symptoms that some participants may have (Pagnini, Manzoni, Castelnuovo, & Molinari, 2013). It is noteworthy that similar to other studies, the symptom levels among the participants were rather high on both the primary symptom scales of PSS and STAI-S and on the secondary scales such as the PHQ-9 (Hadjistavropoulos et al., 2014). This shows that the people who take part in these studies are not a group of people with mild symptoms but rather a group that may be eligible for standard care. The high proportion (58%) of people in the study sample who had previous psychiatric treatment further supports this conclusion. With some caveat, the results from the present studies may thus be generalizable to a larger population.

Predictors of adherence

Some of the hypothesized predictor variables in Study III were supported by the results while others were rejected. In previous studies, treatment credibility has been a recurrent predictor for both adherence to and clinical outcomes of internet-based psychotherapy (El Alaoui et al., 2015). The results in Study III confirmed the importance of treatment credibility but also showed that motivation and engagement in the treatment are important predictor variables. These results are in line with other studies that show that patient engagement is an important factor for adherence in ICBT (Kelders et al., 2015). Treatment credibility and motivation are probably partly overlapping constructs but may never the less hold distinct differences. Treatment credibility is to a large extent a preconception that probably facilitates the initiation of treatment while intrinsic motivation or engagement may reflect participants' subsequent experience of working with the treatment. The two variables may therefore be affected through different means and at different time points during treatment. Whether credibility and motivation can be affected by the treatment content or by therapists is an empirical question that has yet to be answered but in Study III, there were no significant differences on these variables between the conditions. The results from Study III further indicate that motivation is important primarily through an increased adherence to assignments. Homework assignments is a standard component in CBT but there are few studies that have investigated the role of assignments as a treatment mechanism experimentally (Conklin & Strunk, 2015). Future studies may investigate in more detail how to provide motivational support and how to optimize assignments for best treatment outcomes.

Adherence after face-to-face and online psychoeducation

There are relatively few studies that randomly assign participants to either online or face-to-face treatments and a problem with this design became

apparent in Study IV. A large proportion of participants (22%) in the online condition dropped out from the study and among those who remained, the adherence was significantly lower than in the face-to-face condition. The hypotheses that there would be differences in both motivation and adherence between the face-to-face and online conditions were supported by these results. However, the results deviates from some previous studies with similar randomization procedures that show non-significant differences between online and face-to-face treatments (Andersson et al., 2013; Hedman et al., 2011). The conflicting results are difficult to explain but may be influenced heavily by the context and the expectations of participants. It is important to clearly explain the randomization procedure in order to minimize the number of included participants that feel dissatisfied with their treatment condition. In the current study, this effect may have been emphasized by the non-clinical context and that participants took part out of interest rather than clinical need.

Interestingly, the differences in adherence may partly be explained by differences in treatment credibility and motivation, confirming that it is possible to predict drop out and adherence early in online interventions. It is further noteworthy that participants in the face-to-face condition reported higher levels of positive expectations from therapists but not negative external motivation compared to the online condition. This suggests that therapist contact may be effective through increasing the social bond, i.e., working alliance without creating external pressure, but unfortunately working alliance was not assessed in Study IV (Elvins & Green, 2008). Further studies are needed to explore this possibility in more detail. The supplementary motivational variables measured with VAS-scales could predict treatment adherence in the online condition but not in the face-to-face condition. It is thus possible that these constructs captured motivational variables relevant for online interventions better than the measurement of intrinsic motivation did. In conclusion, it seems that intrinsic motivation is associated with adherence in both face-to-face conditions while there are specific motivational variables that may be important only in online conditions.

Methodological considerations

The studies included in this thesis share some methodological considerations regarding design, sample, intervention, measurement and attrition. All these concepts affect the validity of the results and warrant detailed discussion.

Design

Study I-III used a randomized controlled factorial design with four conditions. This design was chosen in order to enable investigation of both main

and interaction effects of the independent variables. A further goal was to keep the sample size manageable while still achieving adequate power for statistical analyses. A shortcoming of the chosen factorial design was the lack of a control group not receiving treatment. The inclusion of a control group would have enabled a comparison of the treatment effect with the natural course of symptom development in the sample and conclusions about the efficacy of the treatment. Alternatively, the control condition could have included some form of active attention to further elucidate the effects of the relaxation training provided in the other conditions. However, the inclusion of control conditions may hamper the recruitment since some participants may refrain from participating in a study where they risk being randomized to a control condition (Ross et al., 1999). The primary aim of the study was to investigate treatment adherence, and while adherence could be assessed in active control condition, it was deemed outside the scope of the current study.

Another important design consideration is to have control over the differences in independent variables between conditions. In the study I-III, there is a risk that the presentation conditions were not different enough since they overlapped and were presented on the same online platform. The enhanced condition comprised more treatment material but had the same underlying content as the normal condition. The design choice was made in order to keep the treatments in the conditions as similar as possible since changing the presentation may also change the content. However, this could have been tested empirically prior to the study. A small pilot study was conducted where people were exposed to the two different conditions in order to assess the differences, but the results were not quantified.

To increase research integrity, Study I-III was first designed to employ a double-blind procedure where therapists would be blind to their assigned condition. All therapists were provided written instructions and guidelines regarding the therapist behaviors they could and could not use. The therapists in the normal support conditions soon realized that they were not allowed to provide optimal support, and the blinding failed in this respect. However, the quality and quantity of the support could still be assessed and was found to be significantly different between the two conditions. In analogue to the discussion of a control condition for treatment presentation, a control condition with minimal or fully automatic support would have provided a ground for even more detailed investigation of support effects. The inclusion of such a condition was considered but was rejected for practical reasons.

Study IV employed a randomized controlled design with two conditions. The main design consideration in Study IV was to construct two conditions that would diverse the independent variable, face-to-face human contact, as much as possible. In the study, participants randomized to the online condition did not have face-to-face contact with any therapist or study staff after

the initial inclusion which may not reflect the common practice in internet-based psychotherapy (Andersson et al., 2008). The ecological validity of this design may thus be questioned. The procedure that participants in both conditions were asked to report their assignment on a web portal was also a deviation from common therapy practice that may have affected the results. The design was chosen in order to balance the effort needed to report assignments between conditions. Taken together both conditions deviated to some degree from standard practice in respective domain and this may have affected the results but hopefully did not result in a systematic bias towards either condition.

Sample

In Study I-III the sample was recruited by self-referral through advertisement. An inherent weakness of this method is that the sample is biased, and the generalizability may, therefore, be questioned. However, the sample included in the study had moderate to high symptom levels and was comparable to samples in studies using clinical recruitment (Hedman et al., 2013). The demographical characteristics of people who are interested in internet-based psychotherapy may be somewhat different than people in regular psychotherapy. It has been suggested that participants in internet-based studies have high levels of education and socio-economic status, but studies of these associations are lacking (Andersson, 2009; Spek et al., 2008). Nevertheless, one should be cautious when generalizing the results from internet- based psychotherapy studies to psychotherapy in general (Karyotaki et al., 2015). The restricted sample may also have constrained the variance of studied variables which affects the conclusions. No clinical interviews were conducted in the studies and no diagnoses were assessed. The intervention targeted people with moderate symptoms of stress and worry, two conditions that are prevalent but do not correspond well to any specific diagnoses in the Diagnostic and Statistical Manual. Including structured clinical interviews may have provided better data regarding the sample characteristics and facilitated the understanding of the processes regarding adherence and attrition.

The sample in Study IV was restricted to a student population and people who were interested in the intervention. While this recruitment strategy severely limits the generalizability of the results, it was chosen to enable recruitment without providing treatment or other incentives for participation. In psychotherapy research, participants are typically offered free treatment, which may be the main incentive for participating in research. In Study IV, the intervention did not consist of a treatment but of a treatment component that could be interesting but not result in any benefits for participants. Other incentives, such as monetary compensation, were considered to affect the investigated processes to much (Watson & Torgerson, 2006). The strategy of recruiting self-selected and motivated participants was considered an ade-

quate model for clinical studies. Taken together, it should be noted that the sample was restricted to people who were interested in learning more about psychotherapy and were able to spend time and effort on participating in the study. In contrast to clinical studies, the overall symptom levels of stress, anxiety and depression reported in the psychiatric screening were low in Study IV.

Interventions

In Study I-III, the intervention with relaxation training may be considered part of mainstream CBT and representative for ICBT in this regard. However, relaxation training is not a specific treatment for any one disorder and is often used as a control condition in studies of other psychotherapy treatments and models (Carlbring et al., 2003; Pagnini et al., 2013). The clinical effects of relaxation training for treating anxiety disorders has also been surpassed by more specialized treatment models. There is therefore a risk that the results from Study I-III are not generalizable to all forms of internet-based psychotherapy. On the other hand, the relaxation protocol comprised many components seen in other CBT protocols such as psychoeducation, goal setting, assignments and problem solving. It also had the benefit of using strictly defined assignments that are relatively easy to measure, something that is essential in research on adherence. Another potential limitation with the relaxation program is that its simplicity and focus on overt behaviors may render it less sensitive to the effects of therapeutic support that may be more important in interventions that focus more on cognitive or emotional assignments. More complex treatments may be more dependent on participants discussing non-intuitive reactions or sensitive topics with therapists and the impact of high-quality support may then be greater than in relaxation training.

In Study IV, the intervention consisted of a psychoeducation component adopted from a published treatment protocol but it had not been evaluated prior to the study. Whether the psychoeducation provided was representative for other types of psychoeducation is unclear, but it included a physiological ground, a psychological model and a rational for assignments that are analogue to what is typically seen in psychoeducation of other treatment protocols (Barlow, 2014; Lukens & McFarlane, 2006). It is questionable whether participants who take part of psychoeducation out of interest can become as engaged in an intervention as participants who expect to receive help with real problems. On the other hand, completing the assignments may be less difficult or cumbersome for participants that experience no actual problems or adverse effects. The high levels of adherence in the face-to-face condition indicate that participants took the intervention seriously and made an effort to complete the assignments. Taken together it is difficult to assess whether this kind of laboratory-based experiments can be seen as a good model for

psychotherapy and it is ultimately an empirical question whether the results can be replicated in a clinical context.

Both interventions used manualized interventions, which ensured that intervention integrity was high. In Study I-III the same written treatment program was used in all conditions and communication between therapists and participants was monitored by the researchers. In Study IV all therapist used the same manual for psychoeducation, but the sessions were not audio recorded for evaluation. Instead, therapists met for roleplaying and discussing the psychoeducation in order to strengthen the internal validity. It is possible that the intervention varied to some degree, and a discovered non-significant trend of a therapist effect on outcome variables may be a sign of this. On the other hand, all face-to-face therapies contain a therapist effect that is interesting to investigate in its own right. There are probably both variances across psychotherapy modalities and across therapists, which warrant detailed investigation.

Measurements

The main outcome variables of adherence were measured behaviorally and by self-report while other variables were measured by self-report only. Adherence was operationalized in several ways and was measured by self-report of registered exercises but also by collecting data on participants' use of the web portal. Self-report of adherence to assignments should be interpreted with caution, but more behavioral measurements of this important variable are difficult to implement. Adherence to the treatment provided on the web portal is in contrast easy to measure but may not represent the best indicator of treatment engagement (Kelders et al., 2013). Momentary assessment with a mobile device may be a technical solution to solve some of these issues in future studies but may also restrict the range of outcome variables.

The different constructs of motivation were assessed by self-report with instruments that are not primarily designed for use in psychotherapy research. The constructs of motivation are mentalistic but correspond to overt behaviors that can be measured. One of the aims of the present thesis was to investigate the associations between self-reported motivation and objective measures of motivation such as adherence. Of these, behavioral measurements are typically more reliable and valid, and the results regarding self-reported motivation should be interpreted with caution. Still, the results from Study IV and the differences between the conditions found are in the hypothesized direction providing some support for the possibility to measure cognitive constructs of motivation.

As far as possible, the self-report instruments included in the studies were chosen among well-established and psychometrically evaluated instruments. This provides some support that the results are valid and can be compared to

the results from other studies. Where no instruments for a studied variable were available, such as in Study IV, new instruments were designed. The psychometric properties of these instruments are unclear, and the results should be interpreted with caution.

Attrition

Attrition, or dropout, was one of the main variables investigated in the studies and was not as such considered a problem or deficit of the designs. In Study I-III, attrition was high and only 58% of participants provided self-report data after treatment end, which dropped to 52% at the four-week follow-up. This is lower than often seen in other studies of internet-based psychotherapy and the reasons for this are unknown (Melville et al., 2010). It could be due to dissatisfaction with an intervention that may not have suited all participants. Further, participants had very little personal contact with study staff which may have increased attrition. While participants who did not respond to measurements were contacted several times, data collection was not pursued with a high level of insistency due to ethical considerations. A more effortful follow-up procedure may have provided more data from participants with low adherence to the intervention. However, the outcome variables regarding online treatment adherence were measured behaviorally during the intervention and for these variables, the attrition was technically zero.

A phenomenon seen to some degree in Studies I-III and to a high degree in Study IV, was the attrition or drop out immediately after the treatment was presented for participants. This pattern has been seen in other internet-based studies as well, and it seems that some participants are immediately put off when they are provided an experience of what internet-based psychotherapy is and what is expected of them (Fernandez, Salem, Swift, & Ramtahal, 2015; Karyotaki et al., 2015). Identifying and finding ways to handle this group of participants is one of the major challenges for internet-based psychotherapy today.

In Study IV, there was a higher level of attrition among those who were randomized to the internet condition. Interestingly, the level of this initial drop out, about 20%, was almost identical in Study I and Study IV, indicating that it may not be a study specific phenomenon. The reasons for this attrition are difficult to explain but indicate lower motivation, perhaps caused by a perceived weaker social contract between participants and study staff when they do not meet in person or a disappointment with the randomization result. These kinds of effects may be the reasons why internet-based psychotherapy studies can have recruitment difficulties. Treatment preferences is an important predictor for drop out in psychotherapy (Kwan, Dimidjian, & Rizvi, 2010). Unfortunately, this kind of attrition was not the scope of the study and therefore not investigated in detail, but all potential

participants were informed about the conditions and randomization procedure prior to inclusion. Since attrition occurred before baseline data collection, there is little data to analyze in order to better understand this group of participants. This procedure was chosen because of practical and technical considerations but most baseline data should preferably be collected before randomization to conditions. Future non-blinded studies need to find ways to better inform participants that in order to take part of similar research, they should be willing to engage in either condition regardless of preferences.

Ethical considerations

All participants in Study I-III provided informed consent before being included. The risk that the interventions would lead to harm for the participants was estimated to be very low. There was no formal assessment of negative effects for the participants but in the open-end section of the post intervention assessment, two participants reported experiencing increased stress due to the demands of the treatment. The data and communication of these two cases were scrutinized by the responsible study psychologist who found that the respective therapists had identified this negative effect already during the treatment and addressed it accordingly. The potential negative effects of the treatment were thus hopefully noted and addressed also in other, unidentified cases. There is however a risk that many of the participants who did not complete the post or follow-up assessments experienced negative effects and dropped out of the study for this reason.

The design of Studies I-III included only active treatment conditions, which meant that all participants received a potentially effective intervention. In the normal conditions, the intervention was designed to mimic existing interventions and not to be subpar of standard care.

The intervention provided in Study IV was not considered a treatment and all participants were clearly informed about this prior to signing informed consent. All participants were screened with a standardized psychiatric instrument in order to identify people in need of clinical care but only one person scored above the cut off and referred to clinical care. The potential negative effects of taking part of the intervention in Study IV are unknown but given the low psychiatric symptoms levels among participants and the brevity and voluntary nature of the intervention, the risk was deemed very low. There was a large drop out of participants in Study IV among those randomized to the internet condition. But since the intervention in Study IV was not considered a treatment this effect was not deemed an ethical issue.

In Study I-IV, all sensitive data were collected through a secure internet platform or by de-identified pen and paper instruments. The possibility to identify individual participants in the presented results was deemed very

low. The procedures and protocols used in Study I-IV was approved by the Regional ethics committee board in Uppsala, Sweden.

Conclusions and implications

While the studies included in this thesis all have methodological limitations, it is possible to draw some general conclusions. First, treatment adherence in online psychotherapy seems to be mostly unaffected by using multimedia presentation. This is further confirmed by the relative effectiveness of even the earliest internet-based interventions that used only screens with plain texts (Ström et al., 2000). The effect of using persuasive design features to improve adherence seen in other studies could not be replicated in the present studies (Kelders et al., 2012). Second, treatment adherence consists of several components and includes both adherence to the online program and adherence to the everyday behavioral prescriptions included in the treatment. These are important to differentiate between since therapist support seems to improve adherence to the online program but not to assignments which is arguably a very important mechanism in behavioral therapy (Mausbach et al., 2010). Third, the clinical effects of an online intervention are rather robust and are not affected heavily by the treatment presentation and therapist support. This suggests that subject factors such as interest and ability are more important variables than treatment features for successful treatment outcomes. Participants who adhere to the behavioral prescriptions report better treatment outcomes compared to those with low levels of adherence, so investigating this mechanism is of furthermost importance. Fourth, while adherence to assignments is difficult to affect, it can be predicted by personality factors and treatment credibility prior to treatment. Also, participants who find a treatment meaningful and interesting are more likely to adhere to an intervention and to achieve positive treatment results. Finally, participants who have personal contact with a therapist report higher motivation and are more likely to complete assignments than are people who complete a similar intervention online. These effects seem to be largely due to higher treatment credibility as well as a positive experience of the personal therapist contact. In contrast with the face-to-face conditions, it may mostly be participants who report high levels of relevance and pleasure with the intervention that adhered to the assignment in an online condition.

The results of this thesis suggest that continuing investigating ways to enhance therapist support is important in order to further facilitate treatment adherence but also to study in more detail whether interventions can be designed to be more intrinsically motivating for participants (Van Gemert-Pijnen, Kelders, & Bohlmeijer, 2014). One step that has already been seen in previous studies is to make interventions more tailored for each participant (Johansson et al., 2012). Another approach, which still needs more investiga-

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tion, is to tailor the amount and quality of support for participants' needs (Kelders et al., 2015). It may also be fruitful to continue investigating what aspects of human interaction can be automated in order to make internet-based interventions effective. Since treatment credibility and positive personal contact with a therapist are important in online interventions, there may be ways to improve these, for example by step-wise introduction to the treatment or by video-call components respectively. It is also possible to approach this question from the other perspective and study how technology can be used in face-to-face therapy to improve adherence and outcomes (Clough & Casey, 2011; Mohr, Burns, Schueller, Clarke, & Klinkman, 2013). So-called blended therapy, that comprises both human and digital components, is still largely under-studied but may pose a way to capitalize on the strengths of both formats (Amichai-Hamburger et al., 2014; Clough & Casey, 2015). Given the public pressure for psychiatric treatment, identifying and evaluating important variables for effective treatments will continue to be an important research field.

Acknowledgements

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