Rapid early improvement in the treatment of insomnia with ACT-based group intervention and the factors linked to improvement

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Insomnia is a common problem that is linked with e.g. elevated risk for other mental disorders and medical problems. Acceptance and commitment therapy (ACT) has not been studied much in the treatment of insomnia although it has been found efficient with a variety of disorders. Also, it has not been studied if early improvement occurs in the treatment of insomnia, even though it has been found in the treatment of e.g. depression and anxiety disorders.

ACT-based group intervention consisted of one individual phone session and five weekly group sessions. Here data from 54 participants is used. Participants completed sleep diary before and during the intervention and completed self-evaluation measures before, in the middle of and after the intervention. All in all, data from 12 measures of sleep, symptoms, and processes are examined here. Participants were divided into the groups of improved, unchanged or deteriorated according to the change in the severity of insomnia using the Reliable Change Index –method (Jacobson & Truax, 1991). Based on these groups, the groups of rapid early responders (n = 5), other responders (n = 16), and nonresponders (n = 25) were formed and then compared using one-way analysis of variance.

In total 15.2 % of the participants improved rapidly, i.e. during the first two sessions, and 45.7 % by the end of the intervention. The rapid early responders did not differ from the other responders and the nonresponders in demographic factors, personality traits or in any of the measures used in the first assessment, including the severity of insomnia. Additionally, the rapid early responders did not differ from the other responders at the end of the intervention in the severity of insomnia, in other factors, or in the change in any other measure. However, those who improved rapidly or during the whole intervention differed from the nonresponders at the end of the intervention.

This study shows that early improvement can occur in the treatment of insomnia and that ACT-based group intervention for insomnia can lead into clinically significant improvement. Here no predicting or explaining factors were found and also the persistence of improvement was not investigated. Future research should investigate other possible explaining factors of the improvement and the persistence of the improvement.

Key words: insomnia, Acceptance and Commitment Therapy, group intervention, rapid early improvement

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Unettomuus on yleinen ongelma, johon liittyy muun muassa kohonnut riski sairastua muihin mielenterveyden häiriöihin sekä somaattisiin sairauksiin. Hyväksymis- ja omistautumisterapiaa ei ole vielä juuri tutkittu unettomuuden hoidossa, vaikka se on todettu tehokkaaksi hoidoksi moniin muihin ongelmiin. Myöskään nopeaa hyötymistä ei ole tutkittu aiemmin unettomuuden hoidossa, vaikka kyseinen ilmiö on löydetty muun muassa mieliala- ja ahdistuneisuushäiriöiden hoidossa.

Hyväksymis- ja omistautumisterapiaan pohjautuva ryhmäinterventio koostui yhdestä puhelinistunnosta ja viidestä viikoittaisesta ryhmäistunnosta. Tässä käytetään aineistona 54 intervention läpikäyneeltä osallistujalta intervention alussa, puolivälissä ja lopussa kerättyä kyselylomakedataa, sekä unipäiväkirjoja, joita osallistujat täyttivät ennen interventiota ja sen ajan. Kaiken kaikkiaan tässä käsitellään 12 uni-, oire- ja prosessimittarilla kerättyjä tietoja. Osallistujat jaettiin hyötyneisiin, muuttumattomiin ja taantuneisiin unettomuuden vaikeusasteen mukaan käyttäen Reliable Change Index –metodia (Jacobson & Truax, 1991). Näistä ryhmistä muodostettiin nopeat hyötyjät (n = 5), muut hyötyjät (n = 16) ja hyötymättömät (n = 25), joita vertailtiin muiden mittareiden suhteen yksisuuntaisella varianssianalyysilla.

Kaiken kaikkiaan 15.2 % osallistujista hyötyi interventiosta nopeasti, eli kahden ensimmäisen ryhmäistunnon aikana, ja 45.7 % intervention loppuun mennessä. Nopeat hyötyjät eivät eronneet muista hyötyjistä tai hyötymättömistä taustatekijöiden, persoonallisuuden tai muiden ennen interventiota mitattujen tekijöiden suhteen, unettomuuden vaikeusaste mukaan lukien. Nopeiden hyötyjien ja muiden hyötyjien välillä ei ollut intervention lopussa eroa unettomuuden vaikeusasteessa tai muissa muuttujissa, vaikka molemmat ryhmät erosivat hyötymättömistä useissa muuttujissa.

Tutkimus osoitti, että nopeaa hyötymistä voi tapahtua myös unettomuuden hoidossa ja että hyväksymis- ja omistautumisterapiapohjainen ryhmäinterventio unettomuuteen voi johtaa kliinisesti merkitsevään hyötymiseen. Tämä tutkimus ei löytänyt hyötymistä ennustavia tai selittäviä tekijöitä, eikä myöskään hyödyn pysyvyyttä tarkasteltu. Tulevaisuudessa tulisi tarkastella muita mahdollisia hyötymistä selittäviä tekijöitä sekä hyödyn pysyvyyttä.

Avainsanat: unettomuus, hyväksymis- ja omistautumisterapia, ryhmäinterventio, nopea varhainen hyötyminen

LIST OF ABBREVIATIONS

AAQ-II	Acceptance and Action Questionnaire
ACT	Acceptance and Commitment Therapy
ANOVA	Analysis of Variance
BDI-II	Beck Depression Inventory II
CBT-I	Cognitive Behavior Therapy for Insomnia
CFQ-13	Cognitive Fusion Questionnaire-13
DASS	Depression Anxiety Stress Scales
DASS-D	Depression scale
DASS-A	Anxiety scale
DASS-S	Stress scale
DBAS-16	Dysfunctional Beliefs and Attitudes about Sleep-16
ES	Effect Size
ESS	Epworth Sleepiness Scale
FFMQ	Five Facet Mindfulness Questionnaire
FFMQ-O	Observing
FFMQ-D	Describing
FFMQ-A	Acting with Awareness
FFMQ-NJ	Nonjudgement of inner experiences
FFMQ-NR	Nonreacting to inner experiences
ISI	Insomnia Severity Index
NR	Nonresponders
OR	Other Responders
OSAS	Obstructive Sleep Apnea
PLMD	Periodic Limb Movement Disorder
RCI	Reliable Change Index
RER	Rapid Early Responders
RFT	Relational Frame Theory
SCL-90	Symptom Check-List-90
GSI	General Symptom Index
SD	Standard deviation
SE	Sleep Efficiency
SOL	Sleep Onset Latency
SQ	Sleep Quality
TST	Total Sleep Time
TTB	Total Time in Bed
WASO	Wake time After Sleep Onset

Contents

1. INTRODUCTION

The aim of the present study is to investigate Acceptance and Commitment Therapy -based group intervention for insomnia and whether rapid early improvement occurs in this intervention. There are some previous studies about treating insomnia with ACT (e.g. Dalrymple, Fiorentino, Politi, & Posner, 2010) but ACT-based group interventions for insomnia have not been studied before. Furthermore, rapid early improvements have not been studied earlier in the treatment of insomnia. Considering the prevalence of insomnia, group interventions and brief interventions may be one solution for making treatment available for as many as possible. Also, by recognizing rapid early improvement, treatment outcomes could be maximized.

1.1. Insomnia

DSM-IV-TR defines insomnia as a chronic difficulty in initiating and/or maintaining sleep and/or the sleep is non-restorative (Van Houdenhove, Buyse, Gabriëls, & Van den Bergh, 2011). In primary insomnia 1) sleep disturbance is present for at least one month, difficulties occurring at least three times per week and 2) insomnia affects daytime functioning (Van Houdenhove et al., 2011). In DSM-V primary insomnia is called insomnia disorder and this diagnosis can no longer be given if sleep is only non-restorative and there is no difficulty in initiating or maintaining sleep (American Psychiatric Association, 2013). In addition to occurring as an independent disorder, insomnia can also occur as a comorbid disorder with for example another mental disorder, somatic disorder or use of chemical substances (American Psychiatric Association, 2013). However, it is hard, even impossible, to point out the causality between insomnia and for example another mental disorder or substance abuse, and pointing out the causalities may not even be relevant (American Psychiatric Association, 2013). Nowadays the term "secondary insomnia" is more rarely used and DSM-V refers to comorbid insomnia instead of secondary insomnia (American Psychiatric Association, 2013).

Generally approximately 30 % of adults suffer from at least one symptom of insomnia (Roth, 2007). Diagnostic insomnia has a prevalence of about 10 % (Roth, 2007). In a Finnish population study by Ohayon and Partinen (2002) these numbers were slightly higher. At least one symptom of insomnia was reported by 37.6 % of the participants; 21.3 % reporting just one symptom; 9.6 %

two; 5.7 % three and 1.4 % four symptoms. In the same study global dissatisfaction with sleep was reported by 11.9 % of the same Finnish sample. The prevalence of any DSM-IV insomnia disorder diagnosis in Finland is 11.7 % (Ohayon & Partinen, 2002).

Insomnia is more common among women, aged and people with other somatic or mental disorders (Blais, Morin, Boisclair, Grenier, & Guay, 2001; Buysse et al., 1994; Hohagen et al., 1993). Also the unemployed, divorced, separated, and widowed have higher prevalence of some or all insomnia symptoms (Ohayon & Partinen, 2002). However Ohayon and Partinen (2002) found no significant difference between genders in the prevalence of insomnia symptoms in the Finnish population. Interestingly, Ohayon and Partinen (2002) found that report of insomnia symptoms and global sleep dissatisfaction differed between seasons in Finland.

If left untreated, insomnia is a very persistent condition, still found in up to 88 % of cases at 2-year follow-up (Ganguli, Reynolds, & Gilby, 1996; Katz & McHorney, 1998). Also the risk for comorbid medical and psychological disorders is elevated in people with insomnia (Katz & McHorney, 1998). It is estimated that 40 % of insomniacs have a coexisting psychiatric condition, depression being the most common diagnosis (Roth, 2007). Insomnia has been linked to e.g. daytime fatigue, greater medical service use, greater work absence, increased risk of serious medical conditions, and traffic and work accidents (Harvey, 2002; Roth, 2007). The treatment of insomnia can also affect comorbid disorders. Manber et al. (2008) suggest that including cognitive behavior therapy for insomnia (CBT-I) in the treatment of depression with comorbid insomnia has positive effects in alleviating both, whereas untreated comorbid insomnia affects the course of depression, the treatment outcomes and makes the risk for relapse greater.

1.2. Cognitive and behavioral treatments of insomnia

Several nonpharmacological treatments for insomnia have been developed. One of the oldest of these is *sleep hygiene education* which involves teaching the patient about environmental, lifestyle and behavioral factors that may influence sleep, with a set of instructions that are not agreed-upon and may incorporate aspects from other types of insomnia interventions (Smith & Neubauer, 2003). Different types of *relaxation techniques* have also been used for decades to decrease the hyperarousal that is thought to affect sleep (Smith & Neubauer, 2003). *Stimulus control therapy* (Bootzin, 1973) consists of instructions to limit the amount patient spends awake in bed, the goal being to reassociate the bed, bedroom and bedtime with sleep. *Sleep restriction therapy* (Spielman,

Saskin, & Thorpy, 1987) is a procedure that aims at gradually limiting the time spent in bed to the time of actually sleeping. All of the methods mentioned above can be considered as 'behavioral treatment'.

It has been found that people with chronic insomnia often have negative thoughts and beliefs about their condition and its consequences, and these thoughts and beliefs seem to have an effect to the sleep disturbance, especially to the maintenance of insomnia (Harvey, 2002). Other cognitive processes (e.g. selective attention to sleep-related cues) may also have some contribution to the maintenance of insomnia (Harvey, 2002). Based on these observations about the cognitive factors, many different types of *cognitive therapy (CT)* for insomnia have been developed, and the aim of these therapies is to alter the cognitions about sleep. CT approaches have generally not been used alone but integrated into multicomponent treatment approaches. For review about CT in the treatment of insomnia, see e.g. Smith & Neubauer (2003).

Cognitive Behavior therapy for insomnia (CBT-I) combines all or some of the behavioral and cognitive methods described above. It has been demonstrated efficient on both objective and subjective sleep-continuity measures in several studies, and gains are also maintained or improved at follow-up (Smith & Neubauer, 2003; Wang, Wang, & Tsai, 2005). Many studies have shown CBT-I's superiority over many other treatments (like relaxation training, sleep hygiene or pharmacotherapy alone), and compared to pharmacotherapy, the effect of CBT-I sustains, while that of pharmacotherapy is short-lived (Wang et al., 2005). This superiority can be due to the fact that as insomnia becomes a chronic problem, both cognitions and behavioral factor play a role in maintaining the problem (Smith & Neubauer, 2003). CBT-I is also effective whether it is delivered as individual or group treatment or telephone consultations (Bastien, Morin, Ouellet, Blais, & Bouchard, 2004). Also, relatively short CBT-I (6 - 8 weekly meetings) has been found effective (e.g. Bastien, et al., 2004; Espie, Inglis, Tessier, & Harvey, 2001b; Green, Hicks, Weekes, & Wilson, 2005; Järnefelt et al., 2012). The effectiveness remains even when the treatment is delivered by a non-psychologist, for example trained nurse (e.g. Espie et al., 2001b; Järnefelt et al., 2012). Thus it can be said that CBT-I is a very effective and adjustable treatment for insomnia. Espie, Inglis, & Harvey (2001a) found that no demographic factors predicted outcome in CBT-I. However anxiety and depression symptoms and thinking errors predicted good outcome, i. e. high levels were associated with good outcome (Espie et al., 2001a). The severity of insomnia was also linked to outcome (Espie et al., 2001a).

1.3. Acceptance and Commitment Therapy

Acceptance and Commitment Therapy (ACT) belongs to the "third wave" of behavior therapies (Hayes, 2004; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). It is more focused on "contextual and experiential change strategies, including acceptance, defusion, mindfulness, relationship, values, emotional deepening, contact with the present moment, and the like" (Hayes, 2004, p. 659) in comparison to earlier cognitive and behavior therapies. The basic theory underlying ACT is Relational Frame Theory (RFT), according to which language and cognitions make it possible to alter the functions of events and their relations to other events (Hayes et al., 2006). These cognitive relations are regulated by contextual factors of a particular situation (Hayes et al., 2006). RFT suggests that the goal in clinical interventions should not be to change the psychological events, but rather change the functions of them and the relationship to them (Hayes et al., 2006). Thus it can be seen that CBT and ACT differ in their basic concept; whereas CBT is more focused on the contents of negative cognitions and affecting them, ACT is more focused on how to relate to one's thoughts, memories etc., and how to react to them.

The main goal in ACT is to increase psychological flexibility, the ability to be fully and consciously present without avoidance or evaluation, and to adapt behavior in a way that serves one's personal values (Hayes et al., 2006). The six core processes establishing psychological flexibility are: acceptance, cognitive defusion, being present, self as context, values and committed action (Hayes et al., 2006). The authors see acceptance being an alternative to experiential avoidance. It is described as a way of increasing values-based action which involves welcoming one's inner experiences as they come, without trying to unnecessarily change them. Cognitive defusion techniques aim to find new ways to relate to private events resulting usually in a decrease in their believability or attachment to them. Being present means non-judgmental observation of psychological and environmental events with the goal of experiencing the world more directly which can make behavior more flexible. Self as context aims to create a different view to self, connected to acceptance and defusion by being able to be aware of inner experiences without excessive attachment to them. Work with values and committed action is often interwoven. Values are chosen consequences of actions which cannot be achieved as an object but can be practiced in everyday life. Commitment to the chosen values happens through concrete goals and actions. All of the other processes are primarily methods helping to live life according to values. For review, see Hayes et al. (2006). In practice, working with each process has its own methodology with specific

metaphors, exercises and homework covering it (Hayes, 2004). The processes are however often overlapping, so separating them in practice may also be difficult.

In ACT psychological suffering is in large part seen to be due to entanglement in cognition and thoughts, and attempts to apply same problem-solving methods to inner experiences as to the outer world (Hayes, Levin, Plumb-Vilardaga, Villatte, & Pistorello, 2013). According to Hayes et al. (2013), entanglement with conceptualized sense of self makes people lose contact with the present moment, and thus leads to behavioral inflexibility which is characterized by rigid behavioral patterns and avoidance. Therefore ACT focuses heavily on experiential methods which make it possible for the clients to relate to their thoughts and feelings without entanglement to the language and rules (Hayes et al., 2013).

1.4. ACT in the treatment of insomnia

The theoretical foundations for using ACT or other treatments combining acceptance and mindfulness in the treatment of insomnia have been suggested by Lundh (2005) and Ong, Ulmer, & Manber (2012). Insomnia can be seen as an interaction between sleep-interfering and sleep interpreting processes (Lundh & Broman, 2000), or consisting of primary arousal directly related to sleep and secondary arousal related to the consequences about diminished sleep, the interpretations about them, and sleep arousal (Ong et al., 2012). Lundh (2005) sees that mindfulness and acceptance could ease insomnia by influencing the observation and acceptance of inner events (thoughts, memories etc.) in presleep situation as well as accepting the natural changes in the ability to sleep. In Ong et al.'s (2012) metacognitive model of insomnia this accepting and observing point of view could be seen especially helpful in reducing secondary arousal (finding a new, more accepting way to relate to one's thought about sleep).

The third wave of behavior therapies, including ACT, have been found efficient as interventions for various psychological problems such as depression, anxiety disorders, chronic pain and stress (e.g. Ruiz, 2010; Hayes et al., 2006). In recent years the use of mindfulness and acceptance has also been introduced in the treatment of insomnia e.g. using mindfulness-based cognitive therapy for insomnia (MBCT-I) (Heidenreich, Tuin, Pflug, Michal, & Michalak, 2006), combining mindfulness meditation with CBT-I (Ong, Shapiro, & Manber, 2008) and combining ACT principles with CBT-I (Dalrymple et al., 2010). The results of these studies are promising but more research needs to be done to further see the usefulness of ACT in treatment of insomnia and

the possible mechanisms leading to successful treatment outcomes. One possible area of interest is also to study if the improvement in treatment can happen early in the intervention or if the changes are more gradual or can be seen later.

1.5. Treatment response and sudden gains

In an attempt to make psychotherapy as effective as possible, researchers have begun to analyze within-individual changes during therapy. One important factor in this research is time: when do the changes occur and are they gradual or rapid improvements during the course of therapy? Ilardi and Craighead (1994) found that 60–70 % of improvement on mean depression severity occurs in the first four weeks of CBT. However, this average symptom severity time course can include many heterogeneous individual time courses. Tang and DeRubeis (1999) observed individual trajectories during CBT and found that some patients demonstrated a drop in depression severity score between two sessions and that this drop represented a large proportion of the patient's total symptom improvement during the whole intervention. The authors named this phenomenon sudden gain in their study of treating adults suffering from major depressive disorder with CBT. In the original study, sudden gainers experienced a larger reduction in BDI points than those who did not experience a sudden gain and sudden gains predicted better treatment outcomes. Additionally, sudden gains have often occurred early in therapy (Stiles et al., 2003; Tang, Luborsky, & Andrusyna, 2002; Tang & DeRubeis, 1999).

Sudden gains have been found in efficacy studies using different kinds of psychotherapy, including e.g. supportive-expressive psychotherapy (Tang et al., 2002), group-based CT (Kelly, Roberts, & Ciesla, 2005), as well as treating clients with a variety of disorders with a variety of approaches under routine clinic conditions (Stiles et al., 2003). In addition to many studies about sudden gains in the treatment of depression (e.g. Busch, Kanter, Landes, & Kohlenberg, 2006; Gaynor et al., 2003; Hardy et al., 2005; Hunnicutt-Ferguson, Hoxha, & Gollan, 2012; Tang & DeRubeis, 1999, Tang, DeRubeis, Beberman, & Pham, 2005) they have also been found in the treatment of posttraumatic stress disorder (Aderka, Appelbaum-Namdar, Shafran, & Gilboa-Schechtman, 2011) and anxiety disorders (Aderka et al., 2012; Clerkin, Teachman, & Smith-Janik, 2008; Hofmann, Schultz, Meuret, Moscovitch, & Suvak, 2006; Norton, Klenck, & Barrera, 2010). The diversity of approaches and disorders of the sudden gain studies suggests that the gains may be a phenomenon occurring independently from the therapy form or type of problems.

Many possible reasons have been hypothesized to lead to sudden gain but unanimity has not been reached. Tang and DeRubeis (1999) proposed that sudden gains result from the patient's cognitive change that occurs in the critical session preceding the sudden gain and this finding was later replicated (Tang et al., 2005). However, not all studies have managed to replicate these results (e.g. Busch et al., 2006; Gaynor et al., 2003; Kelly et al., 2005). Furthermore, Kelly, Roberts, and Bottonari (2007) examined if sudden gains result from hope, self-evaluation, or life events, but only self-esteem at baseline and decreases in the frequency of social comparisons in the week before the gain could explain sudden gains. Additionally, in Kelly et al.'s (2007) study 60 % of the nontreated sample experienced a sudden gain, but these gains were not durable as the reversal rate was 54.3 %. However, the participants were completing weekly online questionnaires for nine weeks, which could have led to gains in some cases. Thus, it seems that sudden gains can result from nonspecific factors that are difficult to examine. Another option is that rapid improvements in symptoms occur naturally in the course of depression and other disorders.

1.6. Present study

Taking into account the prevalence of insomnia and the harms caused by it, there is a need for effective, brief, and cost-effective treatments for insomnia. It is possible that some patients can benefit from a very brief intervention as others would need a longer treatment. Even though many efficient brief treatments for insomnia have been developed, the factors connected to successful treatment outcomes remain somewhat unfound. With earlier research on sudden gains it has been shown that great changes can occur rapidly and early in the course of treatment and can have good effects on the treatment outcome. However this phenomenon has not been studied in treatment of insomnia so far. As measurements in this study were only made at three points during the treatment instead of every session, it is only possible to point out if the change occurred during the first three sessions (rapid early improvement) or later in the treatment but not possible changes at session to session interval (sudden gain). In this study our aim is to observe if rapid early improvements can be found in an ACT-based group intervention for insomnia, and whether this rapid early improvement leads to better treatment outcomes and which factors may contribute to it. The research questions are:

1. How many improve rapidly from a brief Acceptance and Commitment Therapy -based group intervention for insomnia?
2. Are there differences in the treatment outcome between those who improve rapidly and those who do not?
3. Which factors separate those who improve rapidly from those who improve more gradually or those who do not improve? The factors considered here are: demographic factors, personality, other symptoms (depression, anxiety, stress, somatic, and psychiatric symptoms), sleep symptoms, psychological flexibility, mindfulness skills, cognitive fusion, and dysfunctional cognitions about sleep.
   3.1 Which pretreatment measures, demographic or personality factors separate those who improve rapidly from those who improve more gradually or those who do not improve?
   3.2 Which posttreatment measures separate those who improve rapidly from those who improve more gradually or those who do not improve?
   3.3 Do those who improve rapidly differ from those who improve more gradually or those who do not improve in their changes during the intervention?

Rapid early improvement has not been studied in the treatment of insomnia or other sleep disorders before. Thus, due to the explorative nature of the study, it is difficult to set hypotheses concerning the explaining factors or the consequences of the improvement. However, since sudden gains have been found with many other disorders, it can be assumed that they can also occur in the treatment of insomnia.

2. METHODS

2.1. Data source

Data were obtained from a randomized clinical trial of psychological treatment for insomnia. Data were collected during the fall and spring semesters of the 2012–2013 academic year at the Department of Psychology at Jyväskylä University. Two previous master's theses have been written using the same data (Pelkonen & Puha, unpublished; Naamanka & Suutari, unpublished).

2.2. Procedure

Participants were recruited via an advertisement in a local newspaper in October 2012. Potential participants enrolled in by phone or email and were all interviewed via phone to ensure they met criteria for insomnia. Additionally, four participants were recruited from a lecture concerning diabetes and later interviewed by phone. Overall, 102 people applied for the study, all of whom were Finnish adults living in Central Finland.

To be included participants had to report at least one of the following: difficulty initiating sleep, difficulty maintaining sleep, or early morning awakening. No clinical diagnosis was made. Potential participants were also asked about the duration of insomnia, other symptoms and use of sleep medication. Exclusion criteria were: a comorbid psychiatric diagnosis, apart from moderate depression or anxiety syndromes, diagnosed neurological disorder, alcohol abuse or other ongoing psychological treatment. Furthermore, some applicants were excluded because they wanted to benefit from the treatment professionally or because of difficulties to attend the meetings due to long distance. All in all, six people were excluded and recommended to seek treatment elsewhere and five were put on a waiting list for possible future individual treatment.

Due to the large number of participants, the treatment designed to be individual was transformed into a group intervention. Participants meeting the criteria were contacted to ensure they agreed to take part in the group intervention, of which 16 people declined from. Participants were randomized into treatment (n = 37) and wait list control (n = 35) groups. Both control and treatment groups had a baseline assessment 1 to 2 weeks before the treatment groups' intervention

began. At this assessment all participants received sleep diaries and information about the intervention. The control group completed sleep diary for 4 weeks from the baseline, the treatment group until the end of the treatment. The control group was put on a waiting list and received identical intervention as the treatment group approximately 3 months after the baseline assessment. Thus, participants were treated in two occasions: the treatment group in the autumn and the wait list control group in the spring.

Figure 1 presents the design and participant flow. After the baseline assessment, which was also the treatment group's first assessment, the treatment group completed two assessments: second assessment after the second group session and third assessment after the last group session. The control group had similar assessments during their treatment but they also had one extra assessment about a month before the beginning of the intervention which was their first assessment. Both groups had a follow-up assessment one month after the end of their intervention but the data from the follow-up is not included in this study.

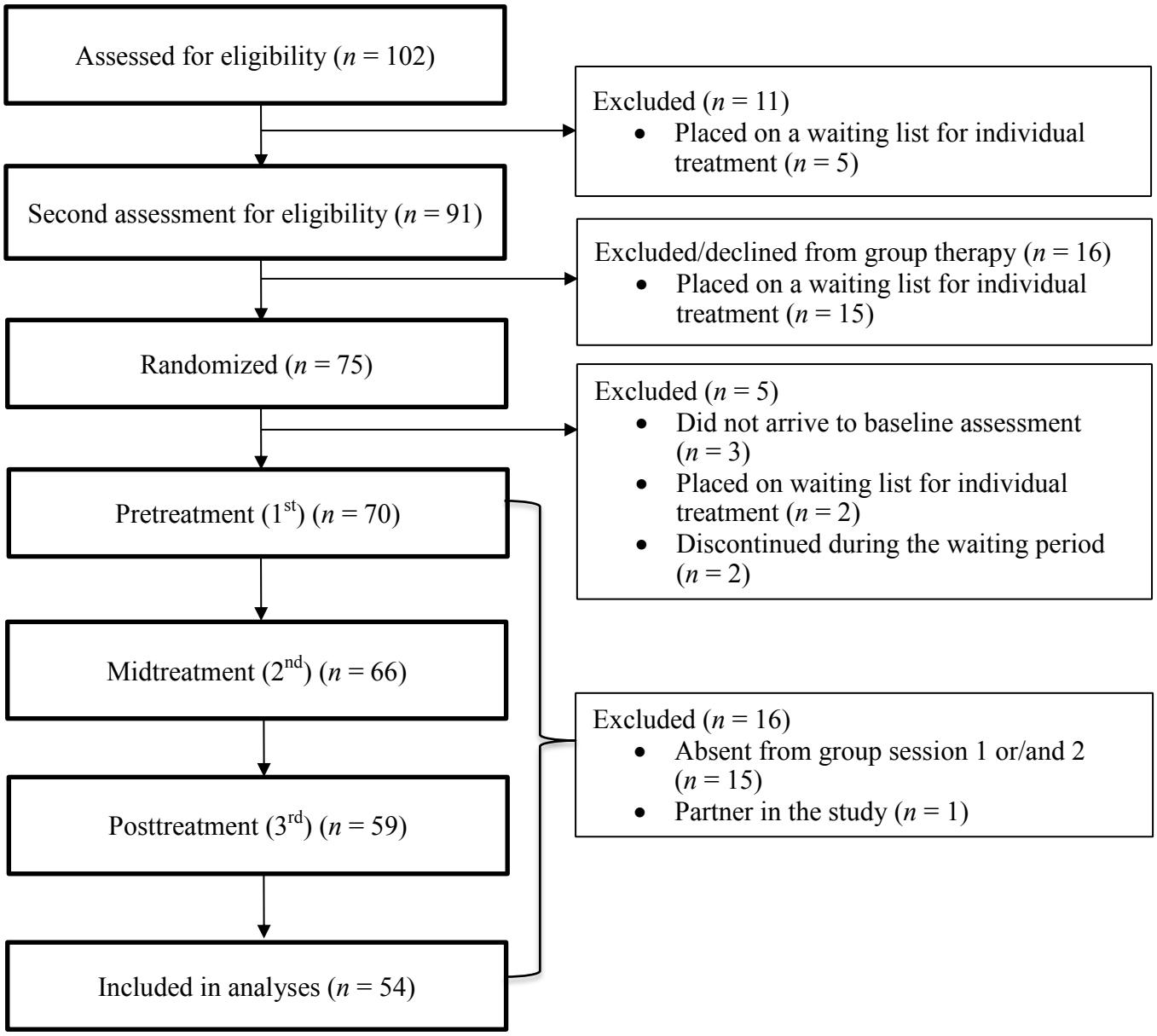

Figure 1. Participant flow.

Here data from all treated participants is used. Those who had another ongoing treatment but attended this treatment and those who had a partner participating in the treatment were excluded. Also, due to the interest in early improvement, only those who attended both the first and second group sessions were included. All in all, 54 people were included in the study and 20 were excluded (see Figure 1). Majority of the participants were 50 years or older, 64.8 % were women, and about a half of all participants were using sleep medication. There were no significant differences between

treatment and control groups in demographic factors. More specific demographic information about the participants is presented in Table 1.

The Epworth Sleepiness Scale (Johns, 1991) at baseline was used to measure excessive daytime sleepiness which is associated with certain sleep disorders including obstructive sleep apnea (OSAS) and periodic limb movement disorder (PLMD) (Johns, 1991). Total score of 16 or more was used as a cutoff point, since it has been found to differentiate those with narcolepsy, idiopathic hyperinsomnia or at least moderate OSAS, from those with other sleep disorders and healthy controls (Johns, 1991). Only a few participants had a total score of 16 or more in ESS (Table 1.). About half of the participants suffered from moderate insomnia, about one third from mild insomnia and about one fifth from severe insomnia (Table 1.).

Table 1. Age, education, occupational status, use of sleep medication, ESS, severity of insomnia in baseline and sex of the participants.

	women	men	total
age (years)	–39 11.4 % 40–49 22.9 % 50–59 22.9 % 60–69 28.6 % 70– 14.3 % M = 54.8 *n* = 35	–39 26.3 % 40–49 5.3 % 50–59 42.1 % 60–69 21.1 % 70– 5.3 % M = 51.79 *n* = 19	–39 16.7 % 40–49 16.7 % 50–59 29.6 % 60–69 25.9 % 70– 11.1 % M = 53.74 *n* = 54
education	no occupational degree 9.4 % occupational degree 9.4 % academic degree 81.3 % *n* = 32	no occupational degree 10.5 % occupational degree 31.6 % academic degree 57.9 % *n* = 19	no occupational degree 9.8 % occupational degree 7.6 % academic degree 72.5 % *n* = 51
occupational status	retired 37.1 % working 48.6 % others 14.3 % *n* = 35	retired 31.6 % working 52.6 % others 15.8 % *n* = 19	retired 35.2 % working 50.0 % others 14.8 % *n* = 19
use of sleep medication	yes 62.9 % no 37.1 % *n* = 35	yes 31.6 % no 68.4 % *n* = 19	yes 51.9 % no 48.1 % *n* = 54
ESS in baseline	< 16 94.3 % ≥ 16 5.7 % *n* = 35	< 16 94.7 % ≥ 16 5.3 % *n* = 19	< 16 94.4 % ≥ 16 5.6 % *n* = 54
severity of insomnia in baseline (according to ISI)	mild/subclinical 27.3 % moderate 54.5 % severe 18.2 % *n* = 33	mild/subclinical 31.6 % moderate 52.6 % severe 15.8 % *n* = 19	mild/subclinical 28.8 % moderate 53.8 % severe 17.3 % *n* = 52

M = mean, ESS = Epworth Sleepiness Scale, ISI = Insomnia Severity Index

2.3. Intervention

The intervention was a structured ACT-based treatment for insomnia which consisted of an individual session of 45–90 minutes (depending on the client) via phone, followed by five weekly group sessions of approximately 90 minutes in groups of seven to ten people. The groups both in the autumn and spring were composed according to days the participants had named to suit them best. A case formulation (Lappalainen, Miettinen, & Lehtonen, 2007) was made based on the phone session. The case formulation accompanied by a letter explaining it was given to each participant in the first group session. The participants were also given information consisting of sleep hygiene instructions, stimulus control advice and sleep restriction, and new perspectives to sleeping problems which were adapted from Lundh (2005, p. 36). These can be found in Appendix 1 and 2. In the first group session some time was also spent to discuss the functioning of the group and to introduce the aim and general principles of the intervention.

The following group sessions all started with a conversation about past week's homework and sleep. Metaphors and exercises were used in each group session as well as videos introducing the processes of ACT. All exercises, videos, and metaphors were discussed in pairs, small groups or with the whole group to share thoughts and/or ask questions. Each group session ended with a brief mindful breathing exercise and self-assigned homework consisting of value-based actions, mindfulness exercises and applying sleep instructions in everyday life. In addition to using a structured intervention, videos, and recorded exercises were used to minimize the possible differences between intervention groups and therapists. A more detailed view of the content of each group session is presented in Table 2.

Table 2. Description of the videos, exercises, and metaphors used in the group sessions.

First group session	exercise: analyzing values (values)
	video: observation (mindfulness)
	video: active awareness (mindfulness)
	exercise: mindful breathing (mindfulness)
Second group session	video: values (values)
	exercise: mindful sitting (mindfulness)
	exercise: the observer (acceptance)
	exercise: mindful breathing (mindfulness)
Third group session	video: wise actions (values)
	metaphors: passengers on a bus (values)
	exercise: body scan (mindfulness)
	exercise: the observer (acceptance)
	exercise: leaves on a stream (acceptance)
	exercise: mindful breathing (mindfulness)
Fourth group session	video: wise choices (values)
	exercise: mindfulness in daily tasks (mindfulness)
	video: acceptance (acceptance)
	metaphor: tug of war with a monster (acceptance)
	exercise: thoughts about self (acceptance)
	exercise: mindful breathing (mindfulness)
Fifth group session	exercise: six months to live (values)
	exercise: mindful listening (mindfulness)
	exercise: terrier thoughts (acceptance)
	metaphor: birds nest (acceptance)
	exercise: mindful breathing (mindfulness)

2.3.1. Therapists

The intervention was led by 11 psychology students aged from 22 to 26, four of whom were doing their master's degree and seven of whom were doing their bachelor's degree. Two students led each intervention group. The students received 16 hours of intensive training for Acceptance and Commitment therapy and had supervision two hours weekly throughout the intervention.

2.4. Measures

2.4.1. Assessment of insomnia

Insomnia Severity Index (ISI)

The Insomnia Severity Index is a self-report questionnaire assessing one's perception of his or her insomnia, including the nature, severity and effects of the insomnia (Morin, 1993; Bastien, Vallières, & Morin, 2001; Morin, Belleville, Bélanger, & Ivers, 2011). The ISI has 7 items and they measure the severity of sleep onset, sleep maintenance, early morning awakening, dissatisfaction with sleep, interference with daytime functioning, noticeability of sleep problems by others, and the level of distress caused by the sleep problems during the last two weeks. The items are rated with a 5-point Likert scale from 0 to 4 with the total score ranging from 0 to 28. The interpretation of the total score is: 0–7 absence of insomnia, 8–14 subthreshold insomnia, 15–21 moderate insomnia, 22–28 severe insomnia (Morin, 1993).

Dysfunctional Beliefs and Attitudes about Sleep-16 (DBAS-16)

The Dysfunctional Beliefs and Attitudes About Sleep Scale (Morin, Vallières, & Ivers, 2007; Finnish translation by Finnish Institute of Occupational Health, 2008, 2012) is used to measure maladaptive cognitions related to sleep. In the questionnaire there are 16 statements to which clients answer in a 10-point Likert scale. The statements can be divided into four subscales: Expectations, Impacts, Worry and Medication (Carney et al., 2010). DBAS-16 is developed on the basis of DBAS-30, which has 30 statements (Carney et. al, 2010). Carney et al. (2010) proved that DBAS-16 can separate the insomniacs from good sleepers, and that the total score has good reliability, although this is not the case with subscales. Therefore, in this study we do not use the subscales but only the total score.

Sleep diary

The sleep diary is a commonly used valid self-report measurement used to assess sleep (Espie et al., 2001b). The participants completed sleep diary daily within 30 minutes after arising throughout the treatment and minimum of 3 weeks before and 1 week after group sessions. The sleep diary constituted of 15 questions relating to sleep, time in bed, use of stimulants or sleep medication,

daytime consequences and subjective assessment of sleep quality. Some questions were answered in minutes etc., some in Likert-scale.

Here we focus on the following questions: “I went to bed and turned off the lights at _”, “ I was awake in bed approximately _ minutes before falling asleep” ,“At night I was awake approximately _ minutes”, “I got out of bed at _”,“My estimation of sleep obtained at total is _ hours _ minutes” and “Last night sleeping was (1 = very restless… 5 = very peaceful)” From these questions following measurements were calculated: total sleep time (TST; min), total time in bed (TTB; min), sleep onset latency (SOL; time from initial sleep onset to actually falling to sleep; min), wake time after sleep onset (WASO; total wakeful time during the night; min) and sleep quality (SQ, 5-point Likert scale). Sleep efficiency (SE) was calculated using TST and TTB ($\frac{TST}{TTB} \times$ 100 %).

2.4.2. Assessment of symptoms

Beck Depression Inventory (BDI-II)

The Beck Depression Inventory II consists of 21 items which assess the severity of depressive symptoms, the recall period being the last two weeks (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; Beck, Steer, & Brown, 1996). Each item has response options from 0 to 4 and the total score ranges from 0 to 63. Higher scores mean more severe depression. Score from 0–13 is interpreted as absence of depression, 14–19 as mild depression, 20–28 as moderate depression and 29–63 as severe depression.

Depression Anxiety Stress Scales (DASS)

Depression Anxiety Stress Scales (Lovibond & Lovibond, 1995) is a 42-item questionnaire assessing negative emotional symptoms. The statements are rated from 0 (not holding true at all) to 3 (holding true a lot) according to the extent the person has experienced each symptom over the past week. The total score ranges from 0 to 126. DASS comprises three scales: Depression (DASS-D), Anxiety (DASS-A), and Stress (DASS-S), each of them consisting of 14 items. Previous studies have shown that the scales can separate between symptoms of depression, physical arousal, and psychological tension and agitation (e.g. Antony, Bieling, Cox, Enns, & Swinson, 1998).

Specifically, Antony et al. (1998) found that DASS-D and DASS-A measure features unique to their domain whereas DASS-S seems to be sensitive to the symptoms of both depression and anxiety.

Symptom Check-List-90 (SCL-90)

The SCL-90 is a questionnaire that measures self-reported symptom intensity (Derogatis, Lipman, & Covi, 1973 in Holi, Sammallahti, & Aalberg, 1998). The questionnaire consists of 90 items describing symptoms, which are rated on a 5-point Likert scale based on how much they disturb the individual (0 = not at all, 4 = extremely), time reference being one week. The Global Severity Index (GSI) is counted by summing the answers and dividing the total by 90. The total range of GSI is from 0 to 4. There are 9 dimensions in SCL-90: somatization, obsessive-compulsive disorder, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism (Holi et al., 1998). However in this study only GSI is used. SCL-90 has good discriminant validity and GSI discriminates psychiatric patients from community sample, patients' mean value being 1.56 (SD 0.61) whereas community's mean value is 0.60 (SD 0.44) (Holi et al., 1998). GSI was assessed only in the first and the third assessment.

2.4.3. Assessment of processes

Acceptance and Action Questionnaire-II (AAQ-II)

A revised, 7-item scale version of the Acceptance and Action Questionnaire - II (Bond et al., 2011) was used to assess acceptance, experiential avoidance and psychological flexibility. The items are rated from 1 (never true) to 7 (always true). Lower scores indicate greater levels of psychological flexibility which in turn is related to lower levels of depression, anxiety, stress and overall psychological distress (Bond et al., 2011).

Five Facet Mindfulness Questionnaire (FFMQ)

The FFMQ is a 39-item self-report questionnaire which measures mindfulness as a construct of five factors (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The facets of mindfulness are: describing (FFMQ-D), observing (FFMQ-O), acting with awareness (FFMQ-A), nonjudging of inner experience (FFMQ-NJ), and nonreacting to inner experiences (FFMQ-NR). Each item is rated

on a five-point Likert scale from 1 (never or very rarely true) to 5 (very often or always true). The total score range is from 0 to 195 and for the facets from 0 to 40 apart from nonreacting which ranges from 0 to 35.

Cognitive Fusion Questionnaire (CFQ-13)

Cognitive Fusion Questionnaire (Gillanders et al., 2014) is a 13-item self-report measure of cognitive fusion, which is a concept from Relational Frame Theory (RFT). Cognitive fusion refers to taking one's thoughts literally without being able to recognize the process of thinking (i.e., Hayes et al., 2013). In RFT it is suggested that it may be safer to change the function of the thought rather than the content of it (Hayes et al., 2013).

Adult Hope Scales

The Adult Dispositional Hope Scale (Snyder et al., 1991) is a trait-like measure of hope (defined as a cognitive set) with 8 items and 4 filter items. The scale has two subscales; *Agency*, determination to reach goals (4 items), and *Pathway*, finding ways to meet goals (4 items). The Adult State Hope Scale is a self-report measure of ongoing goal-directed thinking or state hope (Snyder et al., 1996). The scale has six items, three measuring agency subscale and three pathway subscale.

2.4.4. Assessment of personality

The Short five

The Short five (S5) is a 60-item questionnaire that assesses personality traits (Konstabel, Lönnqvist, Walkowitz, Konstabel, & Verkasalo, 2012). S5 is based on the Five-Factor-Model (FFM) by Costa and McCrae (Lönnqvist, Verkasalo, & Leikas, 2008). The five factors of FFM, Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism, all consist of 6 subtraits (Lönnqvist et al., 2008). The S5 measures these 30 (6 × 5) subtraits with 2 statements (one of them being reversed) which participant rates on a 7-point scale from -3 (does not fit me) to 3 (fits me perfectly) via 0 (do not know, cannot say) (Lönnqvist et al., 2008). The scores of the subtraits are then summed to score the FFM-trait. S5 has good reliability and validity (Lönnqvist et al., 2008)

and it is similar to two longer inventories (NEO-PI-R and EPIP-NEO) (Konstabel et al., 2012). Personality was assessed only at baseline.

2.5. Data analysis

The Reliable Change Index (RCI) presented by Jacobson & Truax (1991) was used to identify clinically meaningful change according to the level of insomnia severity measured by the ISI. Participants were categorized to recovered, improved, unchanged or deteriorated. The RCI method takes into account the individual change of every participant, the reliability of the measure and the mean of the normal population. Normative data were taken from Harvey, Stinson, Whitaker, Moskowitz, and Virk (2008) and the reliability from Morin et al. (2011). We used cutoff b, which defines participants whose scores fall within two standard deviations from the mean of the functional population as members of the functional population.

Cutoff b = $M_{nonpatient}$ + 2 × $s_{nonpatient}$ = 3.70 + 2 × 2.14 = 7.98

RCI = $\frac{(ISI_{post} - ISI_{pre})}{\sqrt{2SE^2}}$, where SE (standard error) = SD$\sqrt{1 - reliability}$

When the absolute value of the RCI is greater than 1.96, it is unlikely that the posttest score is just a coincidence ($p < .05$).

Participants were allocated to four different categories according to the changes in their ISI scores:

1. Recovered: The participants score is below the cutoff and his/her RCI is below -1.96.

2. Improved: The participants RCI is below -1.96.

3. Unchanged: The participants RCI falls between -1.96 and 1.96.

4. Deteriorated: The participants RCI is greater than 1.96.

The outcomes are investigated in two intervals, during the first two group sessions and during the whole intervention. Also, since the focus is in early improvement, groups were formed of those who improved during the first and the second group sessions and sustained the improvement during the last half of the treatment (RER, Rapid Early Responders), of those who improved during the last

half of the intervention (OR, Other Responders) and of those who did not reach the RCI group of improved or recovered by the end of the intervention (NR, Nonresponders).

2.6. Statistical analyses

The changes in group means during the first two group sessions and throughout the whole intervention were analyzed using hierarchical linear modelling with Mplus version 7 (Muthén & Muthén, 2012). Effect sizes are reported using Cohen's *d*, calculated at the second and the third assessment. A within-group effect size of 0.5 is considered small, 0.8 medium, and 1.1 large (Öst, 2006).

Differences between treatment and control groups at the beginning of the intervention were calculated using independent samples t-test with IBM SPSS Statistics version 20. The changes in the control group during the waiting time were analyzed using paired-samples t-test. One-way analysis of variance (ANOVA) was used to explore differences between outcome groups in demographic factors, personality, test results and changes in the test scores. Possible post hoc analyses were made using Bonferroni correction. Pearsons correlation and χ^2 test were used to find connections between the intervals. Possible connections between treatment groups and outcome groups were also investigated using χ^2 test.

3. RESULTS

3.1. The effects of the intervention

Table 3 presents the change in the means of the sleep measures across the intervention. The only statistically significant change in sleep measures between the first and the second assessment was observed in DBAS, where the score decreased during the first two sessions. Other changes were not significant. During the whole intervention scores improved in all sleep measures. However these changes were significant in only ISI and DBAS. Additionally there was a trend showing that the scores in SOL decreased and the scores in TST and SE increased during the treatment. The changes in WASO and SQ were inconsistent. All sleep measures had very small within effect sizes during the intervention, except for DBAS which had a small within effect size. Since the sleep diary measurements showed no significant changes between the first and the second assessment nor during the whole intervention, they are not included in further analyses.

Table 3. Group means, Wald tests for differences in hierarchical models, and within effect sizes in sleep measures.

	1st M (SD)	**2nd M (SD)**	**3rd M (SD)**	**W_{1-3}**	**estim. $_{1-2}$**	**d_{1-3}**	**d_{1-2}**
ISI	16.57 (4.49) *n* = 54	15.77 (5.00) *n* = 52	14.08 (5.53) *n* = 49	14.49***	-0.87	0.49	0.17
Sleep Diary							
SOL (min)	39.53 (36.32) *n* = 49	34.56 (21.80) *n* = 49	33.47 (22.93) *n* = 45	1.27	-3.08	0.20	0.17
WASO (min)	31.52 (33.32) *n* = 44	34.69 (31.75) *n* = 44	30.53 (25.39) *n* = 40	1.57	-3.14	0.03	-0.10
TST (min)	365.15 (82.61) *n* = 47	376.66 (78.52) *n* = 47	383.70 (58.51) *n* = 42	2.55	-8.17	-0.26	-0.14
SE (%)	75.65 (13.54) *n* = 47	76.41 (11.35) *n* = 47	77.89 (11.47) *n* = 42	1.03	0.59	-0.18	-0.06
SQ	3.12 (0.68) *n* = 49	3.10 (0.64) *n* = 49	3.26 (0.66) *n* = 45	3.66	0.04	-0.2	-0.03

DBAS	96.53 (24.57) *n* = 53	90.13 (24.91) *n* = 53	81.27 (28.83) *n* = 48	30.94***	-7.05**	0.57	0.26

*** $p < .001$, ** $p < .01$, * $p < .05$

W1-3 = Wald test for the within group change including the first, second and third assessments; estim.1-2 = parameter estimate for within group change from the first to the second assessment;
d1-3 = within effect size between the first and the third assessment; d1-2 = within effect size between the first and the second assessment
SOL = Sleep onset latency; WASO = Wake time after sleep onset; TST = Total sleep time; SE = Sleep efficiency; SQ = Sleep quality

The change in the means of the process measures across the intervention is presented in Table 4. From the first to the second assessment, statistically significant changes were found in FFMQ-O, FFMQ-NJ, FFMQ-A, Dispositional Hope Scale-total, Dispositional Hope Scale-A, and State Hope Scale-A. Changes were positive except for FFMQ-NJ and FFMQ-A. During the whole intervention, statistically significant changes occurred in FFMQ-total, FFMQ-NR, FFMQ-O, FFMQ-NJ, State Hope Scale-total, State Hope Scale-P, State Hope Scale-A, Dispositional Hope Scale-total, The Dispositional Hope Scale-A, and CFQ-13. FFMQ-NJ differed from the other measures showing significant changes in both intervals as its mean score decreased from the first to the second assessment and then increased from the second to the third assessment. Although statistically significant changes occurred in both intervals, all Cohen's effect size values were low.

Table 4. Group means, Wald tests for differences in hierarchical models, and effect sizes in process measures.

	1st	**2nd**	**3rd**	**W_{1-3}**	**estim.$_{1-2}$**	**d_{1-3}**	**d_{1-2}**
AAQ	16.56 (8.50) *n* = 54	17.33 (8.11) *n* = 52	15.29 (8.48) *n* = 48	10.78**	0.51	0.15	-0.09
FFMQ	129.76 (16.00) *n* = 54	127.64 (19.17) *n* = 53	133.47 (22.45) *n* = 49	8.09*	-1.94	-0.19	0.12
Observing	23.13 (6.48) *n* = 54	25.71 (5.71) *n* = 53	25.18 (6.75) *n* = 49	21.09***	2.40***	-0.31	-0.42
Describing	28.22 (5.93) *n* = 54	27.25 (6.27) *n* = 53	28.27 (6.93) *n* = 49	3.78	-0.89	0.01	0.16
Acting with awareness	26.43 (6.55) *n* = 54	24.98 (6.85) *n* = 53	25.69 (6.51) *n* = 49	4.86	-1.32*	0.11	0.22
Non-Judgement	31.54 (6.18) *n* = 54	29.49 (7.32) *n* = 53	32.82 (6.71) *n* = 49	31.83***	-1.90**	-0.20	0.30
Non-Reacting	20.30 (4.78) *n* = 54	20.21 (5.00) *n* = 53	22.06 (5.35) *n* = 49	6.61*	-0.11	-0.35	0.02
CFQ	38.30 (12.25) *n* = 53	41.08 (11.08) *n* = 53	38.33 (11.30) *n* = 49	7.51*	2.11	-0.00	-0.24
Hope Scale State	34.26 (7.19) *n* = 54	35.13 (6.98) *n* = 53	37.45 (6.70) *n* = 49	17.49***	1.02	-0.45	-0.12
Pathway	17.83 (3.25) *n* = 54	17.87 (3.76) *n* = 53	19.14 (3.58) *n* = 49	12.15**	0.11	-0.38	-0.01
Agency	16.52 (4.60) *n* = 54	17.26 (3.84) *n* = 53	18.27 (3.85) *n* = 49	12.19**	0.81*	-0.41	-0.17
Hope Scale Dispositional	23.43 (3.32) *n* = 54	24.29 (3.31) *n* = 52	24.31 (3.91) *n* = 49	11.88**	0.94**	-0.24	-0.26
Pathway	11.65 (1.89) *n* = 54	11.92 (1.92) *n* = 52	11.98 (2.27) *n* = 49	4.47	0.34	-0.16	-0.14
Agency	11.78 (1.77) *n* = 54	12.37 (1.79) *n* = 52	12.33 (1.99) *n* = 49	14.76***	0.60***	-0.29	-0.33

*** $p < .001$, ** $p < .01$, * $p < .05$

W1-3 = Wald test for the within group change including the first, second and third assessments; estim.1-2 = parameter estimate for within group change from the first to the second assessment;
d1-3 = within effect size between the first and the third assessment; d1-2 = within effect size between the first and the second assessment

The changes in the means of the symptom measures across the intervention can be seen in Table 5. In general psychological symptomatology only the scores in DASS-A changed statistically significantly from the first to the second assessment but the mean values showed higher anxiety at the second assessment than at the beginning of the intervention. However, the scores decreased significantly in all of the symptom measures during the intervention, suggesting that depressive symptoms, anxiety, stress and psychological symptoms had decreased. The effect sizes were very small in all of the measures.

Table 5. Group means, Wald tests for differences in hierarchical models, and effect sizes in symptom measures.

	1st	**2nd**	**3rd**	**W_{1-3}**	**estim.$_{1-2}$**	**d_{1-3}**	**d_{1-2}**
BDI	11.44 (7.04) *n* = 54	10.22 (7.30) *n* = 52	8.12 (6.81) *n* = 49	18.41***	-1.19	0.48	0.17
DASS	24.67 (16.57) *n* = 54	26.17 (16.40) *n* = 53	18.84 (16.32) *n* = 49	26.68***	1.01	0.35	-0.09
Depression	7.80 (7.13) *n* = 54	7.87 (7.37) *n* = 53	5.84 (6.88) *n* = 49	12.93**	-0.06	0.28	-0.01
Anxiety	4.61 (3.94) *n* = 54	5.64 (4.87) *n* = 53	3.73 (4.27) *n* = 49	19.07***	-1.01*	0.21	-0.23
Stress	12.26 (8.44) *n* = 54	12.64 (6.92) *n* = 53	9.27 (7.20) *n* = 49	28.40***	0.23	0.38	-0.05
SCL-90 (GSI)	0.68 (0.39) *n* = 54		0.54 (0.38) *n* = 49	-0.17***		0.36	

*** $p < .001$, ** $p < .01$, * $p < .05$

W1-3 = Wald test for the within group change including the first, second and third assessments; estim.1-2 = parameter estimate for within group change from the first to the second assessment;
d1-3 = within effect size between the first and the third assessment; d1-2 = within effect size between the first and the second assessment

3.2. Categorical outcomes

According to the RCI criteria, 7 participants (15.2 %) had either improved (*n* = 4) or recovered (*n* = 3) after two group sessions. The number of improved (*n* = 14) or recovered (*n* = 7) participants at the end of the intervention was 21 (45.7 %). The groups recovered and improved were combined due to the small number of people in these two groups and renamed as improved. The number of participants who reported no clinically significant change was relatively high: in the second assessment 73.9 % (34 participants) and at the third assessment 52.2 % (24 participants) presented no improvement. At the second assessment 5 people (10.9 %) had deteriorated according to the RCI criteria and by the end of the treatment this number was 1 (2.2 %). In identifying the level of improvement or deterioration in the course of the treatment, 6 people were excluded from the analysis due to missing information and 2 for not meeting the criteria for at least subthreshold insomnia in ISI at the first measurement (possibly because of the changes that happened during the waiting time).

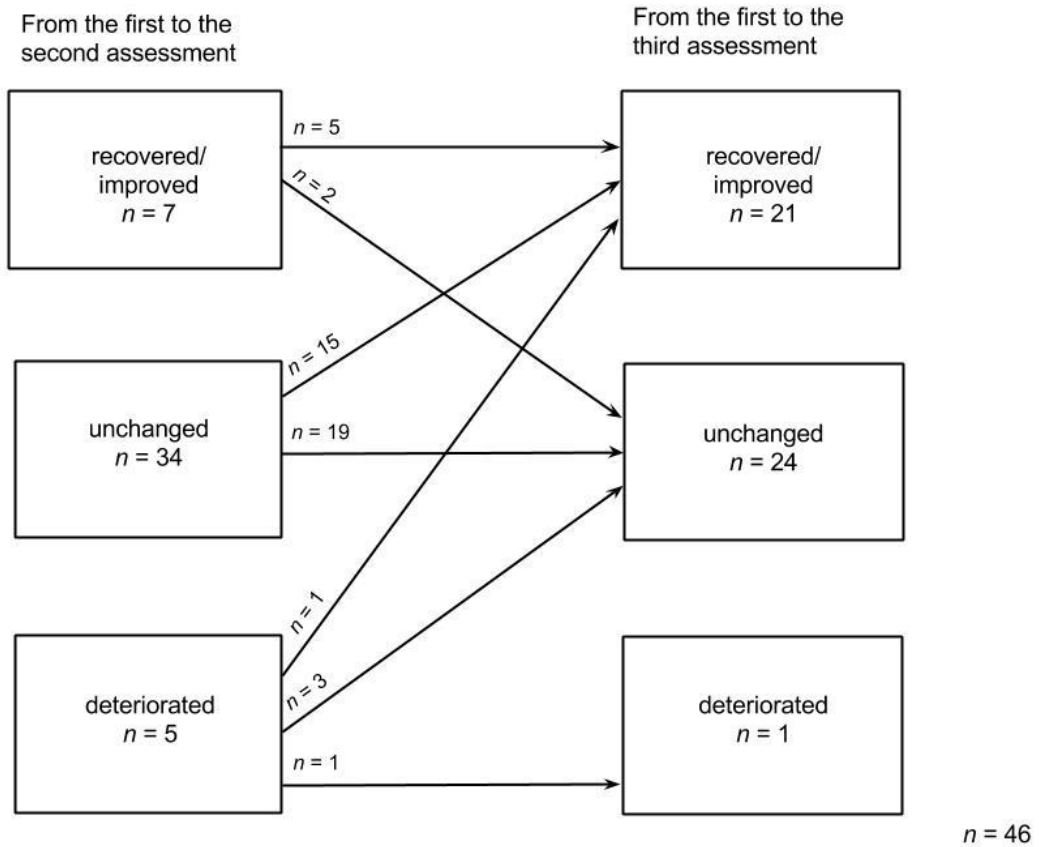

Figure 2. Transition in categorical outcomes (frequencies).

Pearson's correlation analysis was made to see whether participants remained in the same outcome group at the end of the intervention as after the first two sessions, e.g. if those who had improved during the first two sessions remained improved by the end of the treatment. This indeed seems to be the case, since the correlation between groups in the second and the third assessment is $r = .38$ ($p < .01$) and the χ^2 (4, $N = 46$) = 10.85, $p < .05$. The analysis was furthered by looking at the movement between categorical outcomes which is visualized in Figure 2. The trend in movement seems to be to either move up or remain in the same outcome group. Both in the improved and the unchanged groups the majority remained in the same group as in the second assessment. In the deteriorated group majority moved either to the unchanged or the improved.

3.3. Differences between rapid early responders, other responders, and nonresponders

To analyze whether different categorical outcomes are related to 1) differences before treatment or 2) in treatment outcome or 3) if changes in other measures are related to categorical outcome groups, three groups were compared with a series of ANOVAs. The groups used in the analyses were rapid early responders (RERs, $n = 5$), who improved by the second assessment and the gain was durable; other responders (ORs, $n = 16$), who improved after the second assessment and nonresponders (NRs, $n = 25$), who did not improve during the treatment, being in either group of deteriorated or unchanged at the end of the treatment.

Figure 3 presents the change in ISI scores during the treatment in the groups RER, OR, and NR. The RERs had higher ISI scores ($M = 19.6$) compared to the ORs ($M = 17.1$), and the NRs ($M = 17.1$) at the beginning of the intervention although the differences were not statistically significant. The groups did not differ significantly in any other measures in the first assessment. Also, no differences were observed between the groups in any of the five personality traits or in demographic factors. At the second assessment the RERs differed in ISI scores from both the ORs ($p < .01$) and the NRs ($p < .001$). At the third assessment, the difference in ISI between the RERs and the ORs was not significant, but both the RERs ($p < .01$) and the ORs ($p < .001$) differed from the NRs.

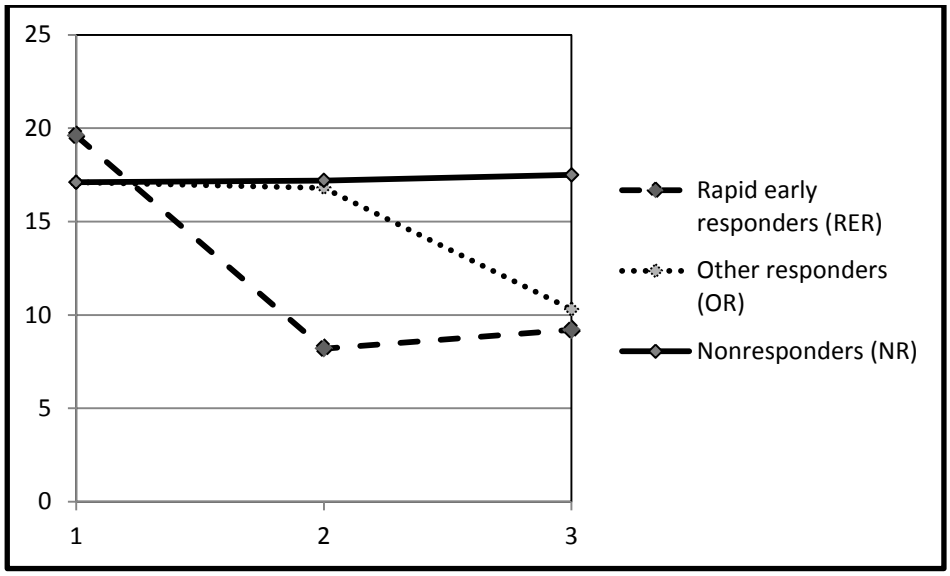

Figure 3. Changes in ISI scores by outcome groups rapid early responders (RER), other responders (OR), nonresponders (NR).

At the third assessment the majority of differences were found between the other responders and the nonresponders. The only way the rapid early responders differed significantly from the other groups was that they had lower scores than the NRs in BDI-II. The ORs had statistically significantly better scores than the NRs in SCL-90 (F (2, 43) = 6.02, $p < .01$); DASS (F (2, 43) = 5.81, $p < .01$); DASS-D (F (2, 43) = 4.13, $p < .05$); DASS-A (F (2, 43) = 5.07, $p < .05$); DASS-S (F (2, 43) = 4.38, $p <. 05$); and BDI-II (F (2, 43) = 6.19, $p < .01$).

3.4. Differences in changes between rapid early responders, other responders, and nonresponders

The change in the scores of ISI during the first two group sessions differed between all groups (F (2, 43) = 43.22, $p < .001$). The rapid early responders' scores changed more compared to both the other responders and the nonresponders ($p < .001$). During the same interval The ORs and the NRs did not differ significantly (both had almost no change). The overall change score of ISI during the whole intervention also differed by groups (F (2, 43) = 48.54, $p < .001$). During the whole intervention both the RERs and the ORs had a greater change in the ISI scores than the NRs ($p < .001$) and in the RER group the change was marginally greater than in the OR group ($p = .054$).

The analysis was furthered to see if other measures vary differently in the three outcome groups during the first two group sessions or across the whole intervention. During the first two sessions the changes in the scores differed in FFMQ-NR F (2, 43) = 3.48, $p < .05$; State Hope Scale-P F (2, 43) = 6.41, $p < .01$; DASS F (2, 43) = 10.73, $p < .001$; DASS-D F (2, 43) = 4.86, $p < .05$; DASS-A F (2, 43) = 4.39, $p < .05$, and DASS-S F (2, 43) = 11.57, $p < .001$. Post hoc comparisons were conducted to see specific differences between groups. The rapid early responders had greater change in the scores compared to the other responders in DASS-S and FFMQ-NR, meaning they had improved more. Also in DASS total score the RERs had improved almost significantly ($p = .059$) more than the ORs. The nonresponders' scores had deteriorated in DASS total score and in all DASS subscales causing a significant difference to the RERs in all of them and to the ORs in DASS total score. The scores in these measures had improved in the RER and the OR groups. Interestingly, in the Pathway subscale of the State Hope Scale only the ORs and the NRs differed, the ORs showing greater positive change. See Table 6 for post hoc comparisons.

Table 6. Statistically significant differences at group level between outcome groups (rapid early responders (RER), other responders (OR), nonresponders (NR)) in change scores between the first and the second measurement. Means and standard errors.

Measure	RERs and ORs	RERs and NRs	ORs and NRs
FFMQ-NR	*		
RER 4.40 (5.94) OR -1.00 (3.92) NR .48 (3.64)			
State Hope Scale Pathway			**
RER 3.00 (3.39) OR 2.88 (3.48) NR -.56 (6.39)			
DASS		***	*
RER -15.8 (13.55) OR -3.50 (7.49) NR 5.16 (10.5)			
DASS-D		*	
RER -4.6 (5.46) OR -2.13 (4.10) NR 1.52 (5.16)			
DASS-A		*	
RER -2.60 (1.67) OR .06 (3.15) NR 1.88 (3.67)			
DASS-S	**	***	
RER -8.60 (8.17) OR -1.38 (3.20) NR 1.76 (4.32)			

* $p < .05$, ** $p < .01$, *** $p < .001$

During the whole intervention the scores in the following measures changed differently between outcome groups: SCL-90 F (2, 43) = 15.82, $p < .001$; DASS F (2, 43) = 8.92, $p < .01$; DASS-D F (2, 43) = 4.93, $p < .05$; DASS-A F (2, 43) = 3.67, $p < .05$; DASS-S F (2, 43) = 9.12, $p < .001$; and BDI-II F (2, 43) = 5.38, $p < .01$. Groups differed also in the change of FFMQ-A F (2, 43) = 3.85, $p < .05$ although the post hoc comparisons showed no significant differences. For post hoc comparisons, see Table 7. The changes of the rapid early responders and the other responders were

not different in any of the measures during the whole intervention. However, compared to the NRs, both the RERs and the ORs showed significant changes. The NRs had very little change in the scores in DASS, DASS-S and SCL-90 compared to both the RERs and the ORs. In DASS-A and SCL-90 the NRs differed only from the RERs, the RERs having a greater change. Differences between the NRs and the ORs were found in DASS-D and BDI-II, the ORs having a greater change. Also in FFMQ-A the NRs had deteriorated, when the ORs had improved, but this difference was marginally significant (p = .06).

Table 7. Statistically significant differences at group level between outcome groups (rapid early responders (RER), other responders (OR), nonresponders (NR)) in change scores between the first and the third measurement. Means and standard errors.

Measure	RERs and ORs	RERs and NRs	ORs and NRs
DASS		**	**
RER -20.00 (16.45) OR -12.31 (12.78) NR -.48 (9.46)			
DASS-D			*
RER -5.80 (7.12) OR -4.63 (6.55) NR .08 (4.15)			
DASS-A		*	
RER -3.80 (1.48) OR -1.81 (3.19) NR -.32 (2.78)			
DASS-S		**	*
RER -10.40 (9.91) OR -5.88 (5.62) NR -.24 (4.69)			
BDI-II			*
RER -7.00 (6.89) OR -5.94 (6.62) NR -.96 (4.18)			
SCL-90		***	**
RER -.56 (.23) OR -.31 (.28) NR -.02 (.19)			

* $p < .05$, ** $p < .01$, *** $p < .001$

3.5. Differences between the treatment group and the waiting list control group

No significant differences between the treatment and control groups were found at baseline. At the beginning of the intervention these groups however differed, the control group having statistically significantly lower scores in ISI ($p < .05$), and higher scores in FFMQ-A ($p < .05$). Also, several significant changes were observed in the control group during the waiting time. The scores in ISI (t (23) = 2.23, $p < .05$), DASS total (t (25) = 2.72, $p < .05$), DASS-D (t (25) = 2.12, $p < .05$), DASS-A (t (25) = 2.56, $p < .05$), DASS-S (t (25) = 2.29, $p < .05$), AAQ-II (t (25) = 2.08, $p < .05$), and CFQ-13 (t (24) = 2.18, $p < .05$) were lower at the beginning of the treatment than in the baseline assessment, whereas scores in FFMQ-NJ were higher than at baseline (t (23) = -2.16, $p < .05$).

Of the rapid early responders 80 % (n = 4) were from the treatment group, and 20 % (n = 1) from the control group; of the other responders 68.8 % (n = 11) were from the treatment group, and 31.2 % (n = 5) from the control group; and of nonresponders 48.0 % (n = 12) from the treatment group, and 52.0 % (n = 13) from the control group. However, these differences were not statistically significant (χ^2 (2, N = 46) = 2.78, p = .249).

4. DISCUSSION

The aim of the present study was to investigate whether rapid early improvement occurs in treatment of insomnia, which factors could explain it, and whether it leads to greater change or better treatment outcome than other type of improvement or not responding to treatment. In total seven participants (15.2 %) improved rapidly. Across the whole intervention 45.7 % of the participants improved or recovered. From the seven who improved rapidly, five sustained the improvement. These rapid early responders did not differ from other responders and nonresponders in demographic factors, personality traits or in any of the measures used in the first assessment, including the severity of insomnia. Additionally the rapid early responders did not differ from other responders at the end of the treatment in the severity of insomnia and their change in it was not greater than other responders'. Thus, it seems that those who improve rapidly do not experience greater gains or differ from other responders in other development (e.g. depression, anxiety, mindfulness skills) during the intervention. However, those who improved during the whole intervention showed greater reduction in symptoms (BDI-II, DASS, SCL-90) compared to those who did not improve. At the end of the treatment the rapid early responders had less depressive symptoms than the nonresponders whereas the other responders had generally less symptoms compared to the nonresponders.

On mean level, the participants showed very little change during the first two group sessions as only dysfunctional beliefs and attitudes about sleep, observing, trait-like hopefulness (dispositional) and belief in one's capacity to sustain goal-directed actions (hope state agency) improved. During the whole intervention severity of insomnia, depression, anxiety, stress, general symptoms, and dysfunctional beliefs and attitudes about sleep had improved. Hopefulness increased during the intervention whereas in other processes the changes were inconsistent.

All of the effect sizes were very small which shows that even if the scores changed statistically significantly, the overall effectiveness of the changes was not large. The only exception was dysfunctional beliefs and attitudes about sleep which had a small within effect size during the whole intervention. Thus, it seems that this is one of the phenomena affected by this intervention, as they changed already during the first two group sessions and further during the end of the treatment. Also the cognitive theories about insomnia suggest that dysfunctional beliefs and attitudes, as well as other cognitions are linked to insomnia (Harvey, 2002). However the change in dysfunctional beliefs and attitudes was not related to treatment outcome.

One of the main interests was to investigate whether rapid early improvement occurs in the treatment of insomnia. The percentage of people who improved or recovered after two group sessions was 15.2. Thus, the rapid early improvement seems to be a phenomenon which can be found also in the treatment of insomnia. In the present study the number of rapid early responders is lower than in most of the previous sudden gain studies about depression (e.g. 35.7 % in Hunnicutt-Ferguson et al., 2012 and 43 % in Tang et al., 2002). However, when studied with anxiety disorders, sudden gains normally occur with around 20 % of the patients (Clerkin et al., 2008; Hofmann et al. 2006; Norton et al., 2010). With insomnia sudden gain has not been studied earlier and here the focus was in early improvement, not sudden gain per se.

In Tang and DeRubeis (1999) sudden gains predicted larger reduction in depressive symptoms and better treatment outcomes compared to those who did not experience a sudden gain. Also, the gains remained after 18 months. These findings could not be replicated here since there were no differences between the rapid early responders and other responders in the changes of their insomnia severity or in their scores generally at the end of the treatment. Thus, the improvement was not greater for those who improved rapidly and here all of the improvement of the rapid early responders had occurred after the first two group sessions. Since only the changes occurring during the treatment are reported here, the permanence of the gains remains unclear.

Furthermore, the improvement could not be predicted by demographic factors, personality or any of the factors measured at the beginning of the intervention. This is consistent with Espie et al. (2001a), where also no investigated factors predicted treatment outcome in CBT-I. Here only changes in other measures correlated with treatment outcome assessed with severity of insomnia but it is not possible to know which change caused the other, or if there were some common factors explaining the changes. At the end of the intervention the only difference between the rapid early responders and the other groups was that the rapid early responders had less depressive symptoms than the nonresponders. The lack of differences between the rapid early responders and nonresponders at the end of the intervention is probably due to the small number of the rapid early responders. The nonresponders seem to show very little improvement in all of the measures. It remains unclear if the improvement of insomnia results from the improvement of processes or symptoms or if the improvement of insomnia precedes the improvement of other factors.

Surprisingly the nonresponders differed in different measures when compared to the rapid early responders or the other responders during the whole intervention. The other responders showed greater change than the nonresponders in depressive symptoms whereas rapid early responders did not. Anxiety symptoms decreased more in the rapid early responders than in the nonresponders but this difference was not found between other responders and nonresponders. The

other responders' scores were however lower in the beginning which may explain why no differences were found. Depressive symptoms decreased even more in the rapid early responders than other responders, but the small number of the rapid early responders may explain why no significant differences between the groups were detected.

It has been suggested that cognitive changes precede sudden gains and may even be a factor behind them (Tang et al. 2005; Tang & DeRubeis, 1999). This could not be replicated here since there were no differences between the outcome groups in their changes in dysfunctional beliefs and attitudes about sleep, which was the only measure assessing cognitions about sleep. Based on this one measure no strong conclusions can be made whether cognitive changes occurred prior to improvement or not, perhaps they were just not detected. However, the dysfunctional cognitions had the biggest within effect size of all the measures and therefore seem to be connected to improvement. It may be due to the small number of rapidly improved and recovered participants that the dysfunctional cognitions did not separate the outcome groups from each other. All in all, the factors leading to early improvements and good treatment outcome remain unclear and need to be studied further.

One strength in this study is that the sample consisted of people suffering primarily from insomnia and seeking psychological treatment for it. The intervention was, however, free of charge which may have made it easy to attend. Also the recruitment method was limited, since the announcement was published only in a local newspaper which may have excluded low-income people. However, the sample represented insomniacs quite well according to population studies (Ohayon & Partinen, 2002), the elderly and women being the majority. Also, in reality insomnia is rarely presented alone and is often comorbid with mental or somatic disorders. Thus we did not exclude participants suffering from mild/moderate anxiety or depression, or somatic disorders because these disorders are often comorbid with insomnia and they were not thought to hinder the intervention. In reality, treatment of insomnia and depression is often combined or one is neglected when treating the other (Manber et al., 2008). Other sleep disorders also were not completely excluded. Thus, it can be argued that our sample represents well the insomniacs in practical settings.

Considering the earlier research on treatment of insomnia (with CBT-I) many different kinds of short interventions for insomnia have been found efficient. Also in this study by the end of the intervention, which was only 6 sessions, almost half (45.7 %) of the participants had improved or recovered. This number is slightly greater than in a previous Finnish study of treating insomnia with CBT where approximately 30 % improved by the end of the treatment (Järnefelt et al., 2012). However the criteria used to assess improvement were slightly different than here. In earlier research on insomnia there is a trend of the improvement continuing even after the treatment (Espie

et al., 2001b; Järnefelt et al., 2012; Van Houdenhove et al., 2011), so it can be hypothesized that more than these 45.7 % may actually have benefited from the treatment.

In this study one of the limitations was that the original treatment and control groups were combined. This decision was made because the groups did not differ at the baseline measurement, the intervention they received was identical and the results of the study are more applicable when the sample size is larger. However, the severity of insomnia decreased in the control group during the waiting time while completing sleep diaries, and it was lower in the control group than in the treatment group at the beginning of the intervention. Considering this, the possibilities for change may have been weaker for the control group during the intervention. The percentage of the improved might have been bigger if only the study group was examined since the participants from the treatment and control groups were unevenly, although not statistically significantly, distributed into the three outcome groups.

The exact timing and nature of the rapid early improvement during the intervention is still left unclear because of the relatively long assessment interval. It is possible that the improvement may have occurred already after the phone session or after the first group session, or that it is a more gradual phenomenon taking more than one session to occur. Moreover, differences between categorical outcomes may be due to factors not considered here. For example, high motivation and strong therapeutic alliance could have resulted in better treatment outcome. The motivation of the participants in this study was likely relatively high considering that psychological treatments for insomnia are not commonly offered elsewhere and that the intervention was part of a research project at a university.

The small number of recovered participants weakens the generalizability of the findings about factors connected to recovery. Because here the improved and the recovered were combined into one group, the findings tell which factors are connected to both types of responding and not just to recovering. However, it seems likely that same factors are connected to both. Also the timing of the improvement did not seem to lead to different type of improvement, i.e. the rapid early responders did not differ from other responders at the end of the treatment. This assumption is consistent with the finding that there were no differences in the development between rapid early responders and other responders during the whole intervention.

The absence of follow-up also causes limitations to the study. Insomnia is often a chronic and persistent condition and the improvement may continue after the intervention. E.g. Van Houdenhove et al. (2011) suggested that a six month follow-up might be too short to see all the effects of the treatment. Considering also the nature of ACT, it is possible that it takes time for the processes to work and the changes cannot be seen early in the treatment. Some of the processes or

symptoms seemed to worsen in the beginning (e.g. non-judgment, anxiety), one factor explaining this might be that as people start to be more aware of their symptoms they may become more accurate in evaluating their skills or symptoms. Here the process measures did not seem to be connected to treatment outcome, even though some of them showed significant, but inconsistent, change. Interestingly, here we did not find any linkage between psychological flexibility and treatment outcome, which is contradictory to previous research on ACT (e.g. Hayes et al., 2013). However ACT has not been well studied in treatment of insomnia before and the role of psychological flexibility in insomnia is an important subject of further studies.

The results are based only on quantitative data from self-report questionnaires and no objective measures were used. Also initially insomnia was evaluated by interviewing the participants but no clinical diagnosis was made. Subjective measures have been used to assess insomnia in several CBT-I studies (e.g. Bastien et al., 2004; Espie et al., 2001b; Järnefelt et al., 2012) and it has been argued that self-report measures are more accurate than polysomnography or actigraphy in identifying insomnia (Rosa & Bonnet, 2000). Thus, here the use of subjective measures is well-grounded. Also, cognitive factors such as dysfunctional beliefs and attitudes about sleep are also usually seen as a central part in insomnia (Harvey, 2002) which makes it appropriate to measure insomnia by asking for subjective idea of one's insomnia (as this is the target for the treatment also). Also, the improvement was detected using only one measure. The results could have been different if for example DBAS had been used to detect improvement. Since here the focus is in treatment of insomnia, it is relevant to measure the improvement by severity of insomnia and Insomnia Severity Index is a widely used and reliable measure (Bastien et al., 2001). Also, the reliable change method may not reflect the client's own view of the change in his/her insomnia. More detailed and personal information about the participants' experiences could have been achieved by interviewing them, which was only done in the beginning.

4.1. Conclusions

This is a pioneering study about ACT-based group intervention for insomnia. According to these results, it seems to be an effective intervention for insomnia. Our findings also suggest that it is possible to improve rapidly from insomnia. In previous studies sudden gains have been found in many different types of therapies and the results here show that rapid early improvement can also occur when using ACT. However, it remains unclear why some benefit from the treatment early and

some later in the course of treatment. Additionally, here those who responded rapidly did not differ from those who responded later. Thus some may improve during a very brief treatment, while others would need a longer treatment or longer time for the results to be detected. By following the individual trajectories during the treatment, it could be possible to better make the treatments meet the individual requirements, e.g. shorter or longer intervention or focusing on different aspects.

The use of ACT in the treatment of insomnia needs to be studied further to better understand the mechanisms and to have more evidence of its effectiveness. Also the existence of sudden gains in insomnia seems possible as the rapid early improvement occurred here but examining sudden gains in insomnia treatment would be of interest in the future. Future studies should also broaden the investigation of rapid early improvement in ACT to also other disorders than insomnia.

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APPENDIX 1

Instructions for preventing and treating sleeping problems:

1. Take care of daily physical exercise. Avoid heavy sports in the evening.

2. Tend to avoid caffeine, alcohol and nicotine in the evening.

3. Evening meals: Avoid heavy food in the evening.

4. If possible, keep bedroom quiet and dark. The room should be chilly and the covers warm.

Ways to control sleep stimuli:

1. Maintain a regular waking rhythm. Go to bed in the evening and try to wake up in the morning approximately at the same time every day.

2. Use bed mainly for sleeping. If you have problems with sleep, avoid e.g. reading and watching TV in bed.

3. Get out of bed when unable to fall asleep. After being awake for approximately 20 minutes in bed, get up and do something "boring" that will calm you. Go back to bed only when you feel sleepy. Repeat if necessary.

4. If you tend to worry in bed, move the worrying to day time. Arrange a certain time during the day when you go through your worries. If possible, avoid worrying, planning and problem solving in bed.

5. If you are tired during the day you may rest but avoid taking naps. If, however, you feel that it is necessary to take a nap, make sure that it won't be too long.

6. Do not spend more time in bed than necessary; go to bed only when you are sleepy. Do not spend more time in bed than you require for sleeping.

Remember that everyone has problems related to sleep at some point in their life. You are not alone. Try out these techniques with curiosity. Remember to use the techniques long enough to see their effect.

APPENDIX 2

New perspectives to sleeping problems

1. Sleep fluctuates as a result of various kinds of external and internal events (stressful events, emotional worries etc.).
2. A sleepless night is not a disaster. "Even if will I get no sleep tonight, I can still manage tomorrow."
3. A poor night's sleep is usually compensated for by deeper and more refreshing sleep in the following nights.
4. Sleep is not under voluntary control and there are no techniques that can be used efficiently in order to fall asleep. Therefore the fluctuations in sleep have to be accepted.
5. Sleep may improve by learning new skills and habits but this is a process that requires time, and is not a matter of using these techniques in order to fall asleep. Excessive attempts to sleep or to fall asleep may in fact worsen the sleeping problem.

Lundh, 2005