BACHELOR THESIS

Living with pain: Effects of an Acceptance and Commitment Therapy-based online intervention on depression and positive mental health.

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Abstract

Background: Chronic pain is a major health issue in the Netherlands, and often has a negative impact on a person's mental health. Acceptance and Commitment Therapy (ACT) teaches people to handle pain by increasing their psychological flexibility on the basis of acceptance and mindfulness. The aim of the present study was to investigate the effects of a self-help online ACT intervention for chronic pain patients on depression and positive mental health. *Method:* 238 participants suffering from chronic pain were randomly assigned to 1. the experimental condition *Living with pain*, 2. the minimal intervention condition *Expressive writing*, or 3. the control condition waiting list. Measurements were obtained before, at the end of, and three months after the end of the intervention using the Hospital Anxiety and Depression Scale-Depression (HADS-D), and the Mental Health Continuum-Short Form (MHC-SF). *Results:* The experimental condition did not show significantly more progress than the other conditions across time. However, scores on the HADS-D slightly decreased and scores on the MHC-SF slightly increased. The effects were maintained over a three months follow-up period. *Conclusion:* Despite small effect sizes it can be concluded that the self-help online intervention *Living with pain* benefits positive mental health and reduces depression.

Samenvatting

Achtergrond: Chronische pijn is een belangrijk probleem in Nederland en gaat vaak gepaard met problemen ten opzichte van de mentale gezondheid. Acceptance and Commiment Therapy (ACT) is gebaseerd op acceptatie en mindfulness en leert mensen om te gaan met pijn door hun psychologische flexibiliteit te vergroten. Het doel van deze studie is nagaan of een zelfhulp online ACT interventie voor mensen met chronische pijn invloed heeft op depressie en positieve mentale gezondheid. *Methode*: 238 deelnemers met chronische pijnklachten werden willekeurig verdeeld over drie groepen: 1. de experimentele groep *Leven met pijn*, 2. de minimale interventie groep *Expressief schrijven*, of 3. de controle groep wachtlijst. Metingen werden voor het begin van, meteen na afloop van, en drie maanden na afloop van de interventie afgenomen middels de Hospital Anxiety and Depression Scale-Depression (HADS-D) en de Mental Health Continuum-Short Form (MHC-SF). *Resultaten:* Gemiddeld over de drie condities liet de experimentele groep niet significant meer vooruitgang zien, maar de scores op de HADS-D namen wel af en de scores op de MHC-SF namen toe. Ook drie maanden na afloop van de interventie bleven de effecten gehandhaafd. *Conclusie:* Ondanks een lage effectgrootte kan geconcludeerd worden dat de ACT-gebaseerde interventie *Leven met pijn* positieve mentale gezondheid bevordert en depressie vermindert.

1. Introduction

Almost everybody suffers from some kind of pain regularly. We experience pain when we fall down the stairs or spill hot coffee on our hands. Luckily, this kind of pain is forgotten rather quickly. Acute pain is temporarily limited, caused by a specific disease or injury, and biologically useful, because it alerts us (Grichnik & Ferrante, 1991).

In contrast, pain that lasts longer than three, or in many definitions six months is considered chronic (Clarke, 1994). Chronic pain is a multidimensional phenomenon varying in "pain intensity, pain persistence, pain-related disability and recency of onset" (Von Korff, Ormel, Keefe & Dworkin, 1992, p.133). Reasons for chronic pain can be very complex and might include "physiological, emotional, cognitive, social, and environmental factors" (Turk, Wilson & Cahana, 2011, p. 2226). Generally, chronic pain is caused by the damage of the central and/or peripheral nervous system or the permanent activation (due to a disease or injury) of nociceptors, which initiate pain (Turk et al., 2011). It can occur in various forms. Headaches, lower back pain, traumatic injuries, and arthritis, for example, are very common (Turk et al., 2011; Breivik, Collett, Ventafridda, Cohen & Gallacher, 2006). The complete resolution of chronic pain symptoms is rarely achieved and patients most likely have to live with the pain for the rest of their lives (Turk et al., 2011).

Almost 20% of the adult Dutch population of a mean age of 51.3 years (Bala, Bekkering, Riemsma, Harker, Huygen & Kleijnen, 2011) suffers from moderate to severe chronic pain (Breivik et al., 2006). Clearly, it is difficult to handle pain on a regular basis for a long time. It is not surprising then that studies indicate that chronic pain patients have a significant higher probability of getting psychological problems, such as depression (Bala et al., 2011). In their study, Breivik et al. (2006) found that 19% of the Dutch respondents developed depressive symptoms as a result of chronic pain. Several studies confirm the positive correlation of chronic pain and depression (e.g. Verdurmen et al., 2006; Demyttenaere et al., 2007; Ohayon & Schatzberg, 2003).

Although the level of pain intensity varies from person to person, all people who suffer from chronic pain are restricted in their daily lives to some degree. Due to withdrawal from social activities or even complete isolation, the individual's social life suffers, and due to the pain one might be highly restricted in work life. In their European study Breivik et al. (2006) found that almost 20% of the respondents lost their job, because of their chronic pain. Furthermore, chronic pain sufferers might not be able to participate in any sport activities and might experience problems concerning their sex life and sleeping habits (Breivik et al., 2006). When both chronic pain and depression are present psychological and physical functioning is

restricted to an even greater extent. Clearly, for most individuals chronic pain thus has a tremendous impact on their quality of life (Bala et al., 2011).

Additionally to the impact on the individual's personal life, chronic pain is also responsible for serious economic consequences concerning the society in general. Chronic pain costs across the EU are estimated to be 300 billion Euros (Baker et al., 2010). Indirect costs of chronic pain (loss of productivity) appear to be a major cost factor, since chronic pain can lead to an early pension/disability pension and therefore incapacity benefits (Bala et al., 2011).

Traditionally, chronic pain treatments focus on finding the causes of the pain, trying to reduce the pain, and fighting against it. It is often still the 'mechanistic paradigm' that influences peoples' way of thinking, assuming that there is a cause for each psychological and physical problem that can clearly be identified and abolished (A-Tjak & De Groot, 2008). Medicine and pharmaceuticals are commonly used to relieve pain. The use of drugs has increased over the years with non-steroidal anti-inflammatory drugs being the most common prescription in the Netherlands (Bala et al., 2011). Drugs, however, bear the risk of side effects and addiction and the level of effectiveness remains unclear. Breivik et al. (2006) found that people stopped taking prescribed drugs, because they feared or disliked side effects or thought the medicine to be ineffective. In fact, 79% of the Dutch respondents experienced times of ineffective pain control by medication (Breivik et al., 2006). Even though medicine might help to reduce pain intensity temporarily, a higher quality of life cannot be achieved through drug treatments (Turk et al., 2011). Pain remains an inevitable part of life. Therefore, it seems to make more sense to help people coping with pain using psychological treatments.

Turk et al. (2011) suggest that some psychological treatments (mostly operant conditioning and cognitive-behavioural therapy) show at least moderate benefits for chronic pain patients concerning pain sensation, and physical and emotional functioning. However, in their review, Williams, Eccleston and Morley (2012) conclude that both cognitive-behavioural therapy (CBT) and behaviour therapy (BT) are not very effective in treating chronic pain in adults.

In the last few years a new, promising approach became increasingly popular: positive psychology. Whereas CBT often aims at decreasing discomfort, positive psychology therapies rather focus on increasing positive mental health, which, according to the World Health Organisation (WHO, 2004), can be defined as "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community"

(p.18). Positive mental health has three levels: emotional, psychological, and social well-being (Keyes, 2006). Emotional (hedonic) well-being concerns one's interest in and satisfaction with life, happiness, and a balance of positive and negative affect. Psychological (eudaimonic) well-being includes elements, such as self-actualisation, full functioning, and individuation. It concerns rather private factors, whereas social well-being (also eudaimonic) covers the individual's functioning in society, relationships, and aspects of social coherence, integration, acceptance and contribution (Keyes, 2006). Hence, mental health does "not only [include] the absence of mental disorder but also the presence of positive psychological resources" (Sin & Lyubomirsky, 2009, p. 468). These are two very different things, although, according to the two-continua model of mental health, positive mental health and mental illness are related (Keyes, 2005). There are several overlapping aspects concerning the reduction of mental disorders and the promotion of positive mental health (WHO, 2004). It is very difficult though to evaluate a person's mental health, because one might suffer from a severe mental illness, but still have many positive mental health resources. Keyes (2006) describes a state free of mental disorders and filled with emotional, psychological, and social well-being as *flourishing*. In assessments both mental illness and positive mental health should be considered to make an accurate diagnosis (Lamers, Westerhof, Bohlmeijer, Ten Klooster & Keyes, 2011). Several positive psychology interventions, including for example mindfulness, appear to improve the individual's mental health (Sin & Lyubomirsky, 2009), especially in individualist cultures, such as the Netherlands (Sin & Lyubomirsky, 2009).

Related to positive psychology, Acceptance and Commitment Therapy (ACT) is a relatively new behaviour therapy, which is part of the so-called Third Generation Behaviour Therapy. It is based upon Relational Frame Therapy and on the philosophy of functional contextualism, focusing rather on the context, not the content of behaviour. ACT can be applied to various different areas, such as depression and pain (A-Tjak & De Groot, 2008). Instead of focusing on the behaviour itself ACT addresses the function of problem behaviour. According to ACT and contrary to the ideas presented in the mechanistic paradigm, emotional and physical suffering should be accepted as something that is an inevitable part of life. While common chronic pain treatments focus on fighting against the presence of pain, ACT aims at changing the way one might handle it instead. Avoiding, controlling and suppressing an emotional and physical state is not regarded useful, since it constantly costs energy and does not make the problem disappear anyway. Furthermore, it appears to be difficult to suppress thoughts one is not supposed to have (A-Tjak & De Groot, 2008). Therefore, ACT aims at increasing the individual's psychological flexibility: "the process of contacting the present

moment fully as a conscious human being and persisting or changing behavior in the service of chosen values" (Hayes, Luoma, Bond, Masuda & Lillis, 2006). The therapy itself consists of six processes: acceptance, cognitive defusion, contact with the present moment, self as context, values, and committed action. Since all processes are interrelated, no specific order has to be maintained in therapy (Hayes et al., 2006).

In the process of *acceptance* clients are admonished to accept their suffering instead of trying to ineffectively avoid or control it. Acceptance thus is an alternative to experiential avoidance. In order to gain acceptance, a feeling of so-called 'creative helplessness' needs to be established, where the client realises that nothing he or she did against the pain in the past helped (A-Tjak & De Groot, 2008). Pain is supposed to be accepted without any defence behaviour. *Cognitive defusion* is a process in which awareness is raised for the intense influence of thinking on one's own life. The client is stimulated to differentiate him- or herself from his or her unhelpful thoughts (A-Tjak & De Groot, 2008), and then change the way he or she interacts with or relates to these thoughts (Hayes et al., 2006). In the process *contact with the present moment* language is an important tool used to describe events, feelings, and thoughts in a non-judgmental way. By living in the present moment, the world is assumed to be experienced more directly, which enhances flexible behaviour (Hayes et al., 2006). The process *self as context* fosters defusion and perspective-taking and thus allows the individual to "be aware of one's own flow of experiences without attachment to them" (Hayes et al., 2006, p. 9). *Values* is another process crucial in ACT. Values serve as life directions or guidance to a more vital life. They might need to be discovered before the client can actually adjust his or her behaviour according to those values. This behaviour adjustment to chosen values describes the process *committed action. Mindfulness* is the state where a person observes him- or herself objectively and is fully aware of his or her own presence without any judgement (A-Tjak & De Groot, 2008). Although it is not one of six core processes, it is trained in ACT. Especially *cognitive defusion*, *self as context*, and *contact with the present moment* overlap with and aim at achieving *mindfulness* (Hayes et al., 2006).

The present study aims at analysing the effects of a self-help online ACT-based intervention for chronic pain patients. Previous research indicates that ACT can be effective in reducing depression (Powers, Zum Vörde Sive Vörding & Emmelkamp, 2009). This finding applies to chronic pain patients as well (Veehof, Oskam, Schreurs & Bohlmeijer, 2011; Wicksell, Melin & Olsson, 2007). In accordance with this finding, McCracken, Vowles and Eccleston (2005) conclude that "acceptance of chronic pain engenders relatively healthy emotional, physical, and social functioning" (p. 1343). Furthermore, ACT-based self-help

interventions seem to be beneficial for chronic pain patients concerning several health aspects (Johnston, Foster, Shennan, Starkey & Johnson, 2010).

The chosen online format offers numerous benefits. It offers easy access, for example for people who live in a remote place or have limited mobility, and costs less than face-to-face treatments. Furthermore, the anonymity given in an online intervention diminishes the problem of stigmatisation and might also stimulate people to be more open and honest about problems (Rochlen et al., 2004). The findings of meta-analyses indicate that online therapies (many of them based on CBT) are effective in many areas, such as depression and chronic headaches, and that the results are comparable to those of face-to-face therapies (Rochlen et al., 2004; Barak et al., 2008).

However, the effects of a self-help online intervention based on ACT are not sufficiently explored yet. Studies merely consist of pure ACT-treatments and research on ACT mostly covers face-to-face therapies, acute pain or issues other than pain. The relation between ACT, chronic pain and positive mental health has not been investigated yet.

The intervention *Living with pain*, which is examined in the present study, is a self-help online intervention for people with chronic pain. The online intervention is primarily based on the self-help book *Living with pain* (Veehof, Schreurs, Hulsbergen & Bohlmeijer, 2010), which again is based on ACT and mindfulness. The authors further developed the self-help programme *Living to the full* (Bohlmeijer & Hulsbergen, 2009), designed for people with minor psychological problems, and applied it specifically to chronic pain.

Fledderus, Bohlmeijer, Pieterse and Schreurs (2012) studied the effects of *Living to the full* in combination with minimal or extensive e-mail support on mild to moderate depressive symptoms and positive mental health. The results indicate that the intervention *Living to the full* helped to reduce depression and to improve positive mental health. Effects of minimal e-mail support were comparable to those of extensive e-mail support.

The present study aims at analysing the effects of *Living with pain* on the individual's mental health with the focus lying on the presence of depressive symptoms and positive mental health. Resulting research questions thus are:

- Does the intervention change the participants' level of depression?
- Does the intervention change the presence of positive mental health in the participants?

It is expected that depressive symptoms become significantly less and that positive mental health significantly improves during the intervention in the experimental condition compared to the two control conditions.

2. Method

2.1 Design

A randomised controlled trial was carried out, including three groups: the experimental condition (intervention *Living with pain*), a minimal intervention condition (*Expressive writing*), and a control condition (waiting list).

2.2 Participants

238 people suffering from chronic pain participated in the study. The minimum number of participants was determined based on calculations of the statistical power ($1\text{-}\beta = .80$) necessary to find significant effects ($\alpha \leq .05$), whereby an effect size of 0.66 was pursued and a drop-out percentage of 30% was taken into consideration. At least 132 participants were needed. The minimum age requested for participating was 18 years. Several requirements concerning chronic pain had to be met. Pain intensity scores had to be equal to or higher than four on the Pain Intensity – Numeric Rating Scale (NRS) for at least four days a week for more than six months. Exclusion criteria for participation were severe psychiatric problems (screening with Hospital Anxiety and Depression Scale [HADS], Web Screening Questionnaire [WSQ], Mini International Neuropsychiatric Interview Plus [M.I.N.I. Plus]), extremely low scores on psychological inflexibility (total score < 24 on the Psychological Inflexibility in Pain Scale [PIPS]; ≥ 2 SD below mean of population of chronic pain patients in a pain rehabilitation centre), no Internet and/or e-mail access, not enough time to engage in the intervention (< 30 minutes a day), and reading problems due to illiteracy or insufficient Dutch language skills. The mean age of participants was 52.78, and 76.1% (n=181) of them were female. Nobody received any other psychological (self-help) treatment.

2.3 Recruitment and Procedure

The study was approved by the Medical and Ethical Examination Board (Medisch Ethische Toetsingcommissie) in the Netherlands. Participants were recruited from the Dutch population through advertisement in national newspapers and on popular websites for chronic pain patients, where the website www.haalmeeruitjelevenmetpijn.nl (=Get more out of your life, with pain) was promoted. On this website respondents could download a patient information letter, check whether they met the requirements to participate in the study, and apply for the intervention.

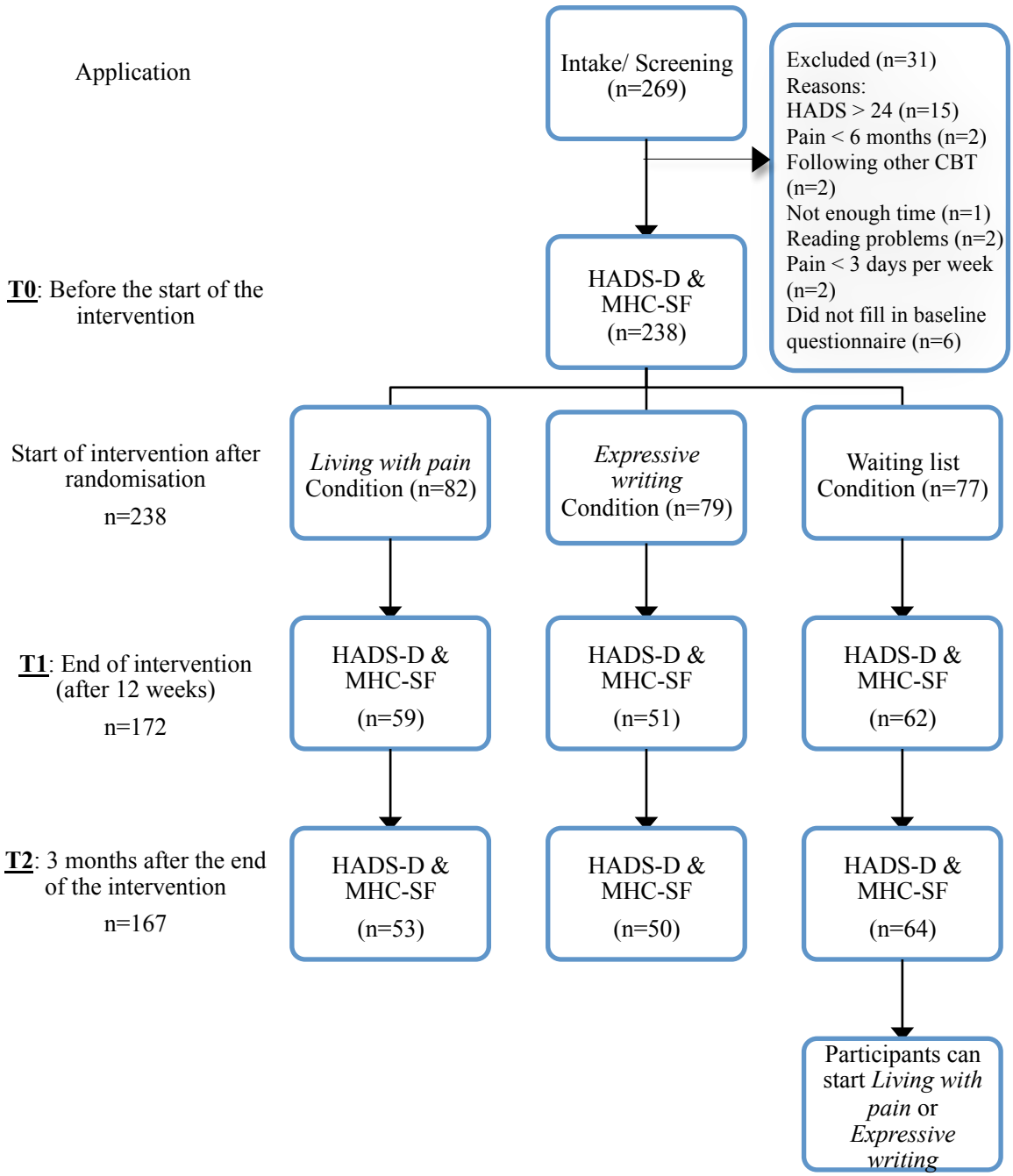
After application the screening procedure started. Respondents were asked to provide written informed consent first. After reassuring that they agreed with the informed consent,

they were tested for inclusion and exclusion criteria. Therefore, the PIPS, HADS, and WSQ were used. People excluded on the basis of the HADS (total score > 24) or the WSQ (Q1> 6 and Q2=1) were assessed with the M.I.N.I. via telephone, and then, depending on the outcome, excluded or included. In case of exclusion, people were advised to see their general practitioner, as they probably needed a more extensive treatment. Respondents who were considered eligible were subsequently screened for the pain criteria. Therefore, they filled in a seven-day baseline period to monitor pain intensity. Respondents received a daily e-mail asking for the pain intensity of that day. In case of non-completion or too low scores on the NRS respondents were excluded.

Respondents who were still eligible for the study after the screening procedure received enrolment information and were asked to fill in the MHC-SF. Afterwards, they were randomly assigned to one of the three conditions. Randomisation was carried out at the University of Twente with use of a computer by the principal investigator. For optimal comparison of the three groups stratification was carried out for sex, age, and education. Participants were then informed about their condition via e-mail and were provided with a link to start the intervention.

Participants of the experimental and minimal intervention group were supposed to accomplish their respective interventions in 9-12 weeks. All three groups filled in the HADS-D (a subscale of the HADS) and MHC-SF before the intervention started (T0), at the end of the intervention (T1), and three months after the end of the intervention (T2).

2.3.1 Study flow diagram



Note. HADS, Hospital Anxiety Depression Scale; HADS-D, Hospital Anxiety Depression Scale – Depression; MHC-SF, Mental Health Continuum – Short Form; CBT, Cognitive Behavioural Therapy

2.4 Measurement

The outcomes concerning the presence of depression and positive mental health have been measured by using the Hospital Anxiety and Depression Scale – Depression (HADS-D) and the Mental Health Continuum – Short Form (MHC-SF).

2.4.1 Hospital Anxiety and Depression Scale – Depression

A Dutch version of the HADS-D was used to measure the presence and severity of depressive symptoms. The HADS-D is a subscale of the HADS (Zigmond and Snaith, 1983), which includes another subscale concerning anxiety and consists of seven items, such as 'I still enjoy the things I used to enjoy'. Answering categories range from 0 (not at all) to 4 (very often). Scores are summed up with higher scores indicating greater depression. In a literature review Cronbach's alpha was found to vary between 0.67 and 0.9 (mean= 0.82), which includes studies using a translated version of the HADS (Bjelland, Dahl, Haug & Neckelmann, 2002). Validity of the HADS is good to very good (Bjelland et al., 2002), and it is indicated that both subscales, HADS-A and HADS-D, have a good sensitivity and specificity. The HADS is mostly used for medical patients, but it can also be applied to the general population (Spinhoven, Ormel, Sloekers, Kempen, Speckens & van Hemert, 1997). In the present study Cronbach's alpha for the HADS-D was found to be high: Cronbach's alpha (T0) = 0.79, Cronbach's alpha (T1) = 0.81, and Cronbach's alpha (T2) = 0.82.

2.4.2 Mental Health Continuum – Short Form

The MHC-SF (Keyes, 2005), a self-report questionnaire, was used to measure the presence of positive mental health on the three dimensions emotional, social, and psychological well-being. It consists of 14 items (three items of emotional well-being, five items of social well-being, and six items of psychological well-being) with questions like 'In the past month how often did you have the feeling that you were happy?'. Ratings were based on the frequency of a certain feeling and answers ranged from 'never' to 'every day' on a six-point scale (never, once or twice a month, about once a week, two or three times a week, almost every day, every day). Scores are summed up with higher scores indicating greater emotional, social, and psychological well-being (Keyes, 2005). Lamers et al. (2011) assessed the reliability and validity of the Dutch version of the MHC-SF. Both validity and reliability were found to be high for the total MHC-SF (Cronbach's alpha = 0.89), and for the subscales emotional (Cronbach's alpha = 0. 83) and psychological (Cronbach's alpha = 0. 83) well-being, and adequate for the subscale social well-being (Cronbach's alpha = 0. 74). In the present study internal reliability was found to be high for the total MHC-SF on T0 (Cronbach's alpha = 0.89), on T1 (Cronbach's alpha = 0.92), and on T2 (Cronbach's alpha = 0.93). Cronbach's alpha was found to be adequate to high on all subscales as well (s. table 1).

Table 1
Reliability Statistics (MHC-SF)

Time	MHC-SF (subscales)	Cronbach's alpha
T0	emotional	.85
	social	.73
	psychological	.82
T1	emotional	.86
	social	.77
	psychological	.88
T2	emotional	.84
	social	.82
	psychological	.88

Note. MHC-SF, Mental Health Continuum- Short Form; emotional, emotional well- being; social, social well-being; psychological, psychological well-being

2.5 Online intervention

Participants in the experimental condition followed the ACT-based intervention *Living with pain*, which consisted of nine modules (Veehof et al., 2010). In the first module, participants mainly received information on pain in general (sorts of pain, possible treatments etc.), and about goals of the intervention. Furthermore, they got to know mindfulness exercises. Module 2 informed them about the negative effects of experiential avoidance, and the modules 3 and 4 then introduced values, which included exercises to find personal values and possibilities to apply them in their daily life. Module 5 was designed to achieve the state of acceptance concerning the participants' chronic pain. In the following modules 6 and 7, the processes cognitive defusion and self-as-context were introduced. Participants practiced identifying unhelpful thoughts concerning their pain and learned the difference between the subjective and objective self. Module 8 then focused on the social environment of the participants, whereas module 9 focused on applying values and goals (identified earlier in the intervention) in daily life. Furthermore, this final module aimed at preventing relapse (Veehof et al., 2010). The modules included various exercises, such as breathing and endurance exercises, (physical) activities, writing a diary, filling in questionnaires concerning pain-related thoughts, emotions, and experiences, and reflecting on them.

At the beginning of the intervention participants were instructed to e-mail their counsellor after having finished a module. The counsellor then sent feedback on the participant's progress via e-mail for support and also motivation. The participant could then react and received the next feedback after finishing the following module. The counsellors were trained graduates with a master of psychology under supervision of a professional.

The first control group, that is the minimal intervention group participated in an *Expressive writing* intervention. *Expressive writing* is based on the idea that the mere

(written) disclosure of a person's problems has a therapeutic effect itself (Pennebaker, 1997). Studies have found that *Expressive writing* can reduce depressive symptoms (Koopman et al., 2005). Participants were instructed to write down emotional upsetting experiences related to their pain in a diary for 15 to 20 minutes on a daily basis. Diaries remained private throughout the intervention, unless participants chose to send parts of it to their counsellor. This minimal intervention included nine modules. Feedback was minimal and given in the same way as in the experimental condition. This minimal intervention condition was included in the study to enable better comparisons of effects. By this means it can be analysed whether possible positive effects are actually due to the ACT treatment, and not only some treatment at all. This would be impossible with a waiting list condition only. Furthermore, the *Expressive writing* condition enables a better study of long-term effects.

The second control group was enrolled on a waiting list. They did not receive any intervention until three months after the end of the intervention of the experimental and minimal intervention group. By this time they could start the web-based intervention *Living with pain* or respectively *Expressive writing,* but did not receive any feedback.

In total, the intervention took 14 months for the experimental group and minimal intervention group, and 11 months for the waiting list group. All participants were able to take part while being in their own living environment.

2.6 Data analysis

The software package 'IBM SPSS Statistics' was used for quantitative statistical analysis. Analyses were conducted on the basis of the intention-to-treat principle, whereby Missing Value Analysis was used to impute all missing data with the expectation maximization method. Using this method, missing values are computed based on maximum likelihood estimates, thereby preventing problems such as the underestimation of standard errors. It is considered a very good method of handling missing data (Blankers, Koeter & Schippers, 2010). All in all, the drop-out percentage at T2 that needed to be compensated for was 29.8%, which was taken into consideration when recruiting participants. Descriptive statistics were obtained for each group at each measurement point. To examine whether the three groups significantly differed from each other at the baseline measurement concerning sex, age, use of medication, working situation, depression, and positive mental health Chi-square analyses were used. Cohen's d was calculated to examine effect sizes between the experimental and the minimal intervention-, and between the experimental and second control group on T1 and T2 by using an online effect size calculator (http://www.uccs.edu/~lbecker/).

A 3 (Condition: intervention, minimal intervention, and waiting list) x 3 (Time of Measurement: before the intervention, right after the intervention, three months after the intervention) repeated-measures-ANOVA, with Condition as between subject variable and Time of Measurement as within subject variable, was carried out. In the analysis the multivariate approach based on the test statistic Wilks' Lambda was used, which is considered an appropriate method for the design of the present study (Ellis, 2006). Main effects were analysed in more detail using univariate confidence intervals based on the Bonferroni correction. The dependent variables were positive mental health (measured by the MHC-SF) and depression (measured by the HADS-D).

3. Results

At the baseline measurement no significant differences have been found between the conditions concerning sex [$X^2(2, N = 238) = .05, p > .05$], age [$X^2(114, N = 238) = 98.18, p > .05$], and use of medication at the present moment [$X^2(2, N = 238) = .67, p > .05$]. Furthermore, there were no differences in depression [$X^2(32, N = 238) = 26.75, p > .05$] and positive mental health [$X^2(98, N = 238) = 102.762, p > .05$], indicating a successful randomisation (s. also means and standard deviations in table 3). However, baseline differences have been found concerning the participants' working situation [$X^2(2, N = 238) = 6.6, p = .037$], indicating a statistically significant association between condition and working situation. The proportion of working and non-working participants is unequal in all conditions, especially the Waiting List condition, with generally more non-working participants (s. table 2).

Table 2
Demographic information at baseline measurement

	LWP (n=82)	EW (n=79)	WL (n=77)	Total (n=238)
Sex	N (%)	N (%)	N (%)	N (%)
Male	19 (23.2)	19 (24,1)	19 (24.7)	57 (23.9)
Female	63 (76.8)	60 (75.9)	58 (75.3)	181 (76.1)
Age	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
	52.9 (13.315)	52.3 (11.769)	53.2 (12.048)	52.8 (12.364)
Work	N (%)	N (%)	N (%)	N (%)
Fulltime/Part-time	35 (42.7)	38 (48.1)	22 (28.6)	95 (39.9)
Non-working	47 (57.3)	41 (51.9)	55 (71.4)	143 (60.1)
Medication	N (%)	N (%)	N (%)	N (%)
Yes	57 (69.5)	54 (68.4)	57 (74)	168 (70.6)
No	25 (30.5)	25 (31.6)	20 (26)	70 (29.4)

Note. LWP, Living with pain; EW, Expressive writing; WL, waiting list; SD, standard deviation

Table 3
Descriptive Statistics

Condition		HADS-D			MHC-SF		
		T0	T1	T2	T0	T1	T2
EW	Mean	6.53	5.83	5.94	52.20	55.34	55.58
	SD	3.54	3.16	3.36	11.88	12.10	11.86
LWP	Mean	6.12	5.14	4.68	52.63	55.04	56.22
	SD	3.53	3.09	2.77	12.01	12.33	12.31
WL	Mean	6.10	5.87	5.65	49.88	52.42	54.02
	SD	3.20	3.35	3.55	12.80	14.18	14.52
Total	Mean	6.25	5.60	5.42	51.60	54.29	55.30
	SD	3.42	3.20	3.26	12.23	12.90	12.90

Note. EW, Expressive writing; LWP, Living with pain; WL, waiting list; HADS-D, Hospital Anxiety and Depression Scale-Depression; MHC-SF, Mental Health Continuum- Short Form; SD, Standard Deviation

3.1 HADS-D

No significant Time x Condition interaction [$F(4,468) = 2.336$, $p = .055$] has been found, indicating that the test scores did not differ significantly across the three conditions between the three points of measurement. A significant main effect of Time has been found [$F(2,234) = 13.245$, $p = .000$]. Across all conditions scores on the HADS-D changed between at least two measurement points. Tests of Within-Subjects Contrasts indicate that changes in HADS-D scores are significant between T0 and T1 [$F(1,235) = 18.892$, $p = .000$] and between T0 and T2 [$F(1,235) = 25.253$, $p = .000$] across the conditions. However, the effects are small (s. table 4). Means and standard deviations for all conditions at each measurement point can be seen in table 3. No main effect of Condition has been found [$F(2,235) = 1.45$, $p = .237$], showing that the overall scores on the HADS-D did not significantly differ in the three conditions (s. table 4).

Table 4
Effect sizes and F-values of ANOVA main- and interaction effects

	Cohen's d (T1)	Cohen's d (T2)	Time	Condition	Time x Condition
HADS-D			13.245*	1.45	2.336
LWP – EW	-.22	-.41			
LWP – WL	-.23	-.30			
MHC-SF			16.847*	1.134	0.347
LWP – EW	-.02	.05			
LWP – WL	.20	.16			

Note. HADS-D, Hospital Anxiety Depression Scale-Depression; MHC-SF, Mental Health Continuum-Short Form; LWP, Living with pain; EW, Expressive writing; WL, waiting list; *$p < .0001$

Univariate pairwise comparisons based on the Bonferroni correction are used to further investigate the differences between measurement points (s. table 5). In the experimental condition HADS-D scores were found to be significantly lower on the two follow-ups (T1 and T2) than on the first measurement (T0). No significant difference has been found between T1 and T2. In the *Expressive writing* condition, the scores on the HADS-D were significantly lower on T1 than on T0. Significant differences have been found neither between the scores on T0 and T2, nor between T1 and T2 (s. also figure 1). In the waiting list condition no significant changes in scores between the three measurement points have been found. Descriptive statistics (s. table 3) show that, even though there are some non-significant decreases in the two control groups, the difference between scores on T0 and T2 is greatest in the *Living with pain* condition (6.12 – 4.68 = 1.44).

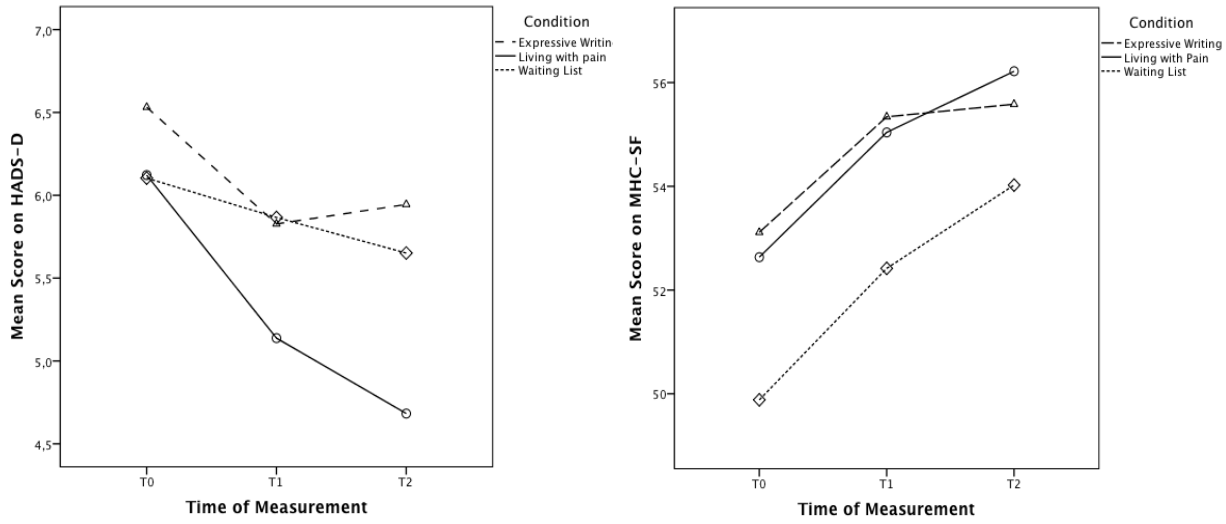


Figure 1. Time x Condition on HADS-D and MHC-SF

3.2 MHC-SF

The results concerning the MHC-SF are similar to the ones concerning the HADS-D. Neither a significant Time x Condition interaction effect [$F(4,468) = .347$, $p = .846$], nor a significant Condition main effect [$F(2,235) = 1.134$, $p = .323$] has been found. A significant Time main effect could be observed [$F(2,234) = 16.847$, $p = .000$], indicating that across all conditions scores on the MHC-SF changed between at least two measurement points. Significant differences were found between T0 and T1 [$F(1,235) = 17.82$, $p = .000$] and between T0 and T2 [$F(1,235) = 33.807$, $p = .000$]. Effect sizes are small (s. table 4).

Pairwise Comparisons (s. table 5) reveal that in the experimental group *Living with pain* MHC-SF scores were significantly higher on T1 and T2 than on T0. Differences between

T1 and T2 are not significant. No significant changes have been found in the *Expressive writing* condition. In the waiting list condition scores on T2 were significantly higher than on T0. Descriptive statistics (s. table 3) reveal that scores on the MHC-SF slightly increase in all conditions throughout the intervention (s. also figure 1), whereby the difference between the measurements on T0 and T2 is the highest in the waiting list condition (54.024 – 49.883 = 4.141), followed by the *Living with pain* condition (56.218 – 52.634 = 3.584), and the *Expressive writing* condition (55.583 – 53.114 = 2.469).

Table 5
Pairwise Comparisons

Condition	Measure	Time	Time	Sig.	95% CI for Difference	
					Lower Bound	Upper Bound
EW	MHC-SF	T0	T1	,073	-4,597	,145
			T2	,059	-5,005	,066
		T1	T2	1,000	-2,361	1,874
	HADS-D	T0	T1	,005	,173	1,236
			T2	,085	-,056	1,229
		T1	T2	1,000	-,621	,386
LWP	MHC-SF	T0	T1	,048	-4,797	-,013
			T2	,000	-5,731	-1,437
		T1	T2	,333	-2,967	,610
	HADS-D	T0	T1	,005	,248	1,720
			T2	,000	,688	2,190
		T1	T2	,060	-,014	,924
WL	MHC-SF	T0	T1	,085	-5,310	,240
			T2	,002	-6,981	-1,300
		T1	T2	,282	-3,922	,711
	HADS-D	T0	T1	,952	-,340	,816
			T2	,330	-,233	1,137
		T1	T2	1,000	-,362	,791

Note. EW, Expressive writing; LWP, Living with pain; WL, waiting list; MHC-SF, Mental Health Continuum- Short Form; HADS-D, Hospital Anxiety and Depression Scale- Depression; Sig., Mean difference is significant when $p < 0.05$; CI, confidence interval with adjustment for multiple comparisons: Bonferroni

4. Discussion

The present study examined whether the web-based intervention *Living with pain* could decrease depression and improve positive mental health in chronic pain patients. It is important to note that the three conditions did not significantly differ across time concerning the scores on both the HADS-D and the MHC-SF. The effect of time was essentially the same regardless of the conditions. Overall scores changed in all groups in the course of the intervention. However, it can still be said that *Living with pain* did indeed decrease depression and enhance positive mental health, and the finding that no significant changes took place between the two follow-up measures T1 and T2 shows that the positive effect of the intervention was not only short-termed, but maintained over a three months follow-up period.

In the *Expressive writing* condition depressive symptoms decreased until the first follow-up measure T1. However, no significant difference concerning the score on the HADS-D between T0 and T2 could be found. Contrary to the *Living with pain* condition, the effect of the *Expressive writing* intervention therefore seems to be rather short-termed. No significant changes in positive mental health have been found, indicating that *Living with pain* might actually be more beneficial than *Expressive writing* concerning the enhancement of positive mental health. However, the effects found in the present study are small.

As expected, in the waiting list condition neither improvement nor deterioration could be observed concerning depression. Surprisingly, the waiting list condition had the greatest change in scores on the MHC-SF from the first measurement to the last follow-up compared to the other conditions. There were no significant changes in scores during the intervention though. This might be due to the fact that after filling out the last questionnaire they could finally start with the intervention themselves. Hope appears to correlate positively with mental health (Farran & Popovich, 1990), so the combination of hope and happiness about starting the intervention after being on the waiting list for months might have increased the participants' positive mental health. Generally, the expectation of participants might have influenced the results. Since the study was not a blind procedure participants might have shown biased behaviour due to certain outcome expectations, which could have had an impact on the results.

The generally small effects related to the HADS-D might be due to a floor effect. People with severe depression were excluded from the study in the screening procedure, and mild to moderate depression does not allow for great improvements, hence the small decrease in HADS-D scores (Veehof et al., 2011).

Even though the *Living with pain* condition was not significantly more effective than the other conditions (no main effect of condition), the positive effects are still in line with previous research. A guided online ACT-based intervention for chronic pain patients was recently conducted in Sweden. The study was a randomised controlled trial as well and included a control group. During the intervention, depressive symptoms (also measured by the HADS-D) significantly decreased in the treatment group (Buhrman et al., 2013). ACT treatments for chronic pain patients appear to be effective and acceptable (Wetherell et al., 2011). Additionally, the findings of the present study are in accordance with Fledderus et al. (2012), who found improvements in positive mental health and reductions in depression for the self-help intervention *Living to the full*, which, however, was not designed for chronic pain patients.

The present study has a number of strengths. The chosen design (a randomised controlled study, including a minimal intervention group) is really good in order to compare the effectiveness of the three conditions appropriately (Lidz, Appelbaum, Grisso, Renaud, 2004). Furthermore, the number of participants was high enough to find significant effects; the drop out rate of almost 30 % has been taken into consideration beforehand and therefore was not a problem in the statistical analyses. Since the intervention is a self-help programme with minimal e-mail support, therapeutic misconceptions were very unlikely to occur. Effects can therefore not be attributed to for example individualised care (Lidz et al., 2004).

However, the present study also encounters some limitations. Although randomisation contains many positive aspects, participants are not considered individually within this procedure. Maybe for some individuals one intervention might have been better than the other, which could lead to different results (Lidz et al., 2004). Furthermore, the intervention was an online self-help programme and not everybody is familiar with this medium. An Internet intervention might be unattractive to some people due to lack of knowledge or interest. However, the majority of the Dutch population has Internet access and uses it frequently (http://www.internetworldstats.com), and the mean age of participants corresponds to the mean age of the Dutch chronic pain population. Another aspect is that participants were mainly women; many of them did not work at the time of the intervention, and all applied after seeing an advertisement of the intervention. The results might therefore not be representative of the whole Dutch population and can therefore possibly not be generalised. A possible explanation for the high number of unemployed participants is that they are not able to work anymore due to their pain. It seems that the more severe chronic pain gets, the less people are able to work (Von Korff et al., 1992). Participants included in the present study

had rather severe chronic pain, so the finding of a high unemployment rate is not that surprising and the high number of non-working participants might actually be representative after all. However, the proportion of working and non-working participants was unequal across the conditions. A possible influence of one's working situation should therefore be subject to further research.

Another factor that needs to be considered is the possible influence of treatments other than the intervention. Participants were allowed to simultaneously follow any other pain treatments and, although it is rather unlikely that they started another treatment during the intervention, it is not impossible that they did. In fact, on T1 25.6% of the participants indicated that they started a new treatment, and 16.3% said they started taking new medication within the last three months. On T2 the percentage of participants who started a new treatment within the last three months rose to 32.9%, and the percentage of participants using new medication to 21.6%. However, the distribution across the groups was equal, indicating that neither new medication nor new treatments influenced the effects found in the present study.

Generally, *Living with pain* seems to be beneficial concerning the online treatment of chronic pain patients, even though the effects are small and the experimental condition did not significantly differ from the two control groups. Therefore, it might be useful to implement *Living with pain* as an additional programme to already existing treatments. The intervention is financially beneficial for society, since online self-help interventions are much cheaper than face-to-face treatments and more people could be reached. However, before widely implementing this kind of intervention in practice, more empirical research is needed to confirm the positive effects of ACT-based online self-help interventions for people suffering from chronic pain. This is especially the case for positive mental health, since no comparable results from other studies could be found.

All in all, it can be concluded from this study that the intervention *Living with pain* benefits positive mental health and reduces depressive symptoms to a certain degree.

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