

Expressive writing

Moderator variables for the effectiveness of a web-based intervention using Expressive Writing for chronic pain patients

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“The emotional findings, then, suggest that to gain the most benefit from writing about life’s traumas, acknowledge the negative but celebrate the positive.”

- James W. Pennebaker, *The Secret Life of Pronouns: What Our Words Say About Us*

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Abstract

Background. Chronic pain is a long-lasting condition with physical as well as psychological consequences. Expressive writing (EW) proves to be beneficial for a variety of problematic conditions, but it has yet to be proven that it can be effective for chronic pain. Benefits of EW include the possibility to express and give meaning to negative emotions. This study aims to examine whether demographic, emotional and physical variables moderate the effectiveness of the EW treatment for participants of the intervention “Living with pain”.

Method. “Living with pain” combined the classic writing paradigm with education about emotion regulation for 79 Dutch participants suffering from chronic pain. The results were compared to those of 77 Dutch chronic pain patients who were assigned to a waiting list (WL). A moderation analysis was carried out using linear regression models for the EW and the WL condition. It was tested whether the interaction of the assigned condition and the variables gender, age, level of education, pain intensity, pain duration and catastrophizing moderated the score on pain interference after the treatment.

Results. The results show that pain intensity and catastrophizing moderated the score on pain interference after the treatment. EW was more effective for participants scoring low for both pain intensity and catastrophizing. The other variables had no significant effect. Comparing the effects to the WL condition shows that the participants receiving EW treatment scored overall higher on pain interference by the end of the intervention.

Conclusion. Based on the results, it is not advised to treat pain patients with EW. If pain patients receive a writing treatment, it is advised to choose patients with a low level of both pain intensity and catastrophizing.

Samenvatting

Achtergrond. Chronische pijn is een langdurige conditie met zowel fysieke als psychische gevolgen. Expressief schrijven (ES) is een behandeling die effectief blijkt te zijn voor een diversiteit van problematische condities, maar tot nu toe werd niet duidelijk bewezen of het effectief zou kunnen zijn voor chronische pijn. Tot de voordelen van ES horen het kunnen uiten van en betekenis geven aan negatieve emoties. Deze studie onderzoekt of demografische, emotionele en fysieke variabelen de effectiviteit van de ES behandeling modereren voor deelnemers van de interventie “Living with pain”.

Methode. “Living with pain” combineerde het klassieke schrijf-paradigma met voorlichting over emotie regulatie voor 79 Nederlandse deelnemers die last hebben van chronische pijn. De resultaten werden vergeleken met de resultaten van 77 Nederlandse chronische pijn patiënten die aan een wachtlijst (WL) toegewezen werden. Een moderatie analyse werd uitgevoerd met behulp van lineaire regressie modellen voor de ES en de WL conditie. Getoetst werd of de interactie van de toegewezen conditie en de variabelen geslacht, leeftijd, niveau van opleiding, pijn intensiteit, duur van de pijn en catastrophizing de score voor pijn interferentie na de behandeling modereerde.

Resultaten. De resultaten laten zien dat pijn intensiteit en catastrophizing de score voor pijn interferentie na de interventie modereerden. De behandeling was effectiever voor deelnemers die lager scoorden voor zowel pijn intensiteit als catastrophizing. De overige variabelen hadden geen significant effect. De vergelijking met de wachtlijst conditie laat zien dat de deelnemers die een ES behandeling kregen in het algemeen hoger scoorden voor pijn interferentie na de interventie.

Conclusie. Gebaseerd op de resultaten wordt niet aangeraden om chronische pijn patiënten met behulp van ES te behandelen. Als pijn patiënten een ES behandeling ontvangen, wordt aangeraden voor patiënten met een laag niveau van zowel pijn intensiteit als catastrophizing te kiezen.

1. Introduction

Pain is a prevalent condition. According to the WHO approximately 20% of the people worldwide experience some kind of chronic pain (Gureje, Korff, Simon, & Gater, 1998; Turk, Wilson, & Cahana, 2011). Also, a large-scale survey in 15 European countries and Israel finds that moderate to severe chronic pain affects 19% of the participants. One-third of these pain sufferers receives no treatment (Breivik, Collett, Ventafridda, Cohen, & Gallacher, 2006). But what exactly is chronic pain? Definitions state that to be considered chronic, the pain has to persist for three to six months. If the person experiencing the pain has clearly been injured, the pain is considered chronic if it persists beyond the healing time normal for that kind of injury (Debono, Hoeksema, & Hobbs, 2013; Turk et al., 2011). Understanding chronic pain can be challenging (Elliott, Smith, Penny, Smith, & Chambers, 1999), as pain is a subjective experience described differently depending on the patient's social context and culture (Nickel & Raspe, 2001). Also, the severity of an injury does not always correlate with the discomfort a patient experiences (Debono et al., 2013). If the pain lasts long enough to be considered chronic, this has several impacts for the patient apart from the physical pain.

When pain becomes chronic, this does not only have consequences for the patient, but also for his environment and society (Turk et al., 2011). Possible consequences include a reduced level of activity, less energy, not being able to attend to the workplace or work around the house anymore and impaired relationships. Less activities and socialization could lead to (social) isolation, which then could set off psychological conditions such as anxiety and depression (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). In a study examining the relationship between pain and psychological conditions, it was found that 65% of the chronic pain patients suffered at least from one psychiatric disorder, and that 56% of the patients suffered from a major depression (Debono et al., 2013). Chronic pain also affects society: The costs for the required treatment are usually high, with € 3.5 billion for the treatment of chronic back pain in the Netherlands in 2007 alone (Lambeek et al., 2011). There is a loss of productivity, as patients are often not able to work or might be disabled for a lifetime (Penny, Purves, Smith, Chambers, & Smith, 1999). Chronic pain is a permanent condition, so the patient has to find a way to cope with it. Considering the impacts, a treatment that helps the patient to cope with both the physical and psychological consequences has to be found.

There are various kinds of treatment available for chronic pain. Examples are pharmacological treatment, surgery or psychological treatment, but all of the available treatments seem to only have a modest effect on the pain and minimal effects on the emotional functioning of the patient. Also, the available treatments almost never lead to a

resolution of all pain symptoms (Turk et al., 2011). Combining different treatments usually works better than single-discipline treatments such as providing medication (Flor, Fydrich, & Turk, 1992). As the patient's quality of life is limited and his condition might keep him from functioning normally or might even disable him for life (Sprangers et al., 2000), an effective treatment should consider the pain and its psychological consequences. Both aspects can be influenced by the patient's coping style (Turner, Jensen, & Romano, 2000). His attitude and anxiety for instance can affect the intensity of the pain (Wachter, 2012). Two common ways of coping are to either completely focus on the pain while avoiding the affected body parts as much as possible, or to ignore the pain and become overactive. The first coping style is described in the *fear-avoidance model* for chronic pain (Vlaeyen & Linton, 2000): A patient with a history of pain episodes experiences pain and misinterprets it as a catastrophe which cannot be controlled. As a result, he starts catastrophizing and refrains from any kind of movement that could cause pain. Avoiding movement keeps the patient from controlling whether his assumptions are indeed correct, so he cannot alter his behavior (Crombez, Eccleston, Damme, Vlaeyen, & Karoly, 2012). The other common reaction to pain is becoming overactive and trying to ignore the pain as much as possible. This behavior is summarized in the *avoidance-endurance model* (Hasenbring & Verbunt, 2010): The experience of pain leads to thoughts of suppression, and the patient tries to distract from it in order to minimize it. He keeps his activity level up and sometimes becomes even more active than before. This might result in more pain episodes due to overexertion.

Catastrophizing is an important psychological aspect when coping with chronic pain. It describes the patient judging the pain as horrible and unbearable and usually involves rumination, magnification and helplessness (Geisser, Robinson, Keefe, & Weiner, 1994). While rumination means repetitively thinking about one's sadness and the circumstances that cause the sadness (Nolen-Hoeksema, 1991), magnification involves exaggerating the significance of an event (Wenzlaff & Grozier, 1988). The feeling of helplessness is caused by uncontrollable events, which can lead to disrupted emotions (Maier & Seligman, 1976). The impacts and the ineffective ways of coping such as catastrophizing emphasize that a therapy simply concentrating on reducing the pain is not sufficient when it comes to chronic pain. A treatment is needed which also concentrates on the patient's emotions and coping style. One example for such a treatment is *Expressive writing*. Expressive writing also focuses on the psychological aspects of pain. The term was first introduced by James Pennebaker in the late 1980's and describes a type of writing whereby people write down their feelings and thoughts about traumatic, stressful events (Pennebaker, 1997). The basic writing paradigm, the

standard version of Expressive writing, asks for random assignment of participants to different groups. The participants receive a topic they have to write about for 15 to 30 minutes per day for about three to five days. While one group writes about emotional and stressful events, the other groups are usually asked to write about superficial topics, for example how they spent their free time (Pennebaker, 1997). The main idea behind Expressive writing is that some people inhibit feelings they do not want to think about, and that writing might be an alternative to avoidance and suppression (Pennebaker & Beall, 1986). Expressive writing is said to be helpful for coping with and giving meaning to such feelings, so that the patient is able to accept them (Boals & Klein, 2005). It can lead to fewer visits to the doctor for health issues and an improvement in the personal health and wellbeing (Park & Blumberg, 2002; Range & Jenkins, 2010). It also has the advantage that it can be used as a supplement, so that the patient gets a traditional therapy such as Cognitive Behavioral Therapy (CBT) and can easily perform Expressive writing in addition to that (Furnes & Dysvik, 2012). This makes Expressive writing a minimal invasive treatment, which the patient can use not only to release his negative emotions caused by the pain, but also to give meaning to them and to accept them better.

When studying the benefits, it has to be mentioned that Expressive writing does not work for everybody equally well. It has been tested under various circumstances, for example with physical conditions such as asthma or arthritis (Kelley & Lumley, 1997), cancer (Moor et al., 2002) and chronic pain (Norman, Lumley, Dooley, & Diamond, 2004), but also with psychological problems such as emotional trauma after a break-up (Lepore & Greenberg, 2002), unemployment (Spera, Buhrfeind, & Pennebaker, 1994) or natural disasters (Smyth, Anderson, Hockemeyer, & Stone, 2002). It has especially been tested for patients suffering from depression and led to promising results for this condition, with fewer depressive symptoms after the treatment (Baum & Rude, 2013; Gortner, Rude, & Pennebaker, 2006; Koopman et al., 2005). The effectiveness of the treatment has more clearly been proven for depression than for physical conditions such as chronic pain. Only a few studies concentrate on Expressive writing for physical conditions, and the findings are mixed: Some studies find self-reported improvements in the patients' physical health, while other studies do not find any beneficial effects at all. Examples of studies that do find positive effects concentrate on patients suffering from physical conditions such as asthma or rheumatoid arthritis. Asthma patients improved regarding their lung function and arthritis patients improved in overall disease activity after receiving Expressive writing treatment (Smyth, Stone, Hurewitz, & Kaell, 1999). Positive effects were also found for patients suffering from pain resulting from

cancer, as they showed fewer physical symptoms and fewer medical appointments due to their pain (Stanton et al., 2002). Other studies did not find any beneficial effects for patients suffering from comparable conditions, such as cancer patients (Moor et al., 2002; Mosher et al., 2012).

Based on the existing studies, it cannot clearly be concluded that Expressive writing is effective for people suffering from chronic pain. These findings match the results of the web-based intervention this study is based on: “Living with pain” proved that Acceptance and Commitment Therapy (ACT) can effectively be used to improve pain interference for chronic pain sufferers (Trompetter, Schreurs, Heuts, & Vollenbroek-Hutten, 2014). Expressive writing was used as a minimal intervention condition, but has not further been examined because it was not overall effective. It remains uncertain whether some pain patients could benefit from Expressive writing, so this paper concentrates on the question whether a subgroup of participants from “Living with pain” did benefit from the treatment. If that is the case, the question occurs what distinguishes these participants from the rest of the group. One possible explanation for the mixed findings is that third variables moderate the effectiveness of Expressive writing. Those variables could be demographic variables such as gender, age and the education of a patient, emotional variables such as the way a patient copes with pain, or physical moderators such as the characteristics of the pain itself. Very few studies about the role of moderator variables in an Expressive writing intervention exist. A meta-analysis with healthy patients found that the gender of the patient might be a moderator variable, as Expressive writing was more effective for male patients, suggesting that the treatment helped male participants to express emotions they would otherwise not dare to show (Smyth, 1998). Nevertheless, other studies about Expressive writing do not concentrate on gender differences (Norman et al., 2004; Range & Jenkins, 2010). Also, Baikie & Wilhelm (2005) conclude based on a literature review that age does not seem to be of any influence on the effectiveness. Expressive writing has been tested with a variety of people with different backgrounds, but education is not mentioned as a significant moderator variable for most studies (Baum & Rude, 2013; Kelley & Lumley, 1997; Moor et al., 2002; Norman et al., 2004; Spera et al., 1994). Smyth (1998) concentrated mainly on participants suffering from stress, and found students to benefit more from Expressive writing than non-students. Regarding the emotional moderators, a study with chronic pain patients found variables such as catastrophizing, being ambivalent about emotions and a higher level of negative affect to be possible moderator variables. Women who suffered from pelvic pain and showed higher levels of these factors benefitted more from the treatment in terms of lower pain intensity ratings afterwards

(Norman et al., 2004). For studies with women suffering from breast cancer, the ability to express emotions seemed an important moderating factor (Jensen-Johansen et al., 2013; Low, Stanton, Bower, & Gyllenhammer, 2010). A literature review about trauma survivors names the amount and severity of the symptoms as possible physical moderators. Patients with a variety of medical issues and more severe symptoms seem to benefit more from Expressive writing compared to control groups (Baikie & Wilhelm, 2005). Having lived with the diagnosis for a longer time also seemed to have a moderating effect for cancer patients (Low et al., 2010). Based on these studies, catastrophizing, pain intensity and pain duration are more likely to moderate the effectiveness than demographic variables.

Considering the lack of studies about moderator variables for pain patients, this study examines whether the discussed demographic, emotional and physical variables moderated the results of “Living with pain”. Expressive writing is expected to be more effective for pain patients who are female, middle-aged or older, better educated and who are showing less intensive and less durable pain and engage in catastrophizing less. Although demographic variables did not seem to work as moderators for earlier studies, these studies did not examine gender differences for a variety of pain symptoms, so gender could still be a moderator for this intervention. Smyth (1998) found males to benefit more, but it is also possible that females benefit more from writing. This hypothesis is based on the assumption that females express their (negative) emotions more often and open than males (Brebner, 2003) and therefore find it more helpful to write about them. Age and education did not appear to be moderators, but again existing studies concentrated on patients with one kind of pain or no pain at all. The treatment is expected to be more effective for older people, based on the assumption that they are more experienced with expressing their emotions (Ross & Mirowsky, 2008). It might also be more effective for higher educated patients, as the writing can lead to increased expressiveness of emotions, and this process asks for personal reflection (Slatcher & Pennebaker, 2006). Higher educated patients might find it easier to achieve this through writing. Regarding the physical moderator variables, it is expected that patients with more intensive and longer lasting pain might not find Expressive writing as beneficial, as these types of patients might need a more intensive treatment. Lastly, catastrophizing seems to be an important variable when it comes to the effectiveness of Expressive writing and coping with the pain. The treatment is expected to be less effective for patients engaging more in catastrophizing, as they might have engaged in avoiding and suppressing their emotions for too long. This could result in problems when being asked to honestly write about them.

2. Methods

2.1 Participants and procedures

All participants were recruited from the Dutch population. From the 269 respondents willing to participate in the intervention “Living with pain”, 31 respondents had to be excluded based on the in- and exclusion criteria. Of the remaining respondents, 79 were assigned to the Expressive writing intervention. Out of these 79 participants, 75.9 % was female. The average age of the participants was 52 years (range 21-78; SD 11.77). Of the participants assigned to the Expressive writing condition, 50 participants completed the intervention. A group of 77 respondents were assigned to a waiting list and waited for 8 months before they were assigned to a web-based intervention. Out of these 77 participants, 75.3% was female. Their average age was 53 years (range 20-75; SD 12.05).

The information about participation in “Living with pain” was spread via a national newspaper and websites for chronic pain sufferers which frequently were attended. Possible participants had to be 18 years or older, and their self-reported chronic pain had to consist for at least six months or longer and had to appear on a regular basis. The pain had to hinder them in their daily lives. Exclusion criteria were having no internet access at home or not having an e-mail address, not enough time to follow the intervention (about 30 minutes every day), insufficient Dutch language skills or being enrolled in a cognitive behavioral treatment at the moment of the intervention. Another exclusion criterion was experiencing serious psychological problems. Those respondents who had passed the screening received an invitation via mail to confirm their enrolment. They were randomly assigned to either the minimal intervention condition (*Expressive writing*), or to the experimental condition (*ACT intervention*), or to the waiting list condition (Trompetter et al., 2014).

2.2. Expressive writing condition

The Expressive writing intervention was used as a minimal intervention condition next to a waiting list condition and an experimental condition. The main goals of the intervention were to help the participants recognize and accept their negative emotions and to gain insight in their avoidance behavior. They were also given the opportunity to give meaning to emotional situations. The intervention was divided into 9 modules which could be completed within 9 weeks or 12 weeks, depending on how much time the participants needed. The total amount of time spent with the intervention was 14 months, counted from the moment of the assignment

until the last measurement six months after the intervention had ended. Every module started with psycho-education about emotions, then instructions for a specific writing task followed, and the modules ended with tips and extra tasks. The first two modules introduced the topic of coping with and expressing emotions. The third and fourth module were about regulating and preventing emotions, the fifth and sixth module about communicating and interpreting emotions, and the seventh and eighth module about positive emotions. The ninth and last module summarized the first eight lessons, and the participants were also asked to write down what they had learned during all the modules. The topics and tasks for each module can be found in Table 1.

The Expressive writing treatment used was a more extensive version compared to the standard writing paradigm by Pennebaker. One important difference between this version and the one invented by James Pennebaker (Pennebaker, 1997) is the set-up of this intervention: the participants were asked to write down their emotions for a more prolonged period than three to five days and had the opportunity to use a diary in addition to that. They performed the writing task on a daily or regular basis for 15-30 minutes each time. Before they started, it was pointed out to them that writing about their negative emotions could cause feelings such as sadness, but that it would be beneficial for their future coping with pain. They were also informed that it would be more effective to write about the emotions while they still mattered, preferably on the day they had occurred. Grammatical rules were not important. This version also added tasks about emotion regulation to the writing task. These tasks included information about emotions in general, reasons not to suppress them and strategies to prevent overreacting or to cope with becoming too emotional. Participants were also taught to not only realize the negative, but the positive emotions as well. They received feedback on their tasks weekly and on a set day from a counselor via mail. The counselor did not change during the intervention. The feedback was given by master students Psychology of the University of Twente, under the supervision of a Health care psychologist who trained the students in giving online feedback. The feedback included reflection on the weekly tasks, answers to questions and encouraging participants regarding their progress.

Table 1. *Overview of Expressive writing program for the intervention “Living with pain”*

Week/module	Title of lesson	Task for participants
1	<i>Writing about emotions</i>	Following the instructions regarding the writing task for a week
2	<i>Expressing emotions</i>	Learning about emotions and basic emotions; continuing Expressive writing Extra task: Looking for nuances in emotions
3	<i>Regulation of emotions</i>	Continuing Expressive writing with attention for unusual/unpleasant situations. Not suppressing own emotions and giving meaning to the situations Extra task: Re-establishment plan when feeling weak
4	<i>Preventive regulation of emotions</i>	Continuing Expressive writing; writing down thoughts regarding described situations Extra task: Plan about using emotion regulation strategies
5	<i>Communicating</i>	Learning about effective communication; looking back on the writing tasks and personal insights Extra task: Practicing effective communication/writing down the results
6	<i>A different approach</i>	Writing about situations in which preventive emotion regulation was used and the effects of that Extra task: Creating meaningful thoughts for difficult situations
7	<i>Positive emotions</i>	Writing about situations which caused positive emotions for at least three times Extra task: Engaging in pleasuring routine activities
8	<i>Getting started</i>	Looking back on last week’s writing task; trying to find more positive situations to write about Extra task: List of rewarding activities
9	<i>Continue with Expressive writing</i>	Writing a letter to a loved one and describing what has been learned during the intervention

Note. Overview is based on the modules for Expressive writing from www.haalmeeruitjelevenmetpijn.nl

2.2.1 Waiting list condition

Participants assigned to the waiting list condition did not receive any kind of treatment when the other participants either started the Expressive writing intervention or the ACT intervention. The participants placed on the waiting list were informed in writing that they had access to treatment as usual (TAU). They later received the opportunity to follow the intervention they personally preferred, either the Expressive writing or the ACT intervention. This happened eight months after the other participants had started one of the two possible interventions.

2.3 Outcomes and moderators

2.3.1 Measurements

The participants of the Expressive writing condition filled in the *Multidimensional Pain Inventory (MPI)* during the baseline period. The measurement took place six weeks after the participants' application (T0). They filled in the questionnaire a second time three months after the intervention had ended (T1).

2.3.2 Outcome variable: Multidimensional Pain Inventory – sub scale pain interference (MPI – interference)

The Multidimensional Pain Inventory (MPI) measures different aspects of pain and disability (Kerns, Turk, & Rudy, 1985). The MPI contains a sub scale that measures one of the psychological aspects of chronic pain: the pain interference with daily life activities such as work, homework chores and social activities. The sub scale consists of 9 items that are answered on a 7-point Likert scale. It contains questions such as “To what extent has the pain changed your ability to work since the beginning of the pain?” or “To what extent did the pain change the relation with your spouse/partner or family?” The possible answers range from 1 to 7 or from “No change” to “A lot of change”. The higher the score, the more does the pain interfere with these aspects of daily life. The Dutch version of the MPI has been validated (Lousberg et al., 1999).

2.3.3 Moderators

Possible moderator variables were baseline characteristics interacting with the assigned condition and affecting the outcome variable. Variables that were not moderators could be non-specific predictors of change that do not interact with the assigned condition, but predict the score on the outcome variable.

2.3.3.1 Demographic moderator variables

2.3.3.1.1 Gender

The gender of the participants was divided into two different categories and was either rated as male or as female.

2.3.3.1.2 Age

The age of the participants was measured in years.

2.3.3.1.3 Level of education

The level of education was divided into three categories: it was either rated as low, average or high. Participants were asked to name the highest form of education they had completed at the moment of the measurement. Less than 10 years of education were rated as low, 10-15 years were rated as average, and more than 15 years were rated as high.

2.3.3.2 Emotional moderator variable

2.3.3.2.1 Pain Catastrophizing Scale (PCS)

The Pain Catastrophizing Scale (PCS) measures patients' catastrophizing about their pain. It contains three subscales: The first subscale measures "rumination" and contains 4 items, the second subscale measures "magnification" and contains 3 items and the third subscale measures "helplessness" and contains 6 items. The PCS contains statements such as "When I'm in pain, I keep thinking of other painful events" or "I anxiously want the pain to go away". The items are answered on a 5-point Likert scale and answers range from 0 to 4 or from "Not at all" to "All the time". The scores for the 13 items can be summed up or can be calculated for each subscale separately. The Dutch version of the PCS proves to be highly reliable and valid (Damme, Crombez, Bijttebier, Goubert, & Houdenhove, 2002).

2.3.3.3 Physical moderator variables

2.3.3.3.1 Pain duration

Pain duration could be reported by the participants in years, depending on how long they had been suffering from chronic pain at the moment of the measurement. The pain duration was divided into two categories: it could either have lasted less than five years or more than five years at the moment of the measurement.

2.3.5.3.2 Pain intensity

Pain intensity was measured with the *Pain intensity- Numeric Rating Scale (Pain NRS)*. On this scale, the participants could rate their pain during the last week from 0 to 10 or from “No pain” to “Worst pain imaginable”. The Pain NRS is short, easy to use and has been validated for measuring pain intensity (Krebs, Carey, & Weinberger, 2007).

2.4 Analysis

Data were analyzed for the 79 participants assigned to the Expressive writing intervention and the 77 participants assigned to the waiting list. All data were analyzed with the program IBM SPSS Statistics version 21. A moderation analysis was carried out using the Computational Tool “PROCESS” which was installed in SPSS. PROCESS (A. F. Hayes, 2012) is a Modelling Tool that can carry out calculations SPSS normally would not be able to provide. Figure 1 summarizes the theoretical model for moderation and Figure 2 summarizes the statistical model used for this analysis.

Linear regression models were used to determine whether the possible moderator variables functioned as moderators or predictors of change for the dependent variable. Pain interference measured with the score on the MPI (T1) was used as dependent variable and the assigned condition as well as the possible moderators were used as independent variables. To control for variety in MPI score at baseline measurement, the score on the MPI (T0) was added as independent variable. Moderators were baseline characteristics which interact with the assigned condition and affect the score on the MPI (T1). In case of significant moderation, the result for the outcome variable would depend on the value of the moderator variable. If the regression coefficient was $p < 0.05$, there was said to be significant moderation. In case of non-significant interaction, but a main effect with $p < 0.05$ for an independent variable, this variable was interpreted as a non-specific predictor of change.

Figure 1. *Theoretical Model for Moderation*

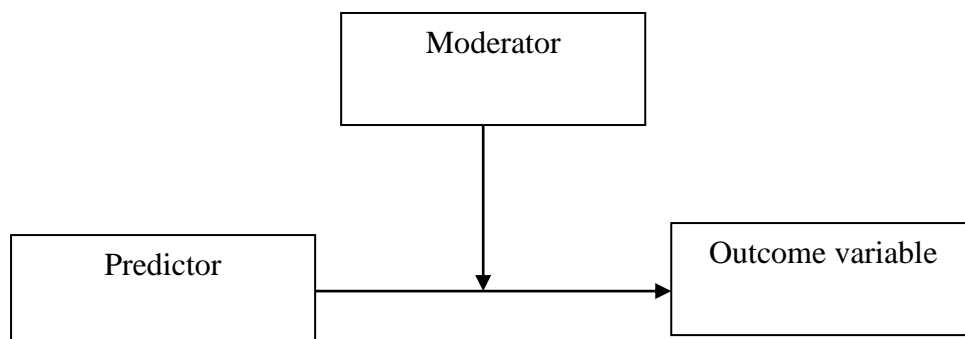
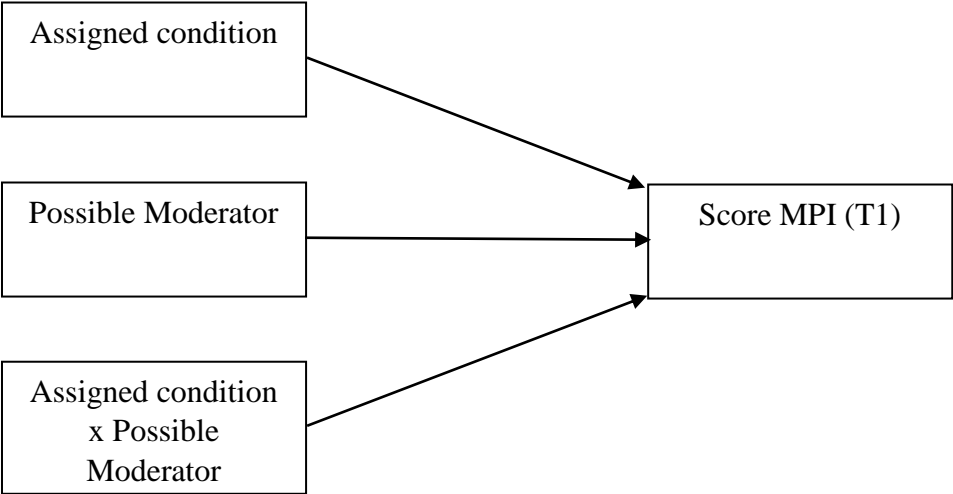


Figure 2. *Statistical Model for Moderation analysis*



3.1 Participants' characteristics

Table 2. Descriptive statistics for Expressive writing condition and waiting list condition

		Expressive writing condition N= 79	Waiting list condition N= 77	Total N= 156
Gender				
<i>Female</i>	%	75.9	75.3	75.6
<i>Male</i>	%	24.1	24.7	24.4
Age	M (SD) Range	52.29 (11.77) 21.00-78.00	53.18 (12.05) 20.00-75.00	52.73 (11.88) 20.00-78.00
Level of education				
<i>Low</i>	%	19.0	22.1	20.5
<i>Medium</i>	%	36.7	35.1	35.9
<i>High</i>	%	44.3	42.9	43.6
Pain duration				
<i>Less than 5 years</i>	%	30.4	39.0	34.6
<i>More than 5 years</i>	%	69.6	61.0	65.4
Pain intensity (T0)	M (SD) Range	6.11 (1.61) 2.00-9.00	6.16 (1.58) 2.00-9.00	6.13 (1.59) 2.00-9.00
Catastrophizing (T0)	M (SD) Range	17.63 (10.20) 0.00-42.00	19.14 (9.64) 0.00-39.00	18.38 (9.93) 0.00-42.00

Note. Catastrophizing was measured using the Pain Catastrophizing Scale (PCS) at baseline measurement (T0)

Table 2 shows the mean, standard deviation and range of the possible moderator variables for the Expressive writing condition and the waiting list condition.

In both conditions, more participants were female than male, with 75.9% female participants in the Expressive writing condition and 75.3% female participants in the waiting

list condition. The average age was 52.29 (range 21-78; SD 11.77) for the Expressive writing condition and 53.18 (range 20-75; SD 12.05) for the waiting list condition. In both conditions the participants stated to have a high to medium level of education: 44.3% had a high level of education and 36.7% had a medium level of education in the Expressive writing condition. In the waiting list condition, 42.9% had a high level of education and 35.1% had a medium level of education.

Pain duration could have either lasted for less or more than five years. For the Expressive writing condition, 30.4% of the participants had suffered from the pain for less than five years and 69.6% had suffered from it for more than five years. For the waiting list condition, 39.0% had suffered from it for less than five years and 61% had suffered from it for more than five years. Pain intensity was measured with the participants' score on the Pain-NRS. Participants of the Expressive writing condition had an average score of $M=6.11$ (range 2-9; SD 1.61) and participants of the waiting list condition had an average score of $M=6.16$ (range 2-9; SD 1.58).

Catastrophizing was measured with the participants' score on the PCS at T0. Participants of the Expressive writing condition had an average score of $M=17.63$ (range 0-42; SD=10.20) and participants of the waiting list condition had an average score of $M=19.14$ (range 0-39; SD= 9.64). Standard deviations are large for both conditions, suggesting that the scores for catastrophizing vary a lot and that the group of chosen participants is heterogeneous.

3.2 Moderation analysis

Regression coefficients were calculated for the chosen possible moderator variables, the assigned condition (ESvsWL) and the interaction between the possible moderator variables and the assigned condition. The results of the moderation analysis are summarized in tables 3, 4 and 5.

3.2.1 Demographic moderators

Table 3. Moderator analysis for gender, age and level of education comparing Expressive writing condition to waiting list condition

Moderator variable	Coefficient	SE	t-value	p-value
Gender				
ESvsWL	3.77	1.15	3.27	0.01*
Gender	3.13	1.47	2.13	0.03*
ESvsWL x Gender	3.31	3.06	1.08	0.28
Age				
ESvsWL	3.74	1.17	3.20	0.00*
Age	0.02	0.05	0.45	0.66
ESvsWL x Age	0.16	0.11	1.45	0.15
Level of Education				
ESvsWL	3.74	1.15	-1.26	0.00*
Education	-1.01	0.80	3.24	0.21
ESvsWL x Level of Education	-2.24	1.63	-1.38	0.17

Note. * p<0.05

Table 3 shows the results of the moderation analysis for the demographic variables. The standard errors were adjusted for heteroscedasticity. The main effect was significant for gender with $b = 3.13$, 95% CI [0.23, 6.03], $t = 2.13$, $p < 0.05$ and for the assigned condition with $b = 3.77$, 95% CI [1.50, 6.04], $t = 3.27$, $p < 0.05$. The interaction between gender and the assigned condition did not moderate the results with $b = 3.31$, 95% CI [-2.73, 9.35], $t = 1.08$, $p > 0.05$.

Regarding the variable age, the main effect was significant for the assigned condition with $b = 3.74$, 95% CI [1.43, 6.04], $t = 3.20$, $p < 0.05$ but not for age with $b = 0.02$, 95% CI [-0.08, 0.13], $t = 0.45$, $p > 0.05$. The interaction between the assigned condition and age did not moderate the results with $b = 0.16$, 95% CI [-0.05, 0.37], $t = 1.45$, $p > 0.05$.

For the variable education, the main effect was significant for the assigned condition with $b = 3.74$, 95% CI [1.46, 6.03], $t = 3.24$, $p < 0.05$ but not for education with $b = -1.01$, 95% CI [-2.60, 0.58], $t = -1.26$, $p > 0.05$. The interaction between the assigned condition and education did not moderate the results with $b = -2.24$, 95% CI [-5.46, 0.98], $t = 1.38$, $p > 0.05$.

3.2.2 Emotional moderator

Table 4. Moderator analysis for Catastrophizing comparing Expressive writing condition to waiting list condition

Moderator variable	Coefficient	SE	t-value	p-value
Catastrophizing				
ESvsWL	3.90	1.13	3.44	0.00*
Catastrophizing	0.16	0.06	2.60	0.01*
ESvsWL x Catastrophizing	0.24	0.10	2.34	0.02*

Note. * $p < 0.05$

Catastrophizing was measured using the Pain Catastrophizing Scale (PCS) at baseline measurement (T0)

Table 4 shows the results of the moderation analysis for the emotional variable. The standard errors were adjusted for heteroscedasticity. The main effect was significant for

catastrophizing with $b= 0.16$, 95% CI [0.04, 0.29], $t= 3.44$, $p< 0.05$ and for the assigned condition with $b= 3.90$, 95% CI [1.66, 6.14], $t= 3.44$, $p< 0.05$. The interaction between the assigned condition and catastrophizing significantly moderated the results with $b= 0.24$, 95% CI [0.04, 0.44], $t=2.34$, $p<0.05$.

3.2.3 Physical moderators

Table 5. Moderator analysis for pain intensity and pain duration (Expressive writing condition and waiting list condition)

Moderator variable	Coefficient	SE	t-value	p-value
Pain intensity				
ESvsWL	3.73	0.41	3.28	0.00*
Pain intensity	0.50	1.14	1.21	0.23
ESvsWL x Pain intensity	1.75	0.77	2.29	0.02*
Pain duration				
ESvsWL	3.77	1.18	3.19	0.00*
Pain duration	-0.73	1.37	-0.53	0.60
ESvsWL x Pain duration	1.50	2.69	0.56	0.58

Note. * $p<0.05$

Pain intensity was measured using the Pain intensity- Numeric Rating Scale (Pain NRS)

Table 5 shows the results of the moderation analysis for the physical variables. The standard errors were adjusted for heteroscedasticity. For pain intensity, there was a significant main effect for the assigned condition with $b= 3.73$, 95% CI [1.49, 5.98], $t= 3.28$, $p< 0.05$ but not for pain intensity with $b= 0.50$, 95% CI [-0.32, 1.32], $t= 1.21$, $p> 0.05$. The interaction between the assigned condition and pain intensity significantly moderated the results with $b= 1.75$, 95% CI [0.24, 3.27], $t=2.29$, $p<0.05$.

Regarding the variable pain duration, there is a significant main effect for the assigned

condition with $b= 3.77$, 95% CI [1.44, 6.10], $t= 3.19$, $p< 0.05$ but not for pain duration with $b= -0.73$, 95% CI [-3.45, 1.98], $t= -0.53$, $p> 0.05$. The interaction between the assigned condition and pain duration did not significantly moderate the results with $b= 1.50$, 95% CI [-3.82, 6.82], $t= 0.56$, $p> 0.05$.

3.3 Visualized effects for Catastrophizing and Pain intensity

Figure 3. Relationship between level of catastrophizing (T0) and score MPI (T1)

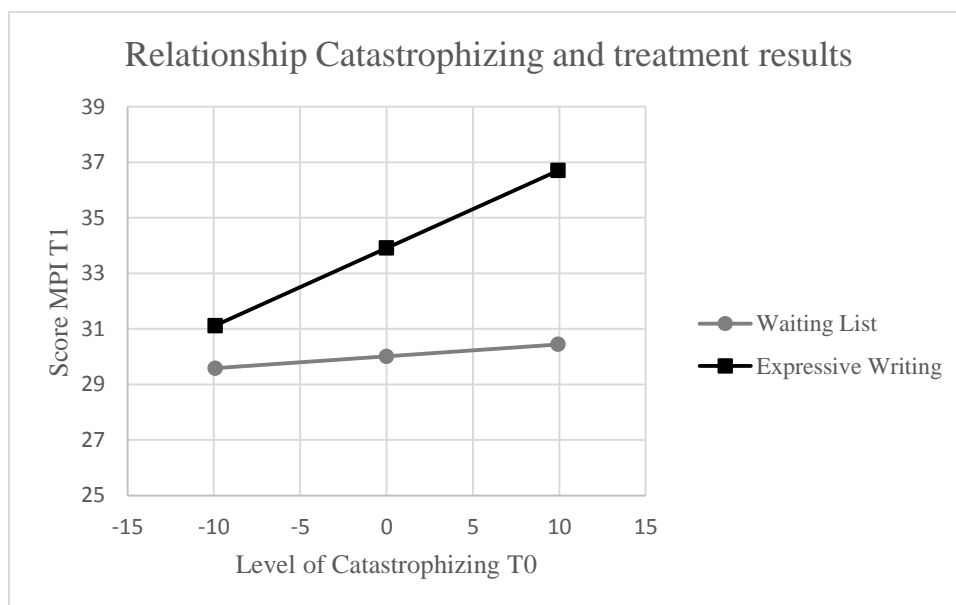


Figure 3 visualizes the relationship between the participants' level of catastrophizing (T0) and their treatment results or score on the MPI (T1). Assuming all participants would have started with the same score on the MPI (T0), the figure shows that the participants assigned to the Expressive writing condition continuously score higher on the questionnaire compared to the waiting list condition. If they started with a lower score for catastrophizing at the baseline measurement, they also scored lower on the MPI by the end of the intervention with a score of 31.12. Participants with an average score for catastrophizing scored higher on the MPI (T1) with a score of 33.91, and participants with a higher score for catastrophizing scored even higher on the MPI T1 with a score of 36.70. A higher level of catastrophizing at baseline measurement therefore results in a higher score on the MPI after the intervention.

Figure 4. Relationship between pain intensity (T0) and score MPI (T1)

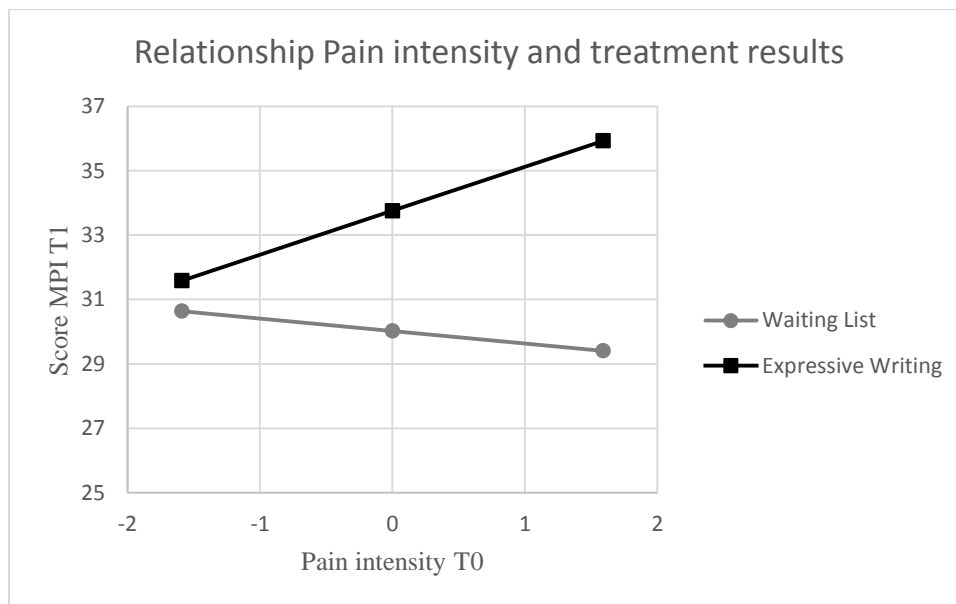


Figure 4 visualizes the relationship between the participants' pain intensity (T0) and their treatment results or score on the MPI (T1). Again, assuming all participants would have started with the same score on the MPI (T0), the figure shows that the participants assigned to the Expressive writing condition continuously score higher on the questionnaire compared to the waiting list condition. If they started with a lower score for pain intensity at the baseline measurement, they also scored lower on the MPI by the end of the intervention with a score of 31.58. Participants with an average score for pain intensity scored higher on the MPI T1 with a score of 33.75, and participants with a higher score for pain intensity scored even higher on the MPI T1 with a score of 36.70. A higher level of pain intensity at baseline measurement therefore results in a higher score on the MPI after the intervention.

4. Conclusion and Discussion

The main question that was addressed in this paper was whether the effectiveness of the Expressive writing treatment for participants from “Living with pain” was moderated by their gender, age, level of education, catastrophizing, pain intensity and pain duration. Although the treatment was not overall effective, the results show that its effectiveness was significantly moderated by participants’ pain intensity and catastrophizing. The treatment was more effective for participants with less intense pain and showing fewer signs of catastrophizing at baseline measurement, as they scored lower on pain interference after the intervention. The other tested variables had no significant effect. The results also show that the participants assigned to the waiting list constantly scored lower on pain interference after the intervention compared to participants from the Expressive writing condition. As a conclusion, it cannot be advised to treat pain patients with Expressive writing and especially not those patients scoring high for pain intensity and catastrophizing.

Earlier studies also found catastrophizing and being ambivalent about emotions to be moderators for the effectiveness of Expressive writing for pain patients. However, the few existing studies about emotional moderator variables concentrate on one kind of chronic pain only, such as chronic pelvic pain or cancer related pain (Jensen-Johansen et al., 2013; Norman et al., 2004). Catastrophizing appears to be an important variable when treating chronic pain, as it can strongly affect the patient’s way of coping. Avoiding as well as ignoring the pain can make the experience worse, until all pain episodes are interpreted as catastrophes (Crombez et al., 2012) and judged as unbearable (Geisser et al., 1994; Gracely et al., 2004). If pain patients who engage less in catastrophizing can benefit more from Expressive writing, this could mean that they cope with their pain more effectively and therefore have an advantage over patients worrying a lot and misinterpreting signs. Pain intensity is also mentioned by earlier studies as a likely moderator variable. One study found the severity of the patients’ symptoms to moderate the effectiveness. Again, this study did not exclusively concentrate on chronic pain, but on all kinds of traumas such as post-traumatic disorders (Greenberg, Wortman, & Stone, 1996; Sloan & Marx, 2004). As both studies did not work with patients experiencing a variety of pain symptoms, conclusions cannot easily be applied to chronic pain in general. This study included a variety of chronic pain symptoms and therefore is the first to find emotional and physical moderators for patients with more than one kind of chronic pain. Pain duration and the tested demographic variables had no significant effect. Pain duration seemed to moderate the effectiveness for cancer patients in an earlier study (Low et al., 2010), but not for the participants of this study. Most of the earlier studies have not found demographic variables

such as gender, age or education to be of significant influence for Expressive writing treatment (Kelley & Lumley, 1997; Norman et al., 2004; Range & Jenkins, 2010; Spera et al., 1994). One study found the treatment to be more effective for male participants (Smyth, 1998), but concentrated on healthy participants, so this conclusion might not be valid for pain patients.

Despite the conclusion that pain intensity and catastrophizing appear to be moderator variables, it cannot be concluded that Expressive writing is a useful treatment for chronic pain. If patients who received no treatment scored better for pain interference afterwards, Expressive writing cannot be interpreted as a successful treatment and might even be harmful for pain patients. As the results are promising for depressed patients (Baum & Rude, 2013; Gortner et al., 2006; Koopman et al., 2005), it could be considered to give the treatment to pain patients who also show symptoms of depression. Studies have indicated that there might be a link between pain, depression and catastrophizing, as one study with chronic pain patients found catastrophic thinking and depression to be significant predictors of disability due to the pain. Modifying these concepts might help chronic pain patient to participate more in daily life activities (Arnouk et al., 2011). Another study with chronic pain patients found perceived life-interference and self-control to be significant intervening variables between pain and depression (Rudy, Kerns, & Turk, 1988). Future studies will have to examine whether patients who suffer from depression as a consequence of their pain can benefit from Expressive writing. In addition to these conclusions, the results of this study could add to a better understanding of why depressed patients can benefit more from Expressive writing than pain patients. Depression and chronic pain both have different impacts on the patients suffering from it: while chronic pain is a physical experience that can have psychological consequences (Pruimboom & Dam, 2006; Turk et al., 2011), depression is a condition less physical and with primarily impact on the thoughts and feelings of the patient. Depression is associated with the occurrence of automatic negative thoughts (Hollon & Kendall, 1980). Expressive writing helps releasing the negative emotions a patient might not be able to express otherwise (Pennebaker & Beall, 1986). For a depressed person, this could support the process of releasing negative thoughts and start concentrating on the positive aspects as well, which then might lead to fewer depression symptoms. In contrast, the pain patient might also get insight in his negative emotions, but the pain itself is not directly affected. As a consequence, by the end of the intervention the pain patient might have gained more insight, but is still experiencing the pain, while the depression patient is directly targeting an important aspect of his condition: the negative thoughts and feelings. Also, not only is the

pain not directly affected, but writing about it and its negative consequences on a regular basis could have had a negative impact on the patients. The participants of the Expressive writing condition might have scored worse on pain interference than the participants from the waiting list because they were constantly reminded of the way their pain interferes with their lives. If these participants did not focus enough on accepting their negative emotions and on the positive aspects of their lives, the writing could have led to thinking about the pain even more than before the intervention.

If Expressive writing is considered to be used for pain patients who are depressed, a few recommendations can be made in order to make the treatment as beneficial as possible: Participants should be screened for depression, pain intensity and catastrophizing. Additional material next to the *Pain Catastrophizing Scale* (Damme et al., 2002) and the *Pain Intensity-Numeric Rating Scale* (Krebs et al., 2007) might be necessary to screen more carefully for the last two factors. As chronic pain is a complex and long lasting condition with a variety of consequences such as depression and anxiety (Debono et al., 2013), it should be considered to combine Expressive writing with additional programs. “Living with pain” added extra tasks about emotion regulation, and this could be crucial for patients coping with pain. As catastrophizing appears to be an important factor, extra tasks could concentrate on teaching the patients alternative coping strategies. Those patients with less intense pain and engaging less in catastrophizing might be more receptive to such programs. It should also be considered to use Expressive writing as a supplement to another form of therapy that concentrates more on pain perception and altering behavior, such as Cognitive and Behavioral Therapy (Furnes & Dysvik, 2012) or Acceptance and Commitment Therapy (S. C. Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Expressive writing can easily be performed at home and does not demand a huge amount of time, which makes it easier to combine it with therapeutic sessions or use as a homework task (Baikie & Wilhelm, 2005). The writing tasks could be used before and during the therapy to learn about the patients’ emotions, get insight in their coping style or to supervise their progress. The patients might be able to gain insight themselves through the writing and could then learn to alter their behavior with another form of treatment. An overview of important factors when setting up an Expressive writing intervention for pain patients is given in Table 6.

This study has several limitations. The participants of “Living with pain” were all recruited by advertising the intervention via websites and a newspaper and rated their chronic pain based on an instrument for self-assessment. They were not examined or instructed by a doctor or an expert for chronic pain, so the results were based on their own evaluation. This makes it

more likely that participants were included that differ from participants from clinical settings who were examined by a medical expert. This could have led to results that are not generalizable to other populations of pain patients. Not all participants completed the intervention, as 37% of the Expressive writing condition dropped out. The results might be biased, as this could have changed the characteristics of the group of participants. Also, the participants followed the intervention online, received feedback via the mail and answered the questionnaires online. There was no surveillance to ensure that the participants understood the instructions correctly and followed the intervention the intended way. They could decide not to share important information with their counselor, so the counselor had to control their progress solely based on the shared contents. The counselors might have missed important information necessary to help the participants receiving the best possible result. The counselors were trained in giving feedback online, but they were neither expert on the topic of chronic pain, nor on the topic of Expressive writing. The feedback they gave could have been different for each counselor, and their personal coaching style could have influenced the participants' motivation, satisfaction and overall experience with the intervention. Some of the chosen participants could also have experienced fewer benefits because they did not enjoy the writing or did not know how to express their personal feelings to a stranger. The Expressive writing intervention might not have been intensive enough for pain patients, as it mostly concentrated on writing about emotions and regulating them.

As a conclusion, it can be stated that Expressive writing has so far proved to be beneficial for a variety of problematic conditions (Kelley & Lumley, 1997; Lepore & Greenberg, 2002; Moor et al., 2002; Norman et al., 2004; Spera et al., 1994), but that the results are mixed for chronic pain. The results of this study indicate that Expressive writing is not effective for treating chronic pain and could better be used to treat depressive patients. If setting up an intervention for pain patients that includes Expressive writing, it should be implemented into another form of therapy and not be given on its own. Possible participants should be screened for depression, catastrophizing and pain intensity and those participants scoring too high on the last two concepts should be excluded. These choices might lead to more promising results when treating patients with chronic pain.

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Appendix

Table 6. *Overview of factors worth considering when setting up an Expressive writing treatment for pain patients*

Participants' characteristics	Demographic variables do not seem to be of influence. Preferably chose depressive patients scoring low for catastrophizing. Little insight in emotions and ambivalence could also be important
Characteristics of the pain	Preferably use Expressive writing for patients scoring low for pain intensity. Patients with severe pain symptoms might need a more intensive treatment
Set-up of intervention	Participants should be able to carry out the writing task in a personal and private place. Encourage participants to have set days for the writing task and to structure their own texts
Instructions for the participants	Give clear instructions to ensure all participants understand the task correctly. Let the participants chose the topic, but explain that the writing can lead to negative emotions. Encourage participants to also write about positive emotions and their personal insights
Writing task and additional tasks	Participants should have enough time for the writing task and the chance to relax afterwards. Set aside at least 30 minutes per task. Additional tasks should benefit the writing task. Add tasks about coping with the pain. Encourage participants to summarize what they have learned through the intervention
Counseling style	If choosing for a counselor, ensure that the counselor does not change during intervention. Train the counselor in giving feedback online in case of a web-based intervention

Note. List is based on the results of this study and literature reviews about Expressive writing