Chronic pain patients' perceptions of their future: a verbal fluency task

Adina C. Rusu[a, b*] & Tamar Pincus[b]

[a] Department of Medical Psychology and Medical Sociology, Faculty of Medicine, Ruhr-University of Bochum, Germany

[b] Department of Psychology, Royal Holloway University of London, Egham, TW20 0EX, UK

Original article

Number of pages: 24

Number of tables: 2

Key words: Pain; Depression; Future Cognitions; Future Thinking.

* Correspondence to: Adina C. Rusu, PhD, Department of Medical Psychology and Medical Sociology, Faculty of Medicine, Ruhr-University of Bochum, Germany.

E-mail address: adina.rusu@rub.de

Abstract

Depression is a common feature of chronic pain, but the content of depressed cognitions in groups with chronic pain may be qualitatively different from other depressed groups. Future thinking has been extensively studied in depressed population, however, to our knowledge this is the first study to investigate future thinking, using a verbal fluency task, in chronic pain. This study investigated the content of cognitions about the future, which are postulated to be a key mechanism in the development of clinical depression, but have not been studies in groups with chronic pain. The present study used the Future Thinking Task (FTT) to investigate general future thinking and health-related future thinking in 4 groups of participants: those with pain and concurrent depression, those with pain without depression, those with depression without pain, and healthy control participants. 172 participants generated positive and negative future events, and rated the valence and likelihood of these events. Responses were coded for health-related content by two independent raters. Participants with depression (with and without pain) produced more negative and less positive future events than control participants. Participants with pain (depressed and non-depressed) produced more positive health-related future events than control participants. Participants with depression and pain produced more negative health-related future events than the non-depressed pain group. The findings suggest that participants with pain and depression exhibit a cognitive bias specific to negative aspects of health-related future thinking. This focus facilitates understanding of the relationship between depression and pain processing. The implications for therapeutic interventions are discussed.

1. Introduction

Chronic pain is an important, highly prevalent, and complex problem [13,40,50], which interferes with all aspects of life. It changes not only the way people interact with the external world, but also the way they perceive themselves and their future [18,23,25,26]. This self-perception has been described as a key to understanding distress in chronic pain, which has been conceptualized to stem from an enmeshment between schemas of the self, of ill-health, and of pain [49].

The concept of depression is commonly considered to encompass negative cognition about the self, the world and the future [8,9]. The focus of current cognitions in people with both pain and depression appears to be centred on negative health, rather than more generic negative content [Rusu et al., 2012], when compared with depressed patients without pain and those with pain but no depression.

Conceptions of the future are creative constructions of the human mind. People infer the future by imagining futures that are consistent with their self-knowledge and theories about how the world works [31]. These imaginative conceptions are important, because they define people's goals and guide their behaviour. The self-fulfilling nature of predictions has been well researched [e.g. 22]. In addition to forming scenarios of how the future might unfold, people sometimes create images of possible selves, representations of how they might behave, look, or feel in the future [11,41,42]. Research has shown that people's thoughts about the future influence how they process information [7,21,19].

Models of depression primarily emphasize the role of negative future thinking as a pivotal mechanism which maintains negative mood and influences current goals and behaviours [16]. MacLeod and colleagues have investigated future cognitions using the Future Thinking Task [FTT; 32], which measures the mental accessibility of future positive and negative events. The FTT has been widely used in published research with different disorders [33,37,38]. Relative to control participants, depressed patients show an increase in

negative and reduction in positive expectancies [33] or only a reduction in positive expectancies [39,36]; and produce more negative sentence completions in reference to the future [4,5]. In people with pain, one study has compared those with and without depression to a control group, and manipulated the stimuli to refer to the present or the future. Findings confirmed the predicted bias towards negative words in the depressed pain group, but the effect could not be demonstrated in the future condition [59].

The current study examines future cognitions in four groups using the FTT. Depressed and non-depressed chronic pain patients were compared with clinically depressed participants without pain and a healthy control group. We hypothesised that: (i) all depressed patients, regardless of pain, will generate less positive and more negative future events; (ii) in pain patients there will be an increase in health-related future events compared to the other two groups; and (iii) in depressed pain patients there will be an increase in negative health-related future events compared to non-depressed pain patients and healthy control participants, in line with previous evidence [59].

2. Method

2.1. Design

The design was a between group factor with four levels: participants with pain and depression, participants with pain but without symptoms of depression, participants with depression but without pain, and participants (controls) with neither pain nor depression. The dependent variables, derived from the FTT, were the number of positive and negative future events, and a composite score.

Previous studies with the FTT [39,34] indicate that the FTT generates large effect sizes (ES) for differences between groups with and without depression. A similar magnitude of effect size was observed in an earlier study of chronic pain patients [60]. Sample size calculation using G*Power [18] ($f = 0.4$, $\alpha = 0.05$, $(1- \beta) = 0.80$) resulted in a sample size n =

76 i.e. a minimum of 19 per group. The recruitment strategy employed in the present study gave sample sizes in excess of this value.

Ethical approval for the study was obtained from the University Ethics Committee and relevant National Health Service Local Research Ethics Committee.

2.2. Participants

172 participants were recruited and tested, including 46 with both depression and pain, 41 with pain but no depression, 42 participants with depression but no pain and 40 healthy controls with neither depression nor pain. Inclusion criteria for all groups included that they should be older than 18 years and able to read and write English fluently.

Participants in the clinical pain and depressed groups were recruited from general practice and pain clinics in London, UK. General practitioners and pain clinicians identified and informed patients about the study and handed them invitations to participate. Information is not available on the total number of participants approached by clinicians. Of those who responded to the invitation only 12 did not take part due to difficulties in attending the appointment, and a further two patients were excluded due to language difficulties.

Participants in the healthy control group were recruited through a large population survey [48], which was based on records from several general practices. Control participants were selected by matching for socio-economic status, age and gender, and invited by post to take part in the study. Participants who responded (53% of those invited) were tested in these general practices.

The inclusion criteria for both the depressed and non-depressed pain patients were musculoskeletal pain (e.g., lower back, neck, shoulder etc.) persistent for more than three months, and current and average level of pain intensity over past 3 months of 3 or above on an 11-point numerical rating scale (NRS), where 0 was ‘no pain’ and 10 was ‘extremely painful’ [30]. General practitioners and clinicians excluded pregnant women, patients with ‘red flags’ [65] or progressive disorders such as cancer.

Inclusion criteria for participants with depression were based on; (a) a general practitioner's referral, based on previous psychiatric diagnosis or primary presentation of current and on-going depression, and (b) patients who had been referred to a counselling service for depression. In addition, we verified the depression status for all participants in the clinical groups through a clinical interview carried out by a trained and qualified clinical psychologist using the Structured Clinical Interview for DSM-IV [SCID; 17].

All participants also completed the Hospital Anxiety and Depression Scale [66]. For people with chronic pain, we divided the groups into those we considered depressed and those considered non-depression using this self-report of symptoms. Our decision to use symptom-based approach rather than psychiatric diagnosis was influenced by two recent studies: Rusu et al. [61] demonstrated that symptoms reported on the Hospital Anxiety and Depression Scale (HADS) provided better discriminatory ability to detect disability in people with pain, and concluded that while the psychiatric interview was probably more accurate in detecting psychiatric disorders, the HADS- was more accurate in detecting pain-related distress. The importance of distinguishing between emotional distress and psychiatric disorder were further described by Geraghty et al. [20] in an analysis of over 450 patients with pain attending primary care.

2.3. Measures

In addition to obtaining basic demographic and clinically relevant descriptive data (age, gender, education, main clinical presenting problem), the following measures were obtained. Participants in the healthy control group completed all measures with the exception of the Pain Disability Index (PDI); they were however asked if they currently or regularly experienced pain as part of the inclusion / exclusion criteria.

2.3.1. The Graded Chronic Pain Scale (GCPS) [64]

Pain-related information was derived from the Graded Chronic Pain Scale (GCPS), provides a simple method of grading the severity of chronic or recurrent pain for use in general population surveys and studies of pain patients in primary care settings [64]. The Graded Chronic Pain Scale provides continuous measures of pain intensity ranging from 0-10 (average pain intensity, characteristic pain intensity), interference with activities (disability score), and chronicity (pain days). The items used have been evaluated in a large population survey with a three-year follow-up and in large samples of primary care pain patients. Its prognostic value at three-year follow-up has been reported for a general population sample [62].

2.3.2. Pain Disability Index (PDI) [57,63]

The PDI is a brief 7-item self-report measure of the extent of interference that chronic pain causes to different domains of an individual's life [57,63]. The 7 domains are family, recreation, social activities, occupation, sexual behaviour, self care and life support activities. Each domain is rated on an 11-point scale (0 = no disability, 10 = total disability). There is evidence of good reliability for the PDI and factor analytic studies have reported one and two factor solutions [12].

2.3.3. The Structured Clinical Interview for DSM-IV Axis 1 disorders (SCID) [17]

The SCID [SCID-1 NP; 17] evaluates current and lifetime diagnosis and the current study only evaluated clinically significant depressive symptomatology at the time of interview. Diagnosis was based strictly on *DSM-IV* criteria without reference to past or current treatment. The interviews were conducted by a qualified clinical psychologist with previous experience in using the SCID in patients. The symptoms considered within the diagnostic category of major depression includes (1) depressed mood; (2) loss of pleasure or interest; (3) appetite disturbance; (4) sleep disturbance; (5) loss of energy; (6) psychomotor agitation or retardation; (7) excessive guilt; (8) concentration difficulties; and (9) suicidal ideation. The presence of depressed mood or loss of pleasure, for a period of at least 2 weeks

is essential for diagnosis. *DSM-IV* criteria require an additional 4 symptoms (from 3 to 9) for a diagnosis of major depression.

2.3.4. The Hospital Anxiety and Depression Scale (HADS) [67]

The HADS is a self-report measure that consists of 14 items grouped on two subscales, seven measuring anxiety and seven depression. Ratings are made on four point scales representing the degree of distress during the previous week. Scores of 7 or less on either sub-scale indicates non-case, 8–10 possible case, and 11+ probable case [67]. Both subscales have been shown good reliability and validity when used as a psychological screening tool in hospital settings and are sensitive to changes in patients' emotional state in longitudinal assessments [27]. Severe psychopathological symptoms (guilt, suicidal thought) are not included, improving its acceptability and making the scale more sensitive to mild forms of psychiatric disorders and avoiding the "floor effect" which is frequently observed when psychiatric questionnaires are used with medical patients [27]. The scale also has the advantage of measuring anxiety, which is generally correlated with depression, but often overlooked as a feature of distress in pain patients [1,2]. The HADS has been extensively used in research of cognitive bias in pain patients [52,58]. Although the HADS was not designed as a diagnostic tool, its validity has been tested against psychiatric interviews and the recommended cut-score has performed well, identifying 85% of depressive disorders [32].

2.3.5. Future Thinking Task (FTT) [39]

Participants are required to think of potential future experiences occurring over three different time periods – the next week, including today; the next year; and the next 5 to 10 years. The time periods were presented verbally, one at a time and in the order given above. There were two conditions, participants were either asked to think about future positive experiences, or they were asked to think of future negative experiences. For each of the three time periods in each of the two conditions, participants' were given a time limit of 1 minute to generate as many responses as they could. Participants were instructed to say aloud a brief

description of as many things as possible for each time period and were told to keep trying until the time limit was up. For the positive condition, they were asked to think of positive things in the future – things that they were looking forward to, things that they would enjoy. For negative events, they were asked to think of negative things in the future – things that they were worried about or not looking forward to. Order of presentation of positive and negative conditions was counterbalanced across participants, with each participant receiving both conditions. The items generated by participants were written down by the experimenter. After giving their responses, participants were presented with their responses and asked to rate each one on a) how likely they thought it was to happen and, b) if it did happen, how they would feel at the time, each on a 7 point scale. The likelihood rating scale was anchored by 1 = not at all likely and 7 = extremely likely. To capture the negativity/positivity of the feeling rating, this scale ran from -3 = very negative to +3 = very positive, although the negative scores were later transformed to positive numbers to make them directly comparable with the positive condition scores [39].

INSERT TABLE 1-e about here

Following MacLeod et al. [39], composite measures of positive and negative future thinking were calculated from number of items x mean likelihood ratings for those items x mean value ratings for those items. Finally, scores were collapsed across the three time periods to build a total score of future thinking, as previous research has not found any effects relating to time period [39].

2.3.5.1. Coding

In addition to the original FTT [33], a coding scheme was devised to categorize the positive and negative experiences into health-related future experiences versus non health-related future experiences. This coding scheme draws on the coding rules, which have been developed by Rusu et al. [59]. Health/Pain related future experiences contain either: a.) own pain, illness, accidents, injuries, b.) pain, health and illness of significant others when

explicitly mentioned, c.) expressions of well-being, improvement of health or evaluation of health, such as "feeling good", "feeling better" etc., d.) explicit mention of pain interventions, such as a pain management course. In the absence of explicit mention of attribution to health or pain states, future experiences were coded as non-health (other content). Based on the same principle, all mention of limiting behaviour (e.g. 'I don't ride my bike any more') without explicit health/pain attribution was coded as non-health. Based on these previously established coding rules [see 59], all future experiences were rated according to content (health related content or other content).

As participants generated the valence themselves (positive and negative future experiences), the investigator only checked the appropriateness of the generated future experience to the respective category.

2.4. Procedure

After consenting to the study, participants were informed that the research was about how people think when they have pain. All participants provided information about demographic and clinically relevant descriptive data (gender, age, education level, pain duration, pain severity). To avoid possible priming from the HADS and the PDI, the FTT was always presented first. Two other cognitive paradigms were administered in counterbalanced way, which have been published elsewhere (see [60]). When participants were interviewed on the same day as a treatment appointment, they were interviewed 60-90 minutes prior to this appointment, to avoid any temporary change in their current pain state. The SCID interview was carried out last for the clinical groups.

Coding: The completed responses were independently coded by two researchers using a comprehensive coding manual. Coders were not aware of participant's group assignment. All responses were coded by the first author (AR), and 20% of the data, sampled across the groups, were coded independently by a second researcher (TP).

2.5. Data analysis

The following statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS for Windows; version 16.0). The distribution of each continuous variable was assessed for normality using values of skew and kurtosis. The distribution of each variable was examined separately for each of the four groups (depressed patients; non-depressed pain patients; depressed pain patients and control participants). The variables met criteria for normality unless stated otherwise. Where data met parametric assumptions, parametric tests were used; otherwise equivalent non-parametric tests were applied. The data were screened for statistical outliers. No outliers were identified for this study. One-way analyses of variance (ANOVA), independent *t*-tests (or chi-square tests when appropriate) were conducted to examine differences between the groups on demographic characteristics, pain ratings and questionnaire scores. Mixed design analyses of variance (ANOVA) were computed to test the hypotheses, with subsequent one-way ANOVAs contrasts used to study significant between group differences. Correlations were tested by computing Pearson correlation coefficients were distributions were normal and Kendall's tau-b correlation coefficients as a non-parametric alternative. A *p* value of 0.05 was set as the critical level at or below which the results would be considered statistically significant.

For the main analysis, we grouped participants according to the scores on the HADS depression scale using the cut score of 8 suggested by the authors of the scale. For the two groups with depression, scores on the HADS-D had to be 8 or above [65]. Using this cut score the SCID verified clinical depression in all the non-pain depressed participants, and identified 59% (27/46) of the participants with pain and depression (HADS ≥ 8) as displaying clinical symptoms fitting a diagnosis for clinical depression. Three of the participants with pain defined as non-depressed by the HADS met SCID criteria for depression.

3. Results

3.1. Sample characteristics

Table 1 reports the summary statistics for gender, age, pain, disability and mood variables. No differences were found for gender or age, showing an equal distribution of men and women and a similar mean age within the groups. However more participants in the control group had a degree level education ($X^2_{(18)} = 50.96$, $P < 0.001$). Differences were found between the two pain groups for the average level of pain interference ($t_{(74)} = 2.31$, $P < 0.05$) with the depressed pain participants reporting a higher level of interference than the non-depressed participants. The depressed pain participants reported significantly greater disability on the PDI than the non-depressed pain participants ($t_{(74)} = 2.82$, $P < 0.01$). As expected there were significant between group comparisons for the HADS depression scale ($F_{(3,168)} = 84.63$, $P < 0.001$) and the two depressed groups were also more anxious ($F_{(3,168)} = 40.27$, $P < 0.001$). Additional analyses were carried out to control for possible effects of the different recruitment sites (primary care setting versus pain clinics). Chi-square and *t*-test analyses showed no differences between the recruitment sites with respect to gender, education, age, pain duration, pain intensity or depression scores.

INSERT TABLE 1 about here

3.2. Concordance between coders

Reliability of coding was assessed by inter-rater agreement. All completed responses were coded on two separate domains: health-related content including pain and other content. Intra-class correlations [ICC; 60] were as follows: Health including pain (ICC = 0.99); other content (ICC = 0.99).

3.3 FTT responses

Table 2 shows the summary statistics for the future thinking data. Dependent variables were the mean composite scores of positive/negative future experiences (number of items x mean likelihood ratings for those items x mean value ratings for those items).

INSERT TABLE 2 about here

3.3.1. Positive and negative future thinking

The first aim of this study was to compare the mean composite scores of anticipated future positive and future negative events generated by the four groups. A group (non-depressed pain; depressed pain; depressed; control) x valence (positive/negative) x time (week, year, 5-10 years) mixed model ANOVA was conducted on the composite score based on the number of items x mean likelihood ratings for those items x mean pleasure ratings for those items. There was a significant main effect for valence, $F(1,134) = 127.89$, $p < .001$ and time, $F(2,268) = 3.02$, $p < .044$, but there was no significant main effect for group, $F(3,134) = 0.78$, $p = .507$. There was a significant three-way group x valence x time interaction, $F(6,268) = 4.11$, $p < .001$ and a significant two-way interaction between group and valence, $F(3,134) = 9.78$, $p < .001$, indicating group differences in the generation of positive or negative future experiences. To further understand the nature of these significant interactions, one-way ANOVAs with *a priori* comparison tests were conducted on the positive and negative conditions separately.

Mean composite scores of positive future experiences

In order to test the hypothesis that the depressed pain group and the depressed group without pain would generate less positive future experiences compared to the control group, a one-way ANOVA on the total number of positive future experiences was performed. As significant differences were observed between the groups further *a priori* comparison tests were conducted to explore between group differences. The control group scored higher on composite scores of positive future events, $F(3,170) = 4.10$, $p = .008$. Participants in the control condition generated significantly more positive responses than the depressed pain group ($p = .061$) and the depressed group without pain ($p = .011$). No significant differences were observed between healthy control participants and the non-depressed pain participants.

Mean composite scores of negative future experiences

In order to test the hypotheses that the depressed pain patients group and the depressed group without pain would generate more negative future experiences compared to the control

group, a one-way ANOVA on the total number of negative future experiences was performed. Both groups with depressive symptomatology, namely the depressed pain group and the depressed group without pain scored higher on composite scores of negative future events compared to the control participants, $F(3,170) = 6.17$, $p = .001$. *A priori* comparison tests showed that both depressed pain patients ($p = .006$) and depressed patients without pain ($p = .006$) scored significantly higher than the non-depressed pain group and the control group.

3.3.2. Health-related positive and negative future thinking

The second aim of the current study was to investigate differences between the four groups on health-related items generated on the FTT. Analyses were conducted on the positive and negative future events of the FTT. Table 2 shows the mean composite scores of health-related items generated by the four groups for the positive and the negative condition.

A group (non-depressed pain; depressed pain; depressed; control) x valence (positive/negative) x time (week, year, 5-10 years) mixed model ANOVA was conducted on the composite scores based on the number of health-related items x mean likelihood ratings for those items x mean pleasure ratings for those items. There was a significant main effect for group, $F(3,143) = 5.24$, $p < .002$, valence, $F(1,143) = 30.12$, $p < .001$ and time, $F(2,286) = 23.43$, $p < .001$. Moreover, there was a significant two-way interaction between group and valence, $F(3,143) = 3.40$, $p = .020$. To further understand the nature of these significant interactions, one-way ANOVAs with *a priori* comparison tests were conducted on the positive and negative conditions separately.

Mean composite scores of positive health-related future experiences

We hypothesised that in depressed pain and non-depressed pain patients there will be an increase in health-related future events compared to the other two groups. This hypothesis was confirmed, as both pain groups, depressed pain ($p = .040$) and non-depressed pain ($p = .001$), scored significantly higher on the composite score of positive future thinking compared to the control participants, $F(3,170) = 5.45$, $p = .001$.

Mean composite scores of negative health-related future experiences

We hypothesised that in depressed pain patients there will be an increase in negative health-related future events compared to the non-depressed pain patients and control participants. Analyses confirmed this hypothesis, as results revealed significant group differences, $F(3,170) = 4.28$, $p = .006$. Depressed pain patients scored significantly higher on the composite score of negative health-related future thinking compared to non-depressed pain patients ($p = .006$) and control participants ($p = .007$).

4. Discussion

4.1 Main findings

The specific purpose of this study was to investigate how patients with chronic pain think about their future in terms of anticipation of future positive and negative events. Additionally, the current study offers the rare possibility of comparing depressed pain patients with depressed patients without pain, which has been a critique of existing studies [49,44]. The current findings that depressed pain patients and depressed patients without pain showed a reduced number of positive future experiences, replicates and extends research by MacLeod and colleagues, which was based on depressed but physically healthy participants [e.g. 38,15]. Both depressed groups generated significantly more negative future thinking and fewer positive future thinking completions compared to the non-depressed pain group and the control participants. This result is in line with a series of previous studies, which were able to show consistently that depressed individuals show both an increase in negative and a reduction in positive future thinking [33] or only a reduction in positive future thinking [38]. These results suggest that in terms of prospective cognitions, depression in the context of chronic pain may be similar to depression in the physically healthy.

The depressed pain group showed significantly more negative future experiences compared with the non-depressed pain group. There were no differences between the pain

groups on pain severity and pain duration. This finding provides evidence for the importance of personal beliefs and the subjective meanings an individual attaches to an event [6,45]. This conclusion is also supported by the finding that the non-depressed pain group and healthy control group could not be differentiated on either the positive or negative conditions of the FTT. People with chronic pain who are not depressed seem to anticipate their future, as measured by the FTT, in the same way as people who do not have a chronic disease. Further research could explore the psychological processes underpinning this finding specifically in terms of acceptance and adaptation to chronic pain.

We found a high rate of positive health-related future thinking in both pain groups, in contrast to Moore and colleagues [44], who examined negative future thinking related to multiple sclerosis (MS). This high percentage of positive health-related prospective cognitions in chronic pain might play a key role in their future thinking. This finding supports the argument that pain-related distress is qualitatively different from clinical depression, and a framework for understanding it better is needed. The increased number of positive health-related future experiences in depressed pain patients, which seems to be counter-intuitive, might be interpreted as a misdirected problem solving attempt. Prospective cognitions, such as *'Next week I will be better and I will have less pain'* might be interpreted in light of the increased tendency of depressed pain patients to believe that strategies of pain control with the aim of pain reduction or pain elimination will improve in the short-term future, although this might be unrealistic. In light of the self-pain enmeshment theory [49], which proposes the enmeshment of self, pain and illness schemas, it is likely that depressed pain patients generate more positive health-related responses compared to the control group, indicating a general focus on health. Pincus et al. [54], found in their qualitative study of practitioners who were treating chronic pain patients that clinicians perceived chronic pain patients to be 'hopeful' in the sense that 'someone or something' might resolve their pain problem, that 'they have just not found the right treatment for the elimination of pain' or hoping that 'future attempts to

control pain will be more successful'. It has been suggested that such a biased, future-related expectation might undermine the understanding that pain reduction in the long-term is in most cases not achievable [10,43,47,46]. Unrealistic expectations about treatment outcomes from clinicians and chronic pain patients might lead to potential conflicts and result in overtreatment or under-treatment, failure to refer appropriately, and failure to apply clinical guidelines [54,55]. Nonetheless, a balance is needed between realistic expectations and positive outlook: Grotle et al. [24] showed in a prospective cohort study that optimistic outlook was linked to better outcomes for acute and chronic low back pain in primary care.

4.2. Implications for clinical practice and research

There is an increasing recognition of the importance of positive states in clinical practice and research. MacLeod and Moore [35] have described how positive and negative thinking are intuitively seen as opposite ends of a single continuum. The general idea is therefore that if therapy is aimed at reducing negative thinking, then it will, in effect, also increase positive thinking. There is now substantial evidence that these cognitions are best thought of as reflecting the operation of two separate systems [29]. The current findings support the notion of positive and negative aspects of experience as independent systems. MacLeod and Moore [35] recommend a two-dimensional approach to mental health, by incorporating strategies to work on increasing positive as well as decreasing negative states. Huppert and Whittington [30] also emphasize the relevance of including measures of positive well-being in studies of health outcomes and quality of life, while Pincus et al. [53,51,59] recommend the assessment of positive outlook specifically for the field of chronic pain. A clinical implication of these findings might be that with an enlarged insight of the temporal dynamic and the importance of interactive and social factors in shaping positive possible selves, health professionals can contribute more effectively in assisting chronic pain patients towards health-promoting goals and a concomitantly higher quality of life.

4.3. Strengths and limitations

Future studies could also study an additional group of pain patients, who are high on anxiety and pain-related fear. Previous studies have shown that anxious participants show, compared to controls, an increase in negative expectancies but no decrease in positive expectancies, whereas depressed participants show both an increase in negative and a reduction in positive expectancies or only a reduction in positive expectancies [e.g. 38]. These results confirm the conceptual model proposed by Clark & Watson [14] that anxiety and depression are both characterised by high negative affect, while depression also has a specific element of low positive affect. Following this, it might be useful to study differential effects of patient subgroups on future thinking by a group of depressed pain patients (without anxiety), a group of anxious pain patients (without depression) and healthy controls participants.

There are a number of limitations to this study. This study was based on a mixed sample, including patients from pain clinics and primary care patients. The proportion of women in the sample was higher than expected. Together, these factors limit generalisability of the findings. Additionally, at present it is not possible to answer the question of the meaning and importance of positive and negative health-related future thinking in depressed pain patients with the current research design. Prospective longitudinal studies would be the appropriate means to understanding whether positive and negative health-related prospective cognitions play an adaptive or maladaptive role in the development of pain. The final limitation relates to the measure. Although there was a significant level of agreement between raters on the dimensions used, future studies of this kind should ensure that coding is obtained for health (excluding pain) and pain itself.

4.4. Conclusions

In conclusion, this study has demonstrated that the future thoughts of depressed chronic pain patients can be characterized by a reduced anticipation of positive future experiences together with an increased anticipation of negative future experiences relative to

non-depressed pain patients and controls. This replicates previous findings using clinically depressed participants [38], which suggests that the cognitive processing of future thinking in depression is not different in the context of chronic pain. The current study also found some support that increased psychological well-being is associated with an ability to maintain aspects of the self, which were not related to chronic pain. This notion was supported by the fact that the depressed pain group generated more negative health-related future experiences compared to non-depressed pain patients and control participants. Psychological models of depression and anxiety have long recognized the important role of future cognitions in emotional disorder, and the ways in which people with chronic pain think about their future is an interesting area for further study.

Conflict of interest statement

The authors report no conflict of interest.

Acknowledgements

The first author was supported by a postgraduate scholarship by the Friedrich-Ebert Foundation, Germany and a research grant by the Research Committee of the University of Bochum. TP and AR received a research grant from Back Care, UK. There are no conflicts of interest.

References

[1] Asmundson GJ, Katz J. Understanding the co-occurrence of anxiety disorders and chronic pain: state –of-the-art. Depress Anxiety 2009; 26:888-901.

[2] Bailey KM, Carleton RN, Vlaeyen JW, Asmundson GJ. Treatments addressing pain-related fear and anxiety in patients with chronic musculoskeletal pain: a preliminary review. Cogn Behav Ther 2010; 39:46-63.

[3] Banks SM, Kerns RD. Explaining high rates of depression in chronic pain: A diathesis stress framework. Psychol Bull 1996; 199:95-110.

[4] Barton SB, Morley S. Specificity of reference patterns in depressive thinking: agency and object roles in self-representation. J Abnorm Psychol 1999; 108(4):655-661.

[5] Barton SB, Morley S, Bloxham G, Kitson C, Platts S. Sentence completion test for depression (SCD): An idiographic measure of depressive thinking. Br J Clin Psychol 2005; 44(1):29-46.

[6] Bates A, Burns DD, Moorey S. Medical illness and the acceptance of suffering. Int J Psychiatry Med 1989; 19(3):269-280.

[7] Baumeister RF, Newman LS. How stories make sense of personal experiences: Motives that shape autobiographical narratives. Pers Soc Psychol B 1994; 20 (6):676-690.

[8] Beck AT, Weissman A, Lester D, Trexler L. The measurement of pessimism: The hopelessness scale. J Consult Clin Psychol 1974; 42:861-865.

[9] Beck AT, Rush AJ, Shaw BF, Emery G. Cognitive Therapy for Depression. New York: Guilford, 1979.

[10] Breen A, Austin H, Campion-Smith C, Carr E, Mann E. "You feel so hopeless": A qualitative study of GP management of acute back pain. Eur J Pain 2007; 11:21-29.

[11] Cantor N, Markus HR, Niedenthal P, Nurius P. On motivation and the self concept. In: Sorrentino RM & Higgins ET (Eds.), Handbook of motivation and cognition: Foundations of social behavior. New York: Guilford Press, 1986. pp. 96-121.

[12] Chibnall JT, Tait RC. The pain disability index: factor structure and normative data. Arch Phys Med Rehabil 1994; 75:1082-6.

[13] Chou R, Huffman L. Medications for acute and chronic low back pain: a review of the evidence for an American Pain Society/American College of Physicians clinical practice guideline. Ann Intern Med 2007;147:505–10.

[14] Clark LA, Watson D. Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. Journal of Abnormal Psychology 1991; 100:316-336.

[15] Conaghan S, Davidson KM. Hopelessness and the anticipation of positive and negative future experiences in older parasuicidal adults. Br J Clin Psychol 2002; 41:233-242.

[16] Disner SG, Beevers C, Haigh EA, Beck AT. Neural mechanisms of the cognitive model of depression. Nature Reviews Neuroscience 2011; 12:467-477.

[17] Faul F, Erdfelder E, Lang A.-G, Buchner A. G*Power 3: A flexible statistical power analysis for the social, behavioral, and biomedical sciences. Behavior Research Methods 2007; 39:175-191.

[18] First MB, Spitzer RL, Gibbon M, Williams JBW. Structured Clinical Interview for DSM-IV-TR Axis I Disorder, Research Version, Non-Patient Edition (SCID-I/P). New York: Biometrics Research, New York State Psychiatric Institute; 2002.

[19] Froud R, Patterson S, Eldridge, S, Seale C, Pincus T, Rajendran D, Fossum C, Underwood M. A systematic review and meta-synthesis of the impact of low back pain on people's lives. BMC Musculoskeletal Disorders 2014; 15:50.

[20] Geraghty AW, Stanford R, Little P, Roberts L, Foster NE, Hill E, Stuart B, Turner D, Yardley L. Using an internet intervention to support self-management of low back pain in primary care: protocol for a randomised controlled feasibility trial (SupportBack). BMJ Open 2015; 5(9):e009524.

[21] Gollwitzer PM. The volitional benefits of planning. In: Gollwitzer PM & Bargh JA (Eds.). The psychology of action: Linking cognition and motivation to behavior. New York: Guilford Press; 1996. pp. 287-312.

[22] Gollwitzer PM, Heckhausen H, Steller B. Deliberative and implemental mind-sets: Cognitive tuning toward congruous thoughts and information. J Pers Soc Psychol 1990; 59:1119-1127.

[23] Greenwald AG, Carnot CG, Beach R, Young B. Increasing voting behaviour by asking people if they expect to vote. J Appl Psychol 1987; 72:315-318.

[24] Grotle PT, Foster NE, Dunn KM, Croft P. Are prognostic indicators for poor outcome different for acute and chronic low back pain consulters in primary care? Pain 2010; 151(3): 790-797.

[25] Hellström C. Temporal dimensions of the self-concept: entrapped and possible selves in chronic pain. Psychol Health 2001; 16:111–124.

[26] Hellström C, Carlsson SG. The long-lasting now: Disorganisation in subjective time in long-standing pain. Scand J Psychol 1996; 37:416-423.

[27] Hellström C, Carlsson SG. Busy with pain: Disorganisation in subjective time in experimental pain. Eur J Pain 1997; 1:133-139.

[28] Herrmann C. International experiences with the hospital anxiety and depression scale – a review of validation data and clinical results. J Psychosom Res 1997; 42:17–41.

[29] Huppert FA, Whittington E. Evidence for the independence of positive and negative well-being: Implications for quality of life assessment. Brit J Health Psych 2003; 8:107-122.

[30] Ito TA, Cacciopo JT. Representations of the contours of positive human health. Psychol Inq 1998; 9:43-48.

[31] Jensen MP, Karoly P, Braver S. The measurement of clinical pain intensity: a comparison of six methods. Pain 1986; 27:117-126.

[32] Johnson MK, Sherman SJ. Constructing and reconstructing the past and the future in the present. In: Higgins ET & Sorrentino RM (Eds.), Handbook of motivation and social cognition: Foundations of social behaviour, Vol. 2. New York: Guilford Press, 1990. pp. 482-526.

[33] Lowe B, Spitzer RL, Grafe K, Kroenke K, Quenter A, Zipfel S, Buchholz C, Witte, S. & Herzog W. Comparative validity of three screening questionnaires for DSM-IV depressive disorders and physicians' diagnoses. J Affect Disord 2004; 78:131-140.

[34] MacLeod AK, Byrne A. Anxiety, depression and the anticipation of future positive and negative experiences. J Abnorm Psychol 1996; 105(2):286-289.

[35] MacLeod AK, Cropley ML. Depressive future thinking: the role of valence and specificity. Cognitive Ther Res 1995; 19:35–50.

[36] MacLeod AK, Moore R. Positive Thinking Revisited: Positive Cognitions, Well-being and Mental Health. Clin Psychol Psychot 2000; 7:1-10.

[37] MacLeod AK, Salaminiou E. Reduced positive future thinking in depression: cognitive and affective factors. Cognition Emotion 2001; 15:99–107.

[38] MacLeod AK, Pankhania B, Lee M, Mitchell D. Parasuicide, depression and the anticipation of positive and negative future experiences. Psychol Med 1997; 27:973-977.

[39] MacLeod AK, Tata P, Kentish J, Jacobsen A. Retrospective and prospective cognitions in anxiety and depression. Cognition Emotion 1997; 11(4):467-479.

[40] MacLeod AK, Tata P, Evans K, Tyrer P, Schmidt U, Davidson, K, Thornton S, Catalan J. Recovery of positive future-thinking with a high-risk parasuicide group: Results from a pilot randomised controlled trial. Br J Clin Psychol 1998; 37:371-379.

[41] Mallen CD, Peat G, Thomas E, Dunn KM, Croft PR. Prognostic factors for musculoskeletal pain in primary care: a systematic review. Br J Gen Pract 2007; 57:655-661.

[42] Markus H., Nurius P. Possible selves. Am Psychol 1986; 41:954-969.

[43] McCracken LM, Morley S. The psychological flexibility model: a basis for integration and progress in psychological approaches to chronic pain management. J Pain 2014; 15:221-234.

[44] McCracken LM, Spertus IL, Janeck AS, Sinclair D, Wetzel FT. Behavioral dimensions of adjustment in persons with chronic pain: pain-related anxiety and acceptance. Pain 1999; 80:283-289.

[45] Moore AC, MacLeod AK, Barnes D, Langdon D. Future-directed thinking and depression in relapsing-remitting multiple sclerosis. Brit J Health Psych 2006; 11:663-675.

[46] Moorey S. When bad things happen to rational people: Cognitive therapy in adverse life circumstances. In: Salkovskis PM (Ed.), Frontiers of cognitive therapy. London: Guilford Press, 1993. pp. 450-469.

[47] Morley S, Davies C, Barton S. Possible selves in chronic pain: self-pain enmeshment, adjustment and acceptance. Pain 2005; 115:84–94.

[48] Nicholas M, Molloy A, Tonkin L, Beeston L. Manage your pain: practical and positive ways of adapting to chronic pain. Souvenir Press, 2003.

[49] Parsons S, Carnes D, Pincus T, Foster N, Breen A, Vogel S, Underwood M. Measuring troublesomeness of chronic pain by location. BMC Musculoskelet Disord 2006; 7:34.

[50] Pincus T, Morley S. Cognitive-processing bias in chronic pain: a review and integration. Psychol Bull 2001; 127:599–627.

[51] Pincus T, Santos R, Morley S. Depressed cognitions in chronic pain patients are focused on health: Evidence from a sentence completion task. Pain 2007; 130:84-92.

[52] Pincus T, Rusu A, Santos R. Responsiveness and construct validity of the Depression, Anxiety and Positive Outlook Scale (DAPOS). Clin J Pain 2008; 24:431-437.

[53] Pincus T, Griffith J, Pearce S, Isenberg D. Prevalence of self-reported depression in patients with rheumatoid arthritis. Br J Rheumatol 1996; 35:879–883.

[54] Pincus T, Vogel S, Williams ACdeC, Field A. The development and testing of the Depression, Anxiety, and Positive Outlook Scale (DAPOS). Pain 2004; 109(1-2):181-188.

[55] Pincus T, Vogel S, Breen A, Foster N, Underwood M. Persistent back pain – why do physical therapy clinicians continue treatment? A mixed methods study of chiropractors, osteopaths and physiotherapists. Eur J Pain 2006; 10:67-76.

[56] Pincus T, Vogel S, Burton A K, Santos R, Field AP. Fear Avoidance and Prognosis in Back Pain: A Systematic Review and Synthesis of Current Evidence. Arthritis Rheum 2006; 54(12):3999–4010.

[57] Pincus T, Vogel S, Santos R, Breen A, Foster N, Underwood M. The Attitudes to Back Pain Scale in Musculoskeletal Practitioners (ABS-mp): The Development and Testing of a New Questionnaire. Clin J Pain 2006; 22:378-386.

[58] Pollard CA. Preliminary validity study of the pain disability index. Percept Mot Skills 1984; 59:974.

[59] Read J, Pincus T. Cognitive bias in back pain patients attending osteopathy: testing the enmeshment model in reference to future thinking. Eur J Pain 2004; 8:525-531.

[60] Rusu AC, Pincus T, Morley. Depressed pain patients differ from other depressed groups: Examination of cognitive content in a sentence completion task. Pain 2012; 153:1898-1904.

[61] Rusu, A. C., Santos, R., Pincus, T. Pain related distress and clinical depression in chronic pain: A comparison between two measures. Scand J Pain (2016) 12, 62-67.

[62] Shrout PE, Fleiss JL. Intraclass correlations: Uses in assessing rater reliability. Psychol Bull 1979; 86:420–428.

[63] Tait RC, Chibnall JT, Krause S. The pain disability index: psychometric properties. Pain 1990; 40:171–182.

[64] Tait RC, Pollard CA, Margolis RB, Duckro PN, Krause SJ. The Pain Disability Index: Psychometric and validity data. Arch Phys Med Rehabil 1987; 68:438–441.

[65] Von Korff M, Ormel J, Keefe F, Dworkin SF. Grading the severity of chronic pain. Pain 1992; 50:133-149.

[66] Waddell G. The Back Pain Revolution. Edinburgh: Churchill Livingstone: 1998.

[67] Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983; 67:361–370.

Table e-1.

Examples of FTT responses and classifications

No.	Next week: Positive events	Health Related	Likeli-hood	Emotional valence
1.	*I am doing my pain management course.*	1	7	+3
2.	*I am looking forward to go at home – see my family at weekend.*	0	7	+3
No.	Next week: Negative events	Health Related	Likeli-hood	Emotional valence
1.	*To be in pain – if pain levels go higher.*	1	5	-1
2.	*Might fail to relief the pain, might fail the pain management course.*	1	3	-3
3.	*I might have a crap weekend because I am in pain.*	1	6	-1
4.	*Upsetting my family because I am in pain.*	1	7	-3

No.	Next year: Positive events	Health Related	Likeli-hood	Emotional valence
1.	*Go on holiday with my family.*	0	4	+3
2.	*Getting my degree in safety management.*	0	7	+3
3.	*Be physically in a better condition.*	1	4	+3
No.	Next year: Negative events	Health Related	Likeli-hood	Emotional valence
1.	*Being in hospital again.*	1	7	-3
2.	*Have an attack of pain at work.*	1	5	-1
3.	*Failing to go on holiday.*	0	6	-3
4.	*Losing my job because of illness.*	1	7	-3
5.	*Being physically disabled.*	1	5	-3

No.	Next 5-10 years: Positive events	Health Related	Likeli-hood	Emotional valence
1.	*Getting my degree – definitely.*	0	7	+3

2.	*Seeing my wife better, she suffers from depression.*	1	4	+3
3.	*Enjoying outdoors again: climbing, hill walking …*	0	3	+3
No.	Next 5-10 years: Negative events	Health Related	Likeli-hood	Emotional valence
1.	*My pain gets worse.*	1	7	0
2.	*Lose my job.*	0	4	-3
3.	*More time in hospital.*	1	7	-1
4.	*Being physically unable to do anything.*	1	7	-3
5.	*My wife getting worse.*	1	4	-3

Note. Likelihood ranges from 1 to 7; emotional valence from -3 to +3.

Table 1.

Summary statistics for participants

	No Pain		Pain	
	Healthy controls (n = 42)	Depressed (n =41)	Not depressed (n = 40)	Depressed (n = 47)
Gender N (male/female)	18/24	12/29	9/31	17/30
Age	48.12 (14.53)	43.24 (11.89)	48.13 (16.15)	43.11 (11.35)
Education (No degree/degree)	5/26	14/6	13/9	11/10
Present pain intensity	-	-	4.88 (2.09)	5.55 (2.02)
Average pain intensity over past week	-	-	5.18 (2.16)	6.23 (1.80)
Worst pain intensity in past 6 months	-	-	8.28 (1.72)	9.13 (1.35)
Pain interference	-	-	5.80 (2.63)	7.15 (1.99)
Pain duration (months)	-	-	83.25 (84.76)	81.38 (104.18)
Disability (PDI)	-	-	23.83 (14.46)	39.79 (13.47)
HADS Anxiety	5.29 (3.20)	13.32 (4.10)	7.73 (3.80)	11.40 (3.77)
HADS Depression	2.31 (2.01)	10.51 (4.24)	4.30 (1.98)	10.57 (3.37)

PDI, Pain Disability Index; HADS, Hospital Anxiety and Depression Scale.

[a] Gender and education are frequency data. Mean (standard deviation) is provided for all other measures.

Table 2. Mean scores of future events by group, condition and health-related future events [a]

Characteristic	No Pain		Pain				
	Healthy Controls *n* =42	Depressed *n* = 41	Not depressed *n* = 40	Depressed *n* = 47	*p* Value	Confidence intervals (95%) lower	Confidence intervals (95%) upper
Future Thinking (FT)							
Positive FT comp. [b]	201.29 (77.19)	145.40 (47.08)	181.14 (75.18)	158.43 (78.59)	0.000	177.68	224.91
Negative FT comp.	88.07 (38.21)	117.62 (62.14)	78.85 (26.48)	114.61 (49.39)	0.000	72.96	103.17
Health-related FT							
Positive Health comp.	9.75 (19.21)	18.74 (21.28)	28.61 (26.10)	22.41 (17.41)	0.000	3.18	16.33
Negative Health comp.	26.91 (20.09)	32.63 (26.00)	31.24 (24.11)	47.74 (37.01)	0.000	17.64	36.19

[a] Data are presented as mean (standard deviation).
[b] Composite score = mean composite score represents the mean number x likelihood x valence summed over all three time periods.