Background and purpose: Depression is a frequent co-morbid diagnosis in chronic pain, and has been shown to predict poor outcome. Several reviews have described the difficulty in accurate and appropriate measurement of depression in pain patients, and have proposed a distinction between pain-related distress and clinical depression. Aims of the current study were to compare a) the overlap and differential categorisation of pain patients as depressed, and b) the relationship to disability between the Structured Interview for DSM-IV (SCID-Depression module) and the Hospital Anxiety and Depression Scale (HADS-D).

Methods: Seventy-eight chronic back pain patients were administered the SCID-D, the HADS-D and the Pain Disability Index (PDI).

Results: Significantly more patients were categorised with possible and probable depression by the HADS than the SCID-D. Results from Receiver Operating Characteristic (ROC) curve analysis suggested that the HADS-D provided better discriminatory ability to detect disability, demonstrating a better balance between sensitivity and specificity compared to the SCID-D, although a direct comparison between the two measurements showed no difference.

Conclusions: The HADS-D is a reasonably accurate indicator of pain-related distress in chronic pain patients, and captures the link between disability and mood.

Implications: It is likely that the SCID-D is better suited to identifying sub-groups with more pronounced psychiatric disturbance.
Manuscript: Pain-related distress and clinical depression in chronic pain: A comparison between two measures

Authors: Adina C. Rusu, Rita Santos & Tamar Pincus

Reviewers' comments:
Reviewer #1: "The authors presented a highly important manuscript with an interesting design. The study investigated if pain-related affective distress or depression as psychiatric diagnosis is relevant for chronic pain. The introduction was very good and understandable formulated. The hypothesis based on a theoretical approach. The method was well described, the results very important and the discussion convincing. The reviewer wants to express her appreciation. Great job!"
Authors response: Thank you very much for these positive comments!

Reviewer #2: This manuscript addresses a theoretical and psychometric issue regarding how depression may best be measured in patients suffering pain. The paper points out in the introduction that while depression is a common and seemingly important co-occurring problem for patients with pain disorders, there are problems in measuring depression. At the base is the issue of whether depression as seen from a psychiatric perspective is the same as "low mood" or depression (distress) in patients suffering pain. The authors argue convincingly that the two probably differ in some significant ways. Thus, the theoretical background is intriguing and important. However, the aim and methods have some significant difficulties in matching the ambitious introduction. The conclusions also appear to go a bit beyond the data. This is a difficult area to research and many other studies also suffer from methodological shortcomings due to measurement issues. Nevertheless, there are some substantial issues that concern this paper.
The stated aim of the paper is to test how different measures of depression perform in relation to two different theoretical models of depression in patients with pain. While this is noble, I had difficulty understanding how the two measures selected qualified as representing the models.
Authors response: It was not aimed to directly test two different models of depression, although we understand this interpretation of the reviewer. We included a statement to the introduction and discussion that this point was formulated more precisely, as stated on page 5 and page 14.
In addition, at least in this country, the SCID is rarely employed in pain settings. Further, although the two measures can be compared, I am not convinced that they actually represent a good "test of the theory" as there are many other ways to interpret the data. In other words, I struggled to see how this comparison was a crisp test of the theoretical models as is stated in the introduction and discussion.

Authors response: We agree with the reviewer that there are multiple ways to interpret the present findings. We included a statement to the limitations section on page 15.

In order to evaluate the two measures of depression they are pitted against self-reports of function on the PDI. This raises the issue of what the measures should be compared against. The authors have chosen a self-report measure of general function. This is understandable. However, because both depression and pain are related to decreases in function (activity levels), the interpretation becomes more complex. When we use the HADS or the SCID in the clinic, it is to assess mood rather than to predict function since an assessment of such a pain problem would include ample evaluations of function. Consequently, I found it difficult to know how to interpret the results. Moreover, the results indicate that there is no significant difference between the measures in the ROC analyses.

Authors response: Thank you for raising our attention to this point. We agree that there are no significant differences between the two measures in the ROC analyses, when the SCID and the HADS were tested against each other, however, the results of the ROC analyses indicate that the HADS-D provided a better balance between sensitivity and specificity compared to the SCID-D, which might be an interesting results in need for further replication. We have noted this as a limitation of this study on page 16.

A general problem is the cross-sectional nature of the study. I realize that this is a first study; still a longitudinal data set would provide a time line and eliminate some threats to the validity of the study such as response bias (all measures are self-report).

Authors response: We have noted this as a general limitation of the study on page 16.

Taken together, I am afraid that the current study does not clearer show how it makes a contribution to the field and the recommendations appear to be premature.

Authors response: We acknowledge the statement of the reviewer and included a statement to the discussion on page 16 that this study might represent a first study towards a more comprehensive understanding of comorbid depression in the context of chronic pain.
Reviewer #3: The authors set out to investigate an intriguing issue, namely the nature of comorbid depression in chronic pain patients, and how two established measures of depression relate to pain-related disability. Their underlying hypothesis views comorbid depression in chronic pain patients more as pain-related distress than psychiatric depression. They therefore use pain-related disability as the gold standard in the ROC analyses where the two tests of depression are compared.

Although the methods and design of the study are not sufficient to shed completely light on the nature of comorbid depression in chronic pain patients, the paper provides a first step by demonstrating how HADS is more closely related to pain-related disability than the more established psychiatric interview, SCID. This is somewhat surprising - one would expect a clinical diagnosis of depression to be associated with more disability than the less conservative measure HADS - and could be interpreted as support for the authors hypothesis of pain-distress being something different than depression. I do, however, miss a more thorough and critical discussion of the study findings and what they imply. The authors should be careful about not overselling the study findings, but rather clearly presenting how they represent a first step towards a more comprehensive understanding of comorbid depression in chronic pain patients.

Authors response: We have revised the discussion section in order to enrich the critical discussion (on page 16, also please see below).

The remaining question, as the authors themselves state, is whether pain-distress and depression really are distinct concepts, or whether they exist along the same dimension. The current paper can not answer this question, but points to future avenues to explore, such as qualitative studies where the chronic pain patients are asked themselves about the nature of their distress. Here, the authors could look to closely related patient populations where such studies have been done, in order to strengthen the rationale for this approach.

Authors response: Thank you for raising our attention to this interesting point. We conducted a literature search on qualitative studies in the area of depression in the context of chronic pain, but could not find a single study in this area. We therefore, included the reference of an upcoming manuscript from our research group, which is currently in preparation (Rusu et al., in prep.; see page 17) and have included a statement that currently there are no research studies available which have used qualitative methodology in order to investigate the content of co-morbid depression in the context of chronic pain.
Additionally, we selected five articles, which used qualitative methodology in a very broad sense in the context of chronic pain, but decided to not include the majority of them to the current discussion as there is a lacking the relationship to co-morbid depression or depressed symptomatology in the context of chronic pain. There was a direct link to our area of research in one qualitative study, which was nested within a RCT trial (Hopton et al., 2014) and was included to the discussion section of the present manuscript. The references are the following:


4. Van Wijngaarden, E, Leget C & Goossensen, A. Ready to give up on life: The lived experience of elderly people who feel life is completed and no longer worth living. Social Science & Medicine, 2015, 138: 257-264.


If the reviewers should advise us to include a short statement with regard to these studies, we are willing to include them to the discussion section of the manuscript.

Finally, we would like to thank the reviewers and the editor for the opportunity to revise the current manuscript in light of their helpful comments.
Paper: **Pain-related distress and clinical depression in chronic pain: A comparison between two measures**

Authors: Adina C. Rusu, Rita Santos & Tamar Pincus

Bullet points Revision I:

**Abstract:** The abstract has been structured according to the guidelines of the Scandinavian Journal of Pain.

**Discussion:** The following points have been included to the discussion section.

- However, it should be noted that it was not aimed to directly test different models of depression against each other. In order to test hypotheses linked to different models of depression, future prospective studies with reliable and valid measures of possible predictors are needed.

- This notion is in line with actual changes in the classification of pain disorders in the DSM-5 classification of disorders, which regards chronic pain no longer as a psychiatric disorder, but highlights the importance of the interaction between pain and pain-related distress and secondary mood changes as consequence of having a chronic pain condition.

- With regard to the limitations of the study,....

- Finally, due to the cross-sectional design of the current study, we would like to highlight that the present results might represent a first step towards a more comprehensive understanding of co-morbid depression in the context of chronic pain and longitudinal studies are warranted.

- We believe that a promising new area of research is to employ qualitative analyses to the responses of depressed chronic back patients to the SCID interview in contrast to clinically depressed patients in order to enhance our understanding of content specificity. 30

- Apart from one qualitative study, there are at present no studies available which investigated with qualitative methodology the area of com-morbid depression in the context of chronic pain, which currently represents a neglected area of study.
Pain-related distress and clinical depression in chronic pain: A comparison between two measures

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Original article
Number of pages: 20
Number of figures: 1
Number of tables: 3

Short running title: Pain-related distress and clinical depression in chronic pain

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Abstract

Depression is a frequent co-morbid diagnosis in chronic pain, and has been shown to predict poor outcome. Several reviews have described the difficulty in accurate and appropriate measurement of depression in pain patients, and have proposed a distinction between pain-related distress and clinical depression. Aims of the current study were to compare a) the overlap and differential categorisation of pain patients as depressed, and b) the relationship to disability between the Structured Interview for DSM-IV (SCID-Depression module) and the Hospital Anxiety and Depression Scale (HADS-D). Seventy-eight chronic back pain patients were administered the SCID-D, the HADS-D and the Pain Disability Index (PDI). Significantly more patients were categorised with possible and probable depression by the HADS than the SCID-D. Results from Receiver Operating Characteristic (ROC) curve analysis suggested that the HADS-D provided better discriminatory ability to detect disability, demonstrating a better balance between sensitivity and specificity compared to the SCID-D, although a direct comparison between the two measurements showed no difference. The HADS-D is a reasonably accurate indicator of pain-related distress in chronic pain patients, and captures the link between disability and mood. It is likely that the SCID-D is better suited to identifying sub-groups with more pronounced psychiatric disturbance.

Perspective

Several reviews have proposed a distinction between pain-related distress and clinical depression. This study compared the overlap and differential categorisation of pain
patients as depressed and the relationship to disability between the Structured Interview for DSM-IV (SCID-D; Depression module) and the Hospital Anxiety and Depression Scale (HADS-D).

**Keywords:** depression; chronic back pain; assessment; sensitivity; specificity
1. Introduction

Chronic back pain and depression are two of the most common health problems that health professionals encounter and depression is a particularly frequent co-morbid diagnosis in chronic pain. Research on the relationship between pain and depression addresses conceptual issues as well as issues of measurement. However, the nature of the relationship between concepts, models and measurement of depression in people with pain is still unclear. Studies have demonstrated that the kind of depression experienced by people with chronic pain differs qualitatively from people who suffer from clinical depression. Low mood in chronic pain patients has been found to be closely related to disability, and to incorporate features that are different from those typical of psychiatric groups with depression. Researchers have therefore suggested conceptualising depression in pain as ‘pain-related distress’ in order to distinguish between traditionally conceptualised clinical depression and the complex features of suffering, anger, worry and pre-occupation with health that seem to be experienced by patients with chronic pain.

The ambiguity surrounding measurement of depression in people with pain is reflected even in basic health information such as prevalence: the wide variability in estimated rates of depression in chronic pain samples, ranging from 16.4% to 73.3%, may be accounted for by methodological problems. Specifically, the choice of measurement is important, as many measurements are limited by criterion contamination: i.e. they include somatic items, such as loss of appetite, weight change and sleep disturbance, which may reflect levels of pain and disability rather than depression. This study focuses on two commonly used measures: The Structured Clinical Interview for DSM-IV Axis 1 disorders (SCID) - Depression module, and the Hospital Anxiety and Depression Scale (HADS). Although
assumed to be a ‘gold standard’, little research has been done to investigate the validity and appropriateness of the SCID interview for use with patients who have chronic pain. Some investigators argue that the use of the SCID interview is as confounded by criterion contamination as self-report measures.\textsuperscript{24, 8} In contrast, the HADS was developed specifically for use with patients from a range of medical conditions and includes less somatic items, and therefore should be relatively free of criterion contamination. The two measurements differ in their objectives: while the SCID was developed to diagnose people with depression, conceptualised as a psychiatric disorder, the HADS aims to identify low mood which may or may not indicate a stand-alone psychiatric diagnosis. They may therefore have different utilities for populations with chronic pain.

If pain-related distress is characterised by a cyclical relationship with disability, as proposed by some models\textsuperscript{24}, while clinical depression is a mood disorder that is less entrenched in pain experiences, it is important to establish which measures best capture each of these distinct constructs. This study aims to investigate the overlap between the measurements in indication of depression, and how each measure relates to disability in general (correlation analysis), and in their sensitivity and specificity discrimination of disability levels.

2. Material and Methods

Participants

Seventy eight adults with chronic back pain participated in this cross-sectional study (23 male, 55 female) and were consecutively recruited from participating general practices and pain clinics from July 2005 until June 2006.
Primary complaints were pain localized in the lower back (79.5%), cervical back pain (18%), and thoracic back pain (2.5%).

The main inclusion criteria were the ability to read and write English fluently. All patients had persistent pain for more than 3 months. Pain patients were only included if they rated their current level of pain, and the level of pain that they had experienced in the past few months as 3 or above on an 11-point Numerical Rating Scale (NRS), where 0 was ‘no pain’ and 10 was ‘extremely painful’ [12]. General practitioners and clinicians excluded patients with signs and symptoms of more severe pathology [33] or progressive disorders such as cancer.

Procedure

Pain patients attending general practices and pain clinics in London, United Kingdom, who consented to take part in the study were interviewed face to face by a qualified consultant clinical psychologist with over 4 years experience of treating pain populations. Participants were administered consecutively the SCID interview, a semi-structured interview that included affective, cognitive and neurovegetative questions designed to diagnose affective disorders according to DSM-IV criteria, followed by the questionnaires.

Of those who left their details with the researcher, only 5% (n = 5) of potential participants did not take part due to difficulties in attending the appointment (because of work deadlines; unexpected family issues; personal demands or illness), and 2.2% (n = 3) were not able to be contacted. Altogether of the 78 patients who came to the appointment with the researcher, there were no refusals to participate in the study. All
participants provided informed consent. The University Ethics Committee and LREC (London Research Ethics Committee) approved this study.

**Measures**

In addition to obtaining basic demographic and clinically relevant descriptive data (age, gender, education, main clinical diagnosis, duration of pain and pain intensity), the following measures were obtained.

*The Hospital Anxiety and Depression Scale (HADS)*

The HADS is a self-report measure that consists of 14 items grouped into two subscales, seven measuring anxiety and seven depression. Ratings are made on four point scales (0-3) representing the degree of distress during the previous week. Scores of 7 or less indicates non-cases, 8–10 possible cases, and 11+ probable cases. Both subscales have 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. Severe psychopathological symptoms (guilt, suicidal thoughts) 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 general medical patients. For this study only the depression subscale was included in the analyses (HADS-D).

*Structured Clinical Interview for DSM-IV Axis I disorders (SCID)* - Depression module

The section of the SCID evaluating current major depressive disorder was used to detect the presence of depressive disorder (SCID-1 NP). Investigations of the
test-retest reliability of the SCID have shown that for most of the major categories, kappa’s for current and lifetime diagnoses in the patient samples were above .60. The SCID depression module provides 9 items with an individual score, and a final dichotomised classification that identifies individuals with present or absent depression (SCID-D).

*Pain Disability Index (PDI)*

The PDI is a brief 7-item self-report measure of the extent of pain interfering with different domains of an individual’s life. The seven domains are family, recreation, social activities, occupation, sexual behaviour, self care and life support activities. Each item is rated on an 11-point Likert-type scale (0 = no disability; 10 = total disability) and the PDI total score can range from 0 to 70. The PDI has established reliability and validity. Factor analytic studies have reported one and two factor solutions. The single factor scoring method was used in this study, i.e. sum of all seven domains.

**Statistical analyses**

The following statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS for Windows, version 16.0) and the Receiver Operating Characteristic (ROC) software program (MedCalc Version 9.5). Missing values in the data set were replaced by means in SPSS. The detection of disability by the HADS-D and the SCID-D was assessed by reference of two standard criteria: sensitivity (the probability of a chronic back pain patient testing positively for depression when the patient scores high on disability/dysfunction) and specificity (the probability of a chronic back pain patient testing negatively for depression when the patient scores
low on disability/dysfunction), using the formulae suggested by Hennekes and Buring. \(^\text{10}\) The relationship between the two depression measures and disability was investigated by Pearson and Spearman (as a non-parametric alternative) correlation coefficients. Correlations were interpreted according to the definitions provided by Tabachnick & Fidell \(^\text{31}\) (\(\leq .30 = \text{weak correlation}; \leq .60 = \text{moderate correlation}; \leq .80 = \text{strong correlation}\)). A \(P\) value of 0.05 was set as the critical level at or below which the results would be considered statistically significant.

Coding of the questionnaires was as follows: The HADS-D was coded both for the 8 cut-off point (HADS-D8) and the 11 cut-off point (HADS-D11) to diagnose possible and probable depression. In the absence of published cut-off scores, the PDI was coded in two ways: a.) PDI2 – a median split was performed to divide the patients into high and low disability groups; and b.) PDI3 – a tercile split was performed; patients that scored below the 33\(^{\text{rd}}\) percentile and above the 66\(^{\text{th}}\) were classified as having low and high disability, respectively. The SCID-D final dichotomous classification (depression absent vs. present), and the total amount of symptoms scored present (range 0-9) were used. \(^\text{6}\)

We also performed several Receiver Operating Characteristic (ROC) analyses to evaluate sensitivity and specificity in detecting disability by the HADS-D and the SCID-D. ROC curves express the relationship between true positives (sensitivity) and false negatives (specificity) over the full range of possible cut-off points providing an assessment of the accuracy of the measurements in discriminative positive from negative cases. \(^\text{24, 19}\) The diagnostic power of a test is estimated by the area under the ROC curve which ranges from 0.5 to 1 (from no discriminatory power to total discriminatory power \(^\text{5}\)). The HADS depression subscale and the SCID depression module were analysed separately to compare their discrimination accuracy for
disability, and together to allow a direct comparison between the measures. The optimal cut-off point criteria chosen for the HADS-D and SCID-D was selected according to the maximum specificity, without allowing it to exceed sensitivity criteria as it places the same priority on avoiding false positives as on avoiding false negative classifications.

3. Results

Demographic variables

Table 1 presents basic demographic information.

- insert Table 1 about here -

A mean score of 8.08 ($SD = 4.2$) was found for the Depression subscale of the HADS, a mean score of 33.82 ($SD = 15.4$) for the PDI, and a mean score of 3.14 ($SD =3.2$) for the total amount of symptoms scored present on the SCID depression module (range 0-9).

Levels of agreement on detecting depression between the HADS-D and the SCID-D

Table 2 shows the levels of agreement and disagreement for both measures in defining patients as depressed. When the HADS-D8 cut-off was used, there was an agreement between the measures for exclusion of depression on 42% of the patients and for inclusion on 32% of the patients. For 21% of the patients the SCID-D provided an indication for exclusion of depression whereas the HADS-D provided an indication for inclusion. Only in 4% of the patients did the SCID-D provide an indication for depression whereas the HADS-D provided an indication for exclusion.
When using the HADS-D11, the agreement for inclusion between the measures decreased to 19%. Furthermore for 15% of the patients the SCID-D provided an indication for exclusion of depression whereas the HADS-D provided an indication for possible inclusion. These differences were statistically significant: in sum, the HADS-D defined overall more patients as depressed compared to the SCID-D.

- insert Table 2 about here -

Relationship between the measures of depression and pain disability

A moderately strong Pearson’s correlation was found between the HADS-D and the PDI total score ($r = .551$, $p < .0001$) and a weak Spearman’s correlation was found between the SCID-D and the PDI total score ($r = .227$, $p < .05$).

Sensitivity/Specificity of detecting disability by the HADS-D and the SCID-D

To investigate whether the HADS-D and the SCID-D can detect reduced function in chronic pain patients, the sensitivity (probability of a chronic back patient testing positively for depression when the patient is high on disability/dysfunction) and specificity (probability of a chronic back pain patient testing negatively for depression when the patient is low on disability/dysfunction) of the two measures were studied. The performance of the HADS-D8, HADS-D11 and the SCID-D for sensitivity and specificity are shown in Table 3, using PDI2 and PDI3 disability as the classification variables. For the HADS-D8, HADS-D11 and SCID-D (dichotomous classification) the sensitivity and specificity were calculated using the formulae suggested by Hennekes and Buring. When using the HADS-D and the SCID-D scores as a continuous variable, several Receiver Operating Characteristic (ROC)
analyses were performed to evaluate their diagnostic prediction of dysfunction. Using the PDI2 as the criteria for case definition and the HADS-D scores, the area under the curve of 0.74 with a standard error of 0.05 (95% CI: 0.63-0.83; \( p = 0.0001 \)), and for the SCID-D an area under the curve of 0.65 with a standard error of 0.06 (95% CI: 0.53-0.75; \( p = 0.017 \)). The optimal cut-off points were >7 for the HADS-D and >5 for the SCID. Using the PDI3 as the criteria for case definition and the HADS-D scores the area under the curve was 0.76 with a standard error of 0.06 (95% CI: 0.62-0.86; \( p = 0.0001 \)) and for the SCID-D there was an area under the curve of 0.64 with a standard error of 0.07 (95% CI: 0.49-0.76; \( p = 0.063 \)). The optimal cut-off points were >7 for the HADS-D and \( \geq 1 \) for the SCID-D. The results from the ROC analyses showed that the HADS-D provided the better discriminatory ability overall, demonstrating a better balance between sensitivity and specificity than the SCID-D. When a more demanding criterion for disability was used (through the PDI3) the results were similar. When the HADS-D and the SCID-D were compared simultaneously using the PDI2, the difference between the areas was 0.093 with a standard error of 0.06 (95% CI: -0.02-0.21; \( p = 0.105 \)). When using the PDI3, the difference between the areas was 0.117 with a standard error of 0.06 (95% CI: -0.005-0.24; \( p = 0.06 \)) (see Table 3 and Figure 1). In sum, both analyses show no statistically significant differences between the areas, but indicating that there was a borderline effect for significance regarding the prediction quality between the two measures for the PDI3 classification.

- insert Table 3 about here -
4. Discussion

To our knowledge this is the first study to explore how closely the HADS-D and the SCID-D relate to disability in chronic pain patients. In the absence of an objective gold standard measure to identify distress and depression in chronic pain it is important to examine how measurements perform in relation to theoretical models. This study was informed by the hypothesis that a large proportion of pain patients experience low mood, but that this affect does not imply clinical depression. Pain-related distress differs qualitatively from clinical depression in that it is closely related to pain, suffering and disability. In contrast, clinical depression is characterised by hopelessness, helplessness and negative cognitions about the self, the world and future. Currently it is not known how measurements of depression perform in reference to the two concepts: this study is a first attempt to explore this, however, it should be noted that it was not aimed to directly test different models of depression against each other. In order to test hypotheses linked to different models of depression future prospective studies with reliable and valid measures of possible predictors are needed. The findings from this study suggest that the HADS-D is a better measure of pain-related distress in pain populations, in that it is more closely related to disability scores, and better able to detect disability than the SCID-D. It is likely that many more patients with chronic pain experience pain-related distress than clinical depression: the findings reflect this in terms of the number of patients categorised as possible and probable depression by the HADS-D, which were considerably higher than those suggested by the SCID-D. This notion is in line with actual changes in the classification of pain disorders in the DSM-5 classification of disorders, which regards chronic pain no longer as a psychiatric disorder, but highlights the importance
of the interaction between pain and pain-related distress and secondary mood changes as consequence of having a chronic pain condition.

While the study provides evidence that the two methods differ in their identification of depression, the explanation for this difference cannot be extrapolated from the data: The methodologies may measure different constructs, as proposed by the models described above, but equally, one measure maybe superior in detecting ‘true’ depression. A divergence between the SCID-D and the HADS-D was to be expected as the inclusion criteria for a current episode of Major Depression in the SCID-D are more conservative compared to the HADS-D, which was specifically designed for use with patients with physical or chronic illness and focuses predominantly on the cognitive state of anhedonia. Our findings highlight the fact that if exclusive reliance were placed only on one or two assessment approaches, significant “false-positives” and “false-negatives” would accrue to the assessment process, thus highlighting the value of multi-method assessment strategies in depressed chronic back pain patients.

Future research should investigate whether pain-distress and clinical depression are distinct constructs, or whether clinical depression is merely a more extreme manifestation of mood along a continuum of a single construct. Interpreting the current findings should be carried out with caution, due to the small sample size, and replication of the findings in larger samples is necessary to further test the utility of the two measures in detecting distress and depression. Further, the results of the current study are limited to patients with chronic back pain. Our tentative interpretation of the results is that the HADS-D is probably an adequate measure to establish which pain patients require interventions on psychosocial factors in addition to pain-related factors, but may result in extensive false-positives if used to diagnose
clinical depression. Conversely, the SCID-D’s utility is in the identification of affective disorder, but may fail to identify pain patients who have mood-related psychological problems that interact with their disability.

With regard to the limitations of the study, the issue of criterion contamination continues to be an important issue in the measurement of depression in pain populations. Recent research has indicated that psychometric properties such as responsiveness alter significantly when somatic items are removed from commonly used instruments: the inclusion of such items in trials’ outcomes that aim to affect mood but not pain may distort findings. Despite the inclusion of more somatic items in the SCID-D than the HADS-D, the interview-based measure did not result in inflated number of patients diagnosed with depression. This may have been because the interviewer had extensive experience in research with pain patients and was familiar with the literature surrounding criterion contamination. Although we attempted to control for experimenter effects by blinding the coding of the HADS questionnaires, it is possible that this researcher was less likely to endorse somatic responses in the SCID-D as mood related. This highlights the need for replication with naïve clinical interviewers, and for comparison between clinical interviewers experienced with pain populations and with those whose experience is in psychiatric non-pain groups. Most importantly, future studies should include additional double ratings from a second rater to examine the rate of agreement for the SCID-D. This also serves as a reminder that the SCID-D, which is considered a gold standard for the diagnosis of depression, is more vulnerable to experimenter bias than self-report measures, which are often considered inferior. However, semi-structured interviews account for the need to allow patients to describe in their own language the processes they experience and enable us to understand the individual responses in relation to
established theoretical concepts and models of depression, and for depression in the presence of chronic pain. Finally, due to the cross-sectional design of the current study, we would like to highlight that the present results might represent a first step towards a more comprehensive understanding of co-morbid depression in the context of chronic pain and longitudinal studies are warranted. We believe that a promising new area of research is to employ qualitative analyses to the responses of depressed chronic back patients to the SCID interview in contrast to clinically depressed patients in order to enhance our understanding of content specificity. Apart from one qualitative study, there are at present no studies available which investigated with qualitative methodology the area of com-morbid depression in the context of chronic pain, which currently represents a neglected area of study. Accumulating evidence that the quality and content of depression in the context of persistent back pain is different compared to clinical depression, may advocate the development of new treatment modalities for this specific group of back pain patients.

ACKNOWLEDGEMENTS

The authors would like to thank Dr Charles Pither, Dr Johannes van der Merwe and Dr. Dylan Morrissey for their support throughout the process of this study and Dr Rob Froud for his advice on statistical issues. We would like to thank all patients for participating in this study. No conflicts of interest declared.

Disclosures

The authors declare that they have no potential conflicts of interest.
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References


Index (PDI) and the Oswestry Disability Questionnaire (ODQ) and their correlation with pain intensity in low back pain patients. *Clin J Pain* 1993; 9(3): 189-95.


Figure legends

Figure 1.
ROC curves for all measures used in the analyses. The further the curve extends into the upper left quadrant of the plots, the higher the sensitivity/specificity of the measure.
Table 1.

Demographic information.

<table>
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<td>Other</td>
<td>16</td>
</tr>
<tr>
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<td>5.42 (2.09)</td>
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<td>SCID - Depression score</td>
<td>3.14 (3.23)</td>
</tr>
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Note. SCID = Structured Clinical Interview for DSM-IV, Depression module; HADS = Hospital Anxiety and Depression Scale, PDI = Pain Disability Index.
Table 2.
The HADS-D and the SCID-D indication of depression in chronic back pain patients (N = 78)

<table>
<thead>
<tr>
<th>SCID-D</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS-D 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent Depression</td>
<td>33</td>
<td>42.3%</td>
</tr>
<tr>
<td>Present Depression</td>
<td>17</td>
<td>21.8%</td>
</tr>
</tbody>
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| HADS-D11 | | |
| Absent Depression | 33 | 42.3% | 3 | 3.8% |
| Indication for Depression | 12 | 15.4% | 10 | 12.8% |
| Present Depression | 5 | 6.4% | 15 | 19.2% |

*Note. SCID-D = Structured Clinical Interview for DSM-IV, Depression module; HADS-D = Hospital Anxiety and Depression Scale, only the Depression scale was used for analyses.*
Table 3. 
Results of the ROC analyses for both PDI2 and PDI3, discriminating between HADS-D and SCID-D

<table>
<thead>
<tr>
<th>Calculations</th>
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<td></td>
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<tr>
<td>&gt;</td>
<td></td>
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</tbody>
</table>

Note. SCID-D = Structured Clinical Interview for DSM-IV, Depression module; HADS-D = Hospital Anxiety and Depression Scale, only the Depression scale was used for analyses; PDI = Pain Disability Index; PDI2 = median split; PDI3 = upper and lower terciles.
Figure 1.

ROC curves for all measures used in the analyses. The further the curve extends into the upper left quadrant of the plots, the higher the sensitivity/specificity of the measure.

Note. SCID = Structured Clinical Interview for DSM-IV, Depression module; HADS = Hospital Anxiety and Depression Scale, only the Depression scale was used for analyses; PDI = Pain Disability Index; PDI2 = median split; PDI3 = upper and lower terciles.
Pain-related distress and clinical depression in chronic pain: A comparison between two measures

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adina.rusu@rub.de
Abstract

Background and purpose: Depression is a frequent co-morbid diagnosis in chronic pain, and has been shown to predict poor outcome. Several reviews have described the difficulty in accurate and appropriate measurement of depression in pain patients, and have proposed a distinction between pain-related distress and clinical depression. 

Aims of the current study were to compare a) the overlap and differential categorisation of pain patients as depressed, and b) the relationship to disability between the Structured Interview for DSM-IV (SCID-Depression module) and the Hospital Anxiety and Depression Scale (HADS-D).

Methods: Seventy-eight chronic back pain patients were administered the SCID-D, the HADS-D and the Pain Disability Index (PDI).

Results: Significantly more patients were categorised with possible and probable depression by the HADS than the SCID-D. Results from Receiver Operating Characteristic (ROC) curve analysis suggested that the HADS-D provided better discriminatory ability to detect disability, demonstrating a better balance between sensitivity and specificity compared to the SCID-D, although a direct comparison between the two measurements showed no difference.

Conclusions: The HADS-D is a reasonably accurate indicator of pain-related distress in chronic pain patients, and captures the link between disability and mood.

Implications: It is likely that the SCID-D is better suited to identifying sub-groups with more pronounced psychiatric disturbance.

Perspective
Several reviews have proposed a distinction between pain-related distress and clinical depression. This study compared the overlap and differential categorisation of pain patients as depressed and the relationship to disability between the Structured Interview for DSM-IV (SCID-D; Depression module) and the Hospital Anxiety and Depression Scale (HADS-D).

**Keywords:** depression; chronic back pain; assessment; sensitivity; specificity
1. Introduction

Chronic back pain and depression are two of the most common health problems that health professionals encounter and depression is a particularly frequent co-morbid diagnosis in chronic pain.\textsuperscript{20, 30} Research on the relationship between pain and depression addresses conceptual issues as well as issues of measurement.\textsuperscript{1} However, the nature of the relationship between concepts, models and measurement of depression in people with pain is still unclear.\textsuperscript{19, 24, 3} Studies have demonstrated that the kind of depression experienced by people with chronic pain differs qualitatively from people who suffer from clinical depression. Low mood in chronic pain patients has been found to be closely related to disability, and to incorporate features that are different from those typical of psychiatric groups with depression.\textsuperscript{22} Researchers have therefore suggested conceptualising depression in pain as ‘pain-related distress’ in order to distinguish between traditionally conceptualised clinical depression and the complex features of suffering, anger, worry and pre-occupation with health that seem to be experienced by patients with chronic pain.\textsuperscript{23, 36, 15}

The ambiguity surrounding measurement of depression in people with pain is reflected even in basic health information such as prevalence: the wide variability in estimated rates of depression in chronic pain samples, ranging from 16.4\% to 73.3\%\textsuperscript{18, 7, 16}, may be accounted for by methodological problems. Specifically, the choice of measurement is important, as many measurements are limited by criterion contamination\textsuperscript{24, 34}: i.e. they include somatic items, such as loss of appetite, weight change and sleep disturbance, which may reflect levels of pain and disability rather than depression.\textsuperscript{26, 8} This study focuses on two commonly used measures: The Structured Clinical Interview for DSM-IV Axis 1 disorders (SCID\textsuperscript{6}) - Depression module, and the Hospital Anxiety and Depression Scale (HADS\textsuperscript{38}). Although
assumed to be a ‘gold standard’, little research has been done to investigate the validity and appropriateness of the SCID interview for use with patients who have chronic pain. Some investigators argue that the use of the SCID interview is as confounded by criterion contamination as self-report measures. In contrast, the HADS was developed specifically for use with patients from a range of medical conditions and includes less somatic items, and therefore should be relatively free of criterion contamination. The two measurements differ in their objectives: while the SCID was developed to diagnose people with depression, conceptualised as a psychiatric disorder, the HADS aims to identify low mood which may or may not indicate a stand-alone psychiatric diagnosis. They may therefore have different utilities for populations with chronic pain.

If pain-related distress is characterised by a cyclical relationship with disability, as proposed by some models, while clinical depression is a mood disorder that is less entrenched in pain experiences, it is important to establish which measures best capture each of these distinct constructs. This study aims to investigate the overlap between the measurements in indication of depression, and how each measure relates to disability in general (correlation analysis), and in their sensitivity and specificity discrimination of disability levels.

2. Material and Methods

Participants

Seventy eight adults with chronic back pain participated in this cross-sectional study (23 male, 55 female) and were consecutively recruited from participating general practices and pain clinics from July 2005 until June 2006.
Primary complaints were pain localized in the lower back (79.5%), cervical back pain (18%), and thoracic back pain (2.5%).

The main inclusion criteria were the ability to read and write English fluently. All patients had persistent pain for more than 3 months. Pain patients were only included if they rated their current level of pain, and the level of pain that they had experienced in the past few months as 3 or above on an 11-point Numerical Rating Scale (NRS), where 0 was ‘no pain’ and 10 was ‘extremely painful’ [12]. General practitioners and clinicians excluded patients with signs and symptoms of more severe pathology [33] or progressive disorders such as cancer.

Procedure

Pain patients attending general practices and pain clinics in London, United Kingdom, who consented to take part in the study were interviewed face to face by a qualified consultant clinical psychologist with over 4 years experience of treating pain populations. Participants were administered consecutively the SCID interview, a semi-structured interview that included affective, cognitive and neurovegetative questions designed to diagnose affective disorders according to DSM-IV criteria, followed by the questionnaires.

Of those who left their details with the researcher, only 5% (n = 5) of potential participants did not take part due to difficulties in attending the appointment (because of work deadlines; unexpected family issues; personal demands or illness), and 2.2% (n = 3) were not able to be contacted. Altogether of the 78 patients who came to the appointment with the researcher, there were no refusals to participate in the study. All
participants provided informed consent. The University Ethics Committee and LREC (London Research Ethics Committee) approved this study.

Measures

In addition to obtaining basic demographic and clinically relevant descriptive data (age, gender, education, main clinical diagnosis, duration of pain and pain intensity), the following measures were obtained.

*The Hospital Anxiety and Depression Scale (HADS)*

The HADS is a self-report measure that consists of 14 items grouped into two subscales, seven measuring anxiety and seven depression. Ratings are made on four point scales (0-3) representing the degree of distress during the previous week. Scores of 7 or less indicates non-cases, 8–10 possible cases, and 11+ probable cases. Both subscales have 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. Severe psychopathological symptoms (guilt, suicidal thoughts) 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 general medical patients. For this study only the depression subscale was included in the analyses (HADS-D).

*Structured Clinical Interview for DSM-IV Axis I disorders (SCID)* - Depression module

The section of the SCID evaluating current major depressive disorder was used to detect the presence of depressive disorder (SCID-1 NP). Investigations of the
test-retest reliability of the SCID have shown that for most of the major categories, kappa’s for current and lifetime diagnoses in the patient samples were above .60.  
The SCID depression module provides 9 items with an individual score, and a final dichotomised classification that identifies individuals with present or absent depression (SCID-D).

_Pain Disability Index (PDI)_26

The PDI is a brief 7-item self-report measure of the extent of pain interfering with different domains of an individual’s life.  

The seven domains are family, recreation, social activities, occupation, sexual behaviour, self care and life support activities. Each item is rated on an 11-point Likert-type scale (0 = no disability; 10 = total disability) and the PDI total score can range from 0 to 70. The PDI has established reliability and validity.  

Factor analytic studies have reported one and two factor solutions.  

Statistical analyses

The following statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS for Windows, version 16.0) and the Receiver Operating Characteristic (ROC) software program (MedCalc Version 9.5). Missing values in the data set were replaced by means in SPSS. The detection of disability by the HADS-D and the SCID-D was assessed by reference of two standard criteria: sensitivity (the probability of a chronic back pain patient testing positively for depression when the patient scores high on disability/dysfunction) and specificity (the probability of a chronic back pain patient testing negatively for depression when the patient scores
low on disability/dysfunction), using the formulae suggested by Hennekes and Buring. The relationship between the two depression measures and disability was investigated by Pearson and Spearman (as a non-parametric alternative) correlation coefficients. Correlations were interpreted according to the definitions provided by Tabachnick & Fidell (≤ .30 = weak correlation; ≤ .60 = moderate correlation; ≤ .80 = strong correlation). A $P$ value of 0.05 was set as the critical level at or below which the results would be considered statistically significant.

Coding of the questionnaires was as follows: The HADS-D was coded both for the 8 cut-off point (HADS-D8) and the 11 cut-off point (HADS-D11) to diagnose possible and probable depression. In the absence of published cut-off scores, the PDI was coded in two ways: a.) PDI2 – a median split was performed to divide the patients into high and low disability groups; and b.) PDI3 – a tercile split was performed; patients that scored below the 33rd percentile and above the 66th were classified as having low and high disability, respectively. The SCID-D final dichotomous classification (depression absent vs. present), and the total amount of symptoms scored present (range 0-9) were used.

We also performed several Receiver Operating Characteristic (ROC) analyses to evaluate sensitivity and specificity in detecting disability by the HADS-D and the SCID-D. ROC curves express the relationship between true positives (sensitivity) and false negatives (specificity) over the full range of possible cut-off points providing an assessment of the accuracy of the measurements in discriminative positive from negative cases. The diagnostic power of a test is estimated by the area under the ROC curve which ranges from 0.5 to 1 (from no discriminatory power to total discriminatory power). The HADS depression subscale and the SCID depression module were analysed separately to compare their discrimination accuracy for
disability, and together to allow a direct comparison between the measures. The optimal cut-off point criteria chosen for the HADS-D and SCID-D was selected according to the maximum specificity, without allowing it to exceed sensitivity criteria as it places the same priority on avoiding false positives as on avoiding false negative classifications.

3. Results

Demographic variables

Table 1 presents basic demographic information.

- insert Table 1 about here -

A mean score of 8.08 (SD = 4.2) was found for the Depression subscale of the HADS, a mean score of 33.82 (SD = 15.4) for the PDI, and a mean score of 3.14 (SD =3.2) for the total amount of symptoms scored present on the SCID depression module (range 0-9).

Levels of agreement on detecting depression between the HADS-D and the SCID-D

Table 2 shows the levels of agreement and disagreement for both measures in defining patients as depressed. When the HADS-D8 cut-off was used, there was an agreement between the measures for exclusion of depression on 42% of the patients and for inclusion on 32% of the patients. For 21% of the patients the SCID-D provided an indication for exclusion of depression whereas the HADS-D provided an indication for inclusion. Only in 4% of the patients did the SCID-D provide an indication for depression whereas the HADS-D provided an indication for exclusion.
When using the HADS-D11, the agreement for inclusion between the measures decreased to 19%. Furthermore for 15% of the patients the SCID-D provided an indication for exclusion of depression whereas the HADS-D provided an indication for possible inclusion. These differences were statistically significant: in sum, the HADS-D defined overall more patients as depressed compared to the SCID-D.

- insert Table 2 about here -

**Relationship between the measures of depression and pain disability**

A moderately strong Pearson’s correlation was found between the HADS-D and the PDI total score \( r = .551, p < .0001 \) and a weak Spearman’s correlation was found between the SCID-D and the PDI total score \( r = .227, p < .05 \).

**Sensitivity/Specificity of detecting disability by the HADS-D and the SCID-D**

To investigate whether the HADS-D and the SCID-D can detect reduced function in chronic pain patients, the sensitivity (probability of a chronic back patient testing positively for depression when the patient is high on disability/dysfunction) and specificity (probability of a chronic back pain patient testing negatively for depression when the patient is low on disability/dysfunction) of the two measures were studied. The performance of the HADS-D8, HADS-D11 and the SCID-D for sensitivity and specificity are shown in Table 3, using PDI2 and PDI3 disability as the classification variables. For the HADS-D8, HADS-D11 and SCID-D (dichotomous classification) the sensitivity and specificity were calculated using the formulae suggested by Hennekes and Buring. When using the HADS-D and the SCID-D scores as a continuous variable, several Receiver Operating Characteristic (ROC)
analyses were performed to evaluate their diagnostic prediction of dysfunction. Using the PDI2 as the criteria for case definition and the HADS-D scores, the area under the curve of 0.74 with a standard error of 0.05 (95% CI: 0.63-0.83; p = 0.0001), and for the SCID-D an area under the curve of 0.65 with a standard error of 0.06 (95% CI: 0.53-0.75; p = 0.017). The optimal cut-off points were >7 for the HADS-D and >5 for the SCID. Using the PDI3 as the criteria for case definition and the HADS-D scores the area under the curve was 0.76 with a standard error of 0.06 (95% CI: 0.62-0.86; p = 0.0001) and for the SCID-D there was an area under the curve of 0.64 with a standard error of 0.07 (95% CI: 0.49-0.76; p = 0.063). The optimal cut-off points were >7 for the HADS-D and ≥ 1 for the SCID-D. The results from the ROC analyses showed that the HADS-D provided the better discriminatory ability overall, demonstrating a better balance between sensitivity and specificity than the SCID-D. When a more demanding criterion for disability was used (through the PDI3) the results were similar. When the HADS-D and the SCID-D were compared simultaneously using the PDI2, the difference between the areas was 0.093 with a standard error of 0.06 (95% CI: -0.02-0.21; p = 0.105). When using the PDI3, the difference between the areas was 0.117 with a standard error of 0.06 (95% CI: -0.005-0.24; p = 0.06) (see Table 3 and Figure 1). In sum, both analyses show no statistically significant differences between the areas, but indicating that there was a borderline effect for significance regarding the prediction quality between the two measures for the PDI3 classification.

- insert Table 3 about here -
- insert Figure 1 about here -
4. Discussion

To our knowledge this is the first study to explore how closely the HADS-D and the SCID-D relate to disability in chronic pain patients. In the absence of an objective gold standard measure to identify distress and depression in chronic pain it is important to examine how measurements perform in relation to theoretical models. This study was informed by the hypothesis that a large proportion of pain patients experience low mood, but that this affect does not imply clinical depression. Pain-related distress differs qualitatively from clinical depression in that it is closely related to pain, suffering and disability. In contrast, clinical depression is characterised by hopelessness, helplessness and negative cognitions about the self, the world and future. Currently it is not known how measurements of depression perform in reference to the two concepts: this study is a first attempt to explore this, however, it should be noted that it was not aimed to directly test different models of depression against each other. In order to test hypotheses linked to different models of depression future prospective studies with reliable and valid measures of possible predictors are needed. The findings from this study suggest that the HADS-D is a better measure of pain-related distress in pain populations, in that it is more closely related to disability scores, and better able to detect disability than the SCID-D. It is likely that many more patients with chronic pain experience pain-related distress than clinical depression: the findings reflect this in terms of the number of patients categorised as possible and probable depression by the HADS-D, which were considerably higher than those suggested by the SCID-D. This notion is in line with actual changes in the classification of pain disorders in the DSM-5 classification of disorders, which regards chronic pain no longer as a psychiatric disorder, but highlights the importance
of the interaction between pain and pain-related distress and secondary mood changes as consequence of having a chronic pain condition⁴.

While the study provides evidence that the two methods differ in their identification of depression, the explanation for this difference cannot be extrapolated from the data: The methodologies may measure different constructs, as proposed by the models described above, but equally, one measure maybe superior in detecting ‘true’ depression. A divergence between the SCID-D and the HADS-D was to be expected as the inclusion criteria for a current episode of Major Depression in the SCID-D are more conservative compared to the HADS-D, which was specifically designed for use with patients with physical or chronic illness and focuses predominantly on the cognitive state of anhedonia.³⁸ Our findings highlight the fact that if exclusive reliance were placed only on one or two assessment approaches, significant “false-positives” and “false-negatives” would accrue to the assessment process, thus highlighting the value of multi-method assessment strategies in depressed chronic back pain patients.

Future research should investigate whether pain-distress and clinical depression are distinct constructs, or whether clinical depression is merely a more extreme manifestation of mood along a continuum of a single construct. Interpreting the current findings should be carried out with caution, due to the small sample size, and replication of the findings in larger samples is necessary to further test the utility of the two measures in detecting distress and depression. Further, the results of the current study are limited to patients with chronic back pain. Our tentative interpretation of the results is that the HADS-D is probably an adequate measure to establish which pain patients require interventions on psychosocial factors in addition to pain-related factors, but may result in extensive false-positives if used to diagnose
clinical depression. Conversely, the SCID-D’s utility is in the identification of affective disorder, but may fail to identify pain patients who have mood-related psychological problems that interact with their disability.

With regard to the limitations of the study, the issue of criterion contamination continues to be an important issue in the measurement of depression in pain populations. Recent research has indicated that psychometric properties such as responsiveness alter significantly when somatic items are removed from commonly used instruments: the inclusion of such items in trials’ outcomes that aim to affect mood but not pain may distort findings. Despite the inclusion of more somatic items in the SCID-D than the HADS-D, the interview-based measure did not result in inflated number of patients diagnosed with depression. This may have been because the interviewer had extensive experience in research with pain patients and was familiar with the literature surrounding criterion contamination. Although we attempted to control for experimenter effects by blinding the coding of the HADS questionnaires, it is possible that this researcher was less likely to endorse somatic responses in the SCID-D as mood related. This highlights the need for replication with naïve clinical interviewers, and for comparison between clinical interviewers experienced with pain populations and with those whose experience is in psychiatric non-pain groups. Most importantly, future studies should include additional double ratings from a second rater to examine the rate of agreement for the SCID-D. This also serves as a reminder that the SCID-D, which is considered a gold standard for the diagnosis of depression, is more vulnerable to experimenter bias than self-report measures, which are often considered inferior. However, semi-structured interviews account for the need to allow patients to describe in their own language the processes they experience and enable us to understand the individual responses in relation to
established theoretical concepts and models of depression, and for depression in the presence of chronic pain. Finally, due to the cross-sectional design of the current study, we would like to highlight that the present results might represent a first step towards a more comprehensive understanding of co-morbid depression in the context of chronic pain and longitudinal studies are warranted. We believe that a promising new area of research is to employ qualitative analyses to the responses of depressed chronic back patients to the SCID interview in contrast to clinically depressed patients in order to enhance our understanding of content specificity. Apart from one qualitative study, there are at present no studies available which investigated with qualitative methodology the area of com-morbid depression in the context of chronic pain, which currently represents a neglected area of study. Accumulating evidence that the quality and content of depression in the context of persistent back pain is different compared to clinical depression, may advocate the development of new treatment modalities for this specific group of back pain patients.

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Disclosures

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was supported by a postgraduate scholarship by the Friedrich-Ebert Foundation,
Germany.
References


Index (PDI) and the Oswestry Disability Questionnaire (ODQ) and their correlation with pain intensity in low back pain patients. *Clin J Pain* 1993; 9(3): 189-95.


Figure legends

Figure 1.

ROC curves for all measures used in the analyses. The further the curve extends into the upper left quadrant of the plots, the higher the sensitivity/specificity of the measure.
Table 1.

Demographic information.

<table>
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<td>3.8%</td>
</tr>
<tr>
<td>Present Depression</td>
<td>17</td>
<td>21.8%</td>
<td>25</td>
<td>32.1%</td>
</tr>
</tbody>
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HADS-D11

|               |          |         |          |         |
| Absent Depression | 33 | 42.3% | 3 | 3.8% |
| Indication for Depression | 12 | 15.4% | 10 | 12.8% |
| Present Depression | 5 | 6.4% | 15 | 19.2% |

Note. SCID-D = Structured Clinical Interview for DSM-IV, Depression module; HADS-D = Hospital Anxiety and Depression Scale, only the Depression scale was used for analyses.
Table 3.
Results of the ROC analyses for both PDI2 and PDI3, discriminating between HADS-D and SCID-D

<table>
<thead>
<tr>
<th></th>
<th>Calculations</th>
<th>ROC</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>HADS-D8</td>
<td>HADS-D11</td>
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<tr>
<td>PDI2</td>
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<td></td>
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<tr>
<td>Sensitivity</td>
<td>0.74</td>
<td>0.60</td>
</tr>
<tr>
<td>Specificity</td>
<td>0.66</td>
<td>0.84</td>
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<tr>
<td>AUC</td>
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<tr>
<td></td>
<td>0.74</td>
<td>0.65</td>
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<td></td>
<td>0.0001</td>
<td>0.017</td>
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<tr>
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<tr>
<td>PDI3</td>
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<td>Sensitivity</td>
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</table>

Note. SCID-D = Structured Clinical Interview for DSM-IV, Depression module; HADS-D = Hospital Anxiety and Depression Scale, only the Depression scale was used for analyses; PDI = Pain Disability Index; PDI2 = median split; PDI3 = upper and lower terciles.
Figure 1.

ROC curves for all measures used in the analyses. The further the curve extends into the upper left quadrant of the plots, the higher the sensitivity/specificity of the measure.

Note. SCID = Structured Clinical Interview for DSM-IV, Depression module; HADS = Hospital Anxiety and Depression Scale, only the Depression scale was used for analyses; PDI = Pain Disability Index; PDI2 = median split; PDI3 = upper and lower terciles.