Readiness to adopt a self management approach to pain – are profiles of subscale scores on the Pain Stages of Change Questionnaire useful?

Terese Fors, M.D.[1], Elin Damsgård, R.N. Cand. San[1,2], Cecilie Røe, M.D., PhD[3,4], Audny Anke, M.D., PhD[1,2].

[1]Department of Physical Medicine and Rehabilitaton, University Hospital of North Norway, 9038 Tromsø, Norway.
[2]Institute of Clinical Medicine, Faculty of Medicine, University of Tromsø, Tromsø, Norway.
[3]Department of Physical Medicine and Rehabilitation, Ullevål University Hospital, Oslo, Norway.
[4]Faculty of Medicine, University of Oslo, Oslo, Norway.

Corresponding author:
Audny Anke
Department of Physical Medicine and Rehabilitation
University Hospital of North Norway
9038 Tromsø
Norway
Tel: +47 95936333
Fax: +47 77628049
E-mail: audny.anke@unn.no

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Abstract

The study aimed at evaluating the ability of the Pain Stages of Change Questionnaire (PSOCQ) to classify subjects with longstanding musculoskeletal pain into specific profiles of readiness to adopt a self-management approach to pain. An analysis was made of whether the five earlier described PSOCQ-profiles Precontemplation, Contemplation, Noncontemplative Action, Participation and Ambivalent could be reproduced by two different methods, visual inspection and cluster analysis with Wards method and a 5-cluster solution. The 184 included subjects completed the PSOCQ, the Hopkins Symptom Check List (HSCL-25), the Tampa scale of Kinesiophobia (TSK) and five self-efficacy questions from the arthritis self-efficacy questionnaire (ASES). Profiles were drawn based on the mean subscale scores of the four stages in PSOCQ. We found that cluster analysis was able to identify the three profiles Precontemplation, Contemplation and Participation. By visual inspection all the five predefined profiles were identified, although 17% of subjects could not be classified, and another 18% were rated as difficult to classify. As expected the two profiles Precontemplation and Participation seem to identify distinct subgroups that differ clearly in psychometric measures, while the Contemplation profile group has scores in between. It is concluded that the three profiles Precontemplation, Contemplation and Participation are the most robust, as they are repeated and could be identified by both methods. The visual method, i.e. to identify PSOCQ- profile by visual inspection, could be clinically useful, but was not promising as the only approach. Classification of subjects into three categories is suggested: A Precontemplation and a Contemplation subgroup determined by highest mean subscale score, and a Participation group with high scores on the action and maintenance subscales.

Introduction

Multidisciplinary chronic pain treatment programmes intend to improve a persons self-management skills in coping with a pain condition (Kerns et al., 1998; Morley et al., 1998; Van Tulder et al., 2000). Self-management treatment approaches challenge the patients to make substantial changes in both beliefs about pain and coping strategies toward pain. How motivated the patient is to engage in and to maintain the treatment recommendations will affect both the way a person carries out the programme, the outcome, and should determine the most effective clinical approach (Burns et al., 2005; Kerns et al., 1998; Kerns et al., 2000; Turk and Rudy, 1991).

Influenced by the Transtheoretical Model (TTM) and the cognitive behavioural perspective on pain management, Kerns and colleagues proposed a model for conceptualizing the process of adopting a self-management approach to chronic pain, and developed the self report questionnaire Pain Stages of Change Questionnaire (PSOCQ) (Kerns et al., 1997). The questionnaire measures the extent to which an individual accepts personal responsibility for pain control and is considering making behavioural changes to cope with the pain. It is comprised of four distinct scales: Precontemplation (belief that management of the pain problem is primarily the responsibility of medical professionals), contemplation (consideration of adopting a self-management approach but reluctance to give up a medical solution), action (beginning attempts to improve self-management skills), and maintenance (commitment to pain self-management) (Jensen et al., 2003).

A central challenge with PSOCQ is the problem of assigning patients to reliable stage groups. Studies have pointed out the relative lack of differences between persons identified as being in different stages, especially a high correlation between the action and maintenance scales (Carr et al., 2006; Dijkstra, 2005; Jensen et al., 2000; Kerns et al. 1997; Strong et al., 2002). Research has suggested that individual profiles of scores could be a more robust predictor of treatment response than relying on a participant's single highest subscale score (Biller et al., 2000; Jensen et al., 2000; Keefe et al., 2000; Strong et al., 2002). Kerns et al sought to identify reliable subgroups of patients based on profiles of all four subscale scores, and identified five profiles labelled Precontemplation, Contemplation, Noncontemplative action, Participation, and Ambivalent (Table 1) (Kerns et al., 2005). However, earlier reports have argued that perhaps people cannot be "staged" in discrete and stable patterns of readiness to self-manage pain, and previous studies with different research designs have given different results (Dijkstra, 2005). Accordingly the primary aim of the current study is to test the occurrence of PSOCQ-profiles in a new sample by two different methods. We

hypothesised that the five profiles described by Kerns could be identified, both by statistical cluster analysis and by visual inspection. Cluster analysis is a coarse statistical way to classify subjects with similar patterns of responding, and we predicted that not all profiles would appear statistically. Visual identification of profiles has as far as we know not been reported earlier, and we also wanted to assess the agreement between cluster analysis and visual inspection. Finally, we hypothesised that the profiles identified were associated with measures of pain belief and coping in agreement with the TTM and previous reports (Jensen et al., 2000; Kerns et al., 2005).

Methods

Participants

Participants were recruited from the "Neck and Back"-unit at the University Hospital of Northern Norway, Department of Physical Medicine and Rehabilitation in the period from October 2005 through October 2006. The clinic receives patients referred from primary health- care with various musculoskeletal complaints. Inclusion criteria were first time visit, understanding and speaking the Norwegian language, and age between 18 and 67 years. Patients with suspected malignant diseases were excluded. In this period 549 eligible patients were referred, about 5% did not meet the inclusion criteria and were excluded, and 263 gave informed consent. One hundred and eighty four patients with complete registrations in PSOCQ were entered into the study.

The average age of the participating patients was 41.5 (SD 9.8, range 19-66) years, and 95 (53%) were female. The subjects underwent a clinical examination and comprised patients with painful conditions with different ICD 10 diagnoses in chapter M00-M99. Based on both clinical examination and pain drawings, they were categorized as: Neck/ shoulder/ arm pain n= 56 (30%), Low back pain n= 82 (45%), Multiple pain sites n= 40 (22%) and Local pain n=5 (3%). All respondents reported pain symptoms for at least 6 months, 90% had had pain for more than one year and 23% for more than 10 years. Nineteen percent had primary school education, 40% had vocational training, 11% had high school education and 30% had college/ university education. At the moment of the study, 30% were on sick leave, 32% were in a rehabilitation or re-education programme, 28% were working or unemployed and 6.5% had retired.

The 263 subjects who consented to participate were compared with the non-consenters. Consenters included more men (47%) than non-consenters (24%), and had significantly higher educational level (primary school 20%, college/university 28% vs primary school 36%, college/ university 24%).

The 184 with complete registrations of PSOCQ who were finally entered into the study, had a statistically significant lower age (41.6 vs 45.1) ($p=0.02$) and higher educational level (primary school 19%, college/ university 30% *vs*. primary school 34%, college/university 23%) ($p<0.05$), than those 79 consenters with incomplete registrations of PSOCQ, while there were no gender differences.

The study was approved by the Norwegian Regional Committee for Medical Research Ethics.

Measures

Pain intensity

Pain intensity was measured for the last week by numeric rating scale (NRS) from 0 (no pain) to 10 (worst pain imaginable). There was one scale for "pain during rest", and one scale for "pain during activity".

The Pain Stages of Change Questionnaire (PSOCQ)

The Pain Stages of Change Questionnaire (PSOCQ) is a measure of individuals' readiness to adopt a self-management approach to chronic pain conditions (Kerns et al., 1997). Several studies have reported substantial reliability, stability and criterion-related and discriminant validity of the measure (Biller et al., 2000; Dijkstra et al., 2001; Jensen et al., 2000; Kerns et al., 1997). This 30 item, self-report questionnaire is composed of four distinct scales that represent the four stages of change from the Transtheoretical Model of behaviour change: precontemplation (7 items), contemplation (10 items), action (6 items) and maintenance (7 items). Each item is provided with a 5 points Likert scale with scoring alternatives ranging from "strongly disagree" (1) to "strongly agree"(5). For each stage/ subscale a mean score is calculated. Item examples for the subscales are given in Table 1.

The five profiles

A profile is a presentation of all four subscale scores. For an individual patient, a profile can be drawn based on the mean scores on each of the four subscales, and this was done for each of the 184 participants. Profiles were drawn in accordance with Kerns et al, after transformation of raw scores into T-scores (Kerns et al., 2005). The individually drawn profiles were then visually compared with the five patterns of meaningful profiles identified by Kerns et al in their cluster analysis (Fig.1, from Kerns et al., 2005). Kerns also described the scoring values for each subscale in terms of means and standard-deviations from mean. It was agreed to classify based on a basically visual comparison, where the pattern of the profiles should clearly correspond to Kerns' profiles presented in Fig.1 regarding the shape and the subscale with highest score. Two of the authors (TF and AA) classified the profiles in consensus, and the easiness of classification was rated on a scale from 1 (very easy) to 5 (impossible).

Insert Fig.1 here

With her permission, we used a version of the PSOCQ translated to Norwegian by Elin Bolle Strand. The instrument was translated following a standard translation-back translation procedure (Strand et al., 2007).

Hopkins symptoms check list – 25 (HSCL-25)

Psychological distress was assessed by the Norwegian version of Hopkins Symptom Check List, 25 questions version. Validity of the instrument for assessing dimensions of psychological distress has been found in several studies (Derogatis et al., 1974; Sandanger et al., 1998). The questionnaire contains 25 questions comprising the dimensions of depression, anxiety and somatisation. The items are scored on a 4 points Likert scale ranging from not at all (1) to very much (4). The scores of the items are summed and then divided by 25. This gives a possible total score range for HSCL-25 from 1.0 to 4.0. The cut off score for HSCL - 25 is suggested to be 1.70 (Sandanger et al., 1998).

To preserve variance, we chose to include 14 patients with one missing question, mostly question number 14 loss of sexual interest. The subjects mean score in HSCL substituted occasional missing items in individual subjects (Denison et al., 2007).

Fear of movement/(re)-injury

The Tampa scale of kinesiophobia (TSK)

A 13- item questionnaire aimed at assessing fear of pain and re-injury due to movement. Each item is provided with a 4 points Likert scale with scoring alternatives ranging from "strongly disagree" (1) to "strongly agree" (4) with a possible range from 13-52 (Kori et al., 1990). The Norwegian version of the Tampa Scale of Kinesiophobia has been found to be a valid and reliable instrument, with a unidimensional underlying construct (Damsgaard et al. 2007; Haugen et al., 2008).

Arthritis Self-Efficacy Scale (ASES) (the self-efficacy for pain subscale)

Self-efficacy was assessed by the subscale of pain in the Arthritis Self-Efficacy Scale (ASES), originally developed for patients with rheumatoid arthritis (Lorig et al., 1989). The instrument has been validated for a Swedish population (Lomi and Nordholm, 1992), and the Norwegian version of the ASES self-efficacy for pain subscale has been used in several studies on back pain (Brox et al., 2005; Keller et al., 1999). The scoring options for the self-efficacy for pain

subscale were on a 6 points Likert scale ranging from “totally disagree” (0) to “totally agree” (6) with a possible raw score for each of the five questions from 0-6. The scores for the 5 items are summed and then divided by 5, giving a possible range from 0-6.

Statistics

The raw scores of each of the four subscales of PSOCQ were transformed into T-scores. Transformation into T-scores gives a mean value of 50 for the whole sample; deviation of 10 points from the mean value is one standard deviation. A cluster analysis using Ward’s method was conducted on the sample of 184 participants. Cluster analysis is a descriptive procedure designed to identify groups of patients with similar profiles or patterns of responding. A single solution with 5 possible clusters was chosen, to explore the possibility of reproducing the finding of five reliable profiles identified in Kerns’ earlier study (Kerns et al., 2005).

For comparisons of groups of data, simple cross-tabulations (Pearson’s Chi-square test) were performed. ANOVAs with follow-up LSD tests were performed with profiles as the independent variable, and the psychometric scales as the dependent values. A significance level of $\alpha = 0.05$ was adopted, and Bonferroni corrected with respect to multiple testing. The analyses were performed by SPSS for Windows version 13.0.

Results

Classification of profiles according to cluster analysis

To explore whether it was possible to reproduce the finding of the 5 profiles described by Kerns (Kerns et al., 2005), a cluster analysis with Wards method and a five-cluster solution was performed. The five patterns of profiles are shown in Table 2 and Fig.2. These clusters confirm Kerns' findings, but not all described profiles were reproduced in this sample of subjects. The two most distinct profiles are the Precontemplation profile with the highest score on the precontemplation subscale and low scores on the other three subscales seen in cluster 1 (31%); and the Participation profile with high scores on both contemplation, action and maintenance subscales and low scores on precontemplation scale identified in cluster 3 (20%) and 5 (9%). The Contemplation profile can be identified in cluster 2 (24%) and in cluster 4 (15%), although the subscale stage scores of contemplation in cluster 4 are around mean. The two other profiles Ambivalent and Noncontemplative Action could not be identified by this cluster analysis.

Insert Table 2 and Fig.2 around here

Classification of profiles according to visual inspection

Of the 184 subjects 153 (83%) were successfully visually classified into one of the five profiles described by Kerns (Fig.1). In thirty-one subjects (17%) the patterns of the subscale stage scores could not be visually identified among Kerns' described profiles, and, to illustrate this, three examples of non-fitting profiles are given in Fig.3. Profile A could resemble a Precontemplation profile, but has not the characteristic L-form, as the precontemplation and contemplation subscales are very close both with high mean T-values. Profile B's highest subscale score is on the action subscale, but it can be classified neither as Non-contemplative action profile because the contemplation subscale score is too high, nor as Participation profile or Ambivalent profile because the maintenance score is very low. The last example, profile C, has a zigzag pattern with highest scores on contemplation and maintenance, and does not fit any predescribed profile.

Insert Fig.3 here

An additional 34 (19%) subjects were rated as very difficult to place into one of the described profiles by visual inspection (score 4 on a scale from 1-5), because some subscale scores deviated from described profiles. However, when the main pattern and the highest subscale

score could be recognised and corresponded to one of the original profiles, the pattern was classified.

In Table 3 and Fig.2 the mean subscale scores in T-scores of the visually classified profiles are given. As anticipated among those with recognisable patterns they corresponded to the five profiles presented by Kerns. Profiles which could not be classified varied considerably and had scores on all subscales around the mean.

Agreement between cluster analysis and visual classification

Three main patterns of profiles were found in the cluster analysis of this material (Precontemplation, Contemplation and Participation), while all the predescribed profiles were recognised by visual identification (Fig.2). Nineteen of the 23 subjects (83%) with visually identified Precontemplation profiles were found in Cluster 1 Precontemplation. Participants with visually identified Participation profiles (n=39) were placed mainly in Cluster 3 Participation (n=21) and Cluster 5 Participation (n=10), and 25 of the 27 subjects with visually defined Contemplation profiles (93%) were found in either of the Contemplation clusters 2 (n=15) or 4 (n=10). However, altogether only 75 of the 184 subjects (41%) were classified in the same profile by visual inspection and cluster analysis. All these were placed in one of the three profiles Precontemplation, Contemplation and Participation.

Correlations between visually identified profiles, demographics, pain and psychometric characteristics

As the visual classified profiles were found to be nearly identical to Kerns, and three of these were seen in the cluster-analysis though less clearly defined, we concentrated analyses of demographic and pain on the visually identified profiles Precontemplation, Contemplation and Participation. In Table 4, demographic characteristics of the participants are related to these three profiles, and one group called "Other profiles and not classified". There were no significant differences in age or gender between these profiles. Though apparently more patients with Contemplation (41%) and Participation (41%) than with Precontemplation (26%) profiles had an educational level beyond high school (college/ university), these differences were not statistically significant ($p= 0.08$). Level of pain intensity during activity was higher in subjects with Precontemplation profiles (mean 7.8) than in subjects with Participation profiles (mean 6.7) ($p=0.04$, Bonferroni corrected significance level $\alpha < 0.02$),

while there were no statistically significant differences in reported levels of pain during rest (Table 4).

Insert Table 4 here

As shown in Table 5, two profiles appeared to have distinct and opposite psychometric characteristics. Subjects with Precontemplation profiles reported most psychological distress and least self-efficacy of pain, and also high scores on fear of movement/ (re)injury. The scores on Tampa were statistically significantly higher in subjects with Precontemplation than Contemplation and Participation profiles. The other extreme was the Participation profile group with lowest scores on emotional distress and fear of movement, and statistically significant higher self-efficacy scores than subjects with all other profiles. There were no other significant differences in self-efficacy between the visually identified profiles. The p-values given in Table 5 are statistically significant after Bonferroni correction.

The cluster- profiles Precontemplation, Contemplation and Participation showed a similar pattern. Cluster 1 Precontemplation had statistically significant higher scores on fear of movement than subjects in cluster 3 Participation ($p<0.01$), and lower scores on self-efficacy than subjects in cluster 3 and 5 Participation ($p<0.01$). The values on psychological distress were also higher in the Precontemplation cluster than in the two Participation clusters, but after Bonferroni correction this finding was not statistically significant.

Patients in each stage of change

The percentage of patients in each "stage", defined as the highest subscale or dimension score, may provide important information on the composition of the sample of patients (Dijkstra 2005), and were as follows: Precontemplation 23%, contemplation 43%, action 9% and maintenance 25%.

Discussion

The main finding in this study which compared two methods of identifying five previously described PSOCQ-profiles (Kerns et al., 2005), was that the three profiles Precontemplation, Contemplation and Participation were found both by cluster analysis and by visual inspection. As suspected not all predefined profiles appeared statistically while all five profiles could be identified visually. Although all profiles were recognised by visual inspection, about one third of the patients were difficult to classify. Only 41% of the subjects were classified in the same profile by visual inspection and cluster analysis. In accordance with earlier studies, the Precontemplation and Participation profiles were shown to have distinct and opposite psychometric characteristics, while the Contemplation profile had scores in between. Pain during activity was higher in subjects with Precontemplation profiles than in subjects with Participation profiles, but this difference was not statistically significant after Bonferroni correction.

Both the visually identified profiles and the cluster profiles were compared to Kerns' subscale profiles (Kerns et al., 2005). Theoretically the scores on the 4 subscales can be combined in many different ways. Cluster analysis is a way of classifying innumerable possible profiles into a few groups with similar patterns of responding. The results are influenced by the fact that cluster analysis contributes to a coarse categorization of individuals, and that different populations can give different cluster profiles. Accordingly, Kerns' system with 5 predefined typical clusters cannot be expected to fit all individuals in any sample, and it should not be surprising that the profiles of our cluster-analysis differed from those of Kerns (Kerns et al., 2005). A further consequence might be that visually identified patterns disagree with the results of cluster analysis. The appearance of the three profiles Precontemplation, Contemplation and Participation in this cluster analysis of a different population, could be viewed as a part confirmation of Kerns finding, and could indicate that these three profiles are the most robust because they are repeated and can be identified by both cluster analysis and visually. The psychometric results further demonstrate the characteristic differences between subjects with Precontemplation and subjects with Participation profiles, while subjects with Contemplation profiles have psychometric values in between.

As far as we know, this is the first study to report visual identification of subscale profiles of readiness to change in a population of patients with musculoskeletal pain. It is quick and easy to calculate the raw scores and means of the four subscales, and it could be meaningful in a clinical setting to view individual profiles of scores rather than to rely on the highest mean

subscale stage score. However, viewing profiles of individual scoring results could be both confusing and time consuming. One challenge was to decide how strictly we should relate our profiles to fit the presentation in Kerns' article. The authors had difficulties in discriminating profiles and keeping in mind the characteristics of all five described profiles, and among those 83% that were successfully categorised a considerable part (18%) was rated as difficult to categorise in a predefined profile or "stage". Overall, the use of the visual method, which is a method that would be practical to use clinically, was not promising. One explanation is the great individual variance in scoring patterns – in fact there are many more patterns or profiles than the five main patterns described by Kerns. It is possible that there may not, in fact, be distinct "stages" or profiles of readiness, but that every person differs along the readiness domains in ways that are unique to them, and this could explain why we were not able to classify patients. As expected, those who were successfully classified by visual inspection of profiles had subscale scores in distinct patterns that corresponded very well to Kerns' description.

In Kerns et al.'s study from 1997 women had lower precontemplation scores (Kerns et al., 1997). In this investigation there were no statistically significant differences in age or gender between the visually classified profiles, and this is in accordance with later reports (Kerns et al 2005). On the other hand, and not reported in previous studies, the level of pain intensity during activity was higher in subjects with Precontemplation profiles than in subjects with Participation profiles. However, this apparently statistically significant difference disappeared after Bonferroni correction, and the significance of this finding should be investigated in other studies. There were no differences among profiles in levels of pain during rest.

Though the sosiodemographic variables investigated did not vary between subjects with different profiles, the psychometric results showed clear differences. Subjects with Precontemplation profiles reported most psychological distress, least self-efficacy of pain and also high scores on fear of movement/ (re)injury. The Participation profile group had the lowest scores on emotional distress and fear of movement, and significantly higher self-efficacy scores than subjects with all other profiles. To perceive oneself in control of pain is assumed to vary between subjects in different stages, and the finding verifies the hypothesis that subjects with high scores on action and maintenance (the Participation profile) report more perceived control than patients in "earlier" stages (Dijkstra, 2005). Self-efficacy, defined as a person's self-beliefs in his or her ability to perform specific tasks, has been shown to be a reliable predictor of both motivation and task performance, and to influence personal goal setting (Bandura, 1977). Studies have pointed out that improvements in self-

efficacy are related to positive short and long-term outcomes of pain coping skills training and educational self-help interventions (Keefe et al., 2004). Investigators of the properties of the stages of change theory have asked for associations between the stages of change theory and self-efficacy (Biller et al., 2000; Keefe et al., 2000; Strong et al., 2002). In one study the conclusion was that the concept of self-efficacy was a better predictor of treatment outcome than the stages of change scales (Strong et al., 2002).

Fear of movement/(re)injury is one phenomenon within a theory of fear avoidance. The essence is that pain is interpreted as a sign of danger, and consequently physical activity is avoided (Brox et al., 2005; Indahl,2004; Kori et al., 1990; Pincus et al., 2006; Vlayen and Linton, 2000; Waddel et al., 1993). Regarding the concept of pain as a signal of damage and that activity should be avoided, our study supports the assumption that fear of movement is a substantial construct within PSOCQ, which varies greatly and statistically significantly between profiles (Kerns et al., 2005). The fact that degree of psychological distress was found to differ between identified visual profiles has not been reported earlier. Jensen and his colleagues reported inconsistent findings for the hypothesis that PSOCQ scale scores are associated with levels of depression and disability (Jensen et al., 2003).

Precontemplation, Contemplation and Participation represent three important profiles in the stages of change theory, clearly different concerning self-management approach to chronic pain. Clinically, these might be the three most important stages of change representing the precontemplation stage, characterized by little perceived responsibility for pain control and no interest in implementing behavioural changes, the contemplation stage, with a consideration of behavioural changes and an increasing awareness of personal responsibility for controlling pain and the participation profile with subjects with a high level of investment and involvement in self management with pain. These three profiles could correspond with three different clinical approaches with respect to motivational intervention and advice. Studies have shown that low precontemplation stage scores may predict completion of a pain management programme (Biller et al., 2000; Glenn and Burns, 2003; Kerns et al., 1997). If a person in the precontemplation stage completes a self management programme, he may profit, but not as much as individuals in a more active stage (Burns et al., 2005; Glenn and Burns, 2003; Kerns et al., 1997). A clinical implication could be to realise that it is important to identify individuals with high scores on the precontemplation scale, in order to provide them with information and education about chronic pain prior to treatment, and then to continue to motivate them during treatment (Burns et al., 2005). This view is supported by this study and by others for subjects with Precontemplation profiles (Kerns et al., 2005), but also for subjects

identified solely by high precontemplation subscale scores (Burns et al., 2005; Kerns et al 2000). Action and maintenance stage patients have attitudes consistent with the self-management orientation promoted by multidisciplinary pain programmes, and because of strong associations between these subscales, several studies have recommended a joint action-maintenance scale (Carr et al., 2006; Jensen et al., 2000; Strand et al., 2007; Strong et al., 2002). Subjects with high scores on the action scale have been found to profit from pain treatment programmes, apparently because this treatment approach supports established strategies (Burns et al., 2005). As a consequence, subjects with longstanding pain and Participation profiles should be identified and included in multidisciplinary treatment programmes (Kerns et al., 2005). Regarding contemplation stage score, some predictive ability of the scale has been demonstrated (Carr et al., 2006; Kerns et al., 2000). Pre-treatment contemplation score has been reported to be one of the parameters predicting 3-month functional outcome (Hankin and Killian, 2004). Other investigators have concluded that subjects in the contemplation stage have moderate values on psychometric scores compared to other stages (Kerns et al., 2005), a finding that was supported in our study, and it is questioned whether this scale represents an ambivalent stage (Jensen et al., 2004).

Though the number of patients is relatively high, and a broad spectrum of musculoskeletal disorders are represented, the response rate is a limitation in this study. Further, the participants included more male subjects and subjects with a higher educational level, than those not participating. A selection of participants with higher educational level, could cover a possible difference between profiles in levels of education. This study has a cross-sectional design, and future research should attempt to evaluate the predictive value of both clusters and visually identified profiles, as well as the classification method recommended in this study.

Our recommendation regarding the measure PSOCQ is to categorise as simple and meaningful as possible. The classification should be possible to accomplish prior to treatment, i.e. at or before the first consultation. Clustering by statistical cluster analysis is not feasible in a clinical setting. Visual identification with a choice between five profiles would be difficult and would still leave nearly 20% un-classified. In our opinion, subjects with longstanding pain could be classified as follows into three categories: The highest mean subscale score defines subjects as either Precontemplators or Contemplators, while a profile with low score on precontemplation and high on both action and maintenance classifies subjects into the Participation profile. This way of categorising subjects would place approximately 80% of the subjects in our sample, and leave 20% as non-classified with mixed profiles. We share

Dijkstra (2005)'s opinion in his review of the validity of the stages of change model, i.e. that further studies of validity are needed before the instrument can be applied clinically.

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Fig.1 Pain stages of change profiles as presented by Kerns et al. (2005).

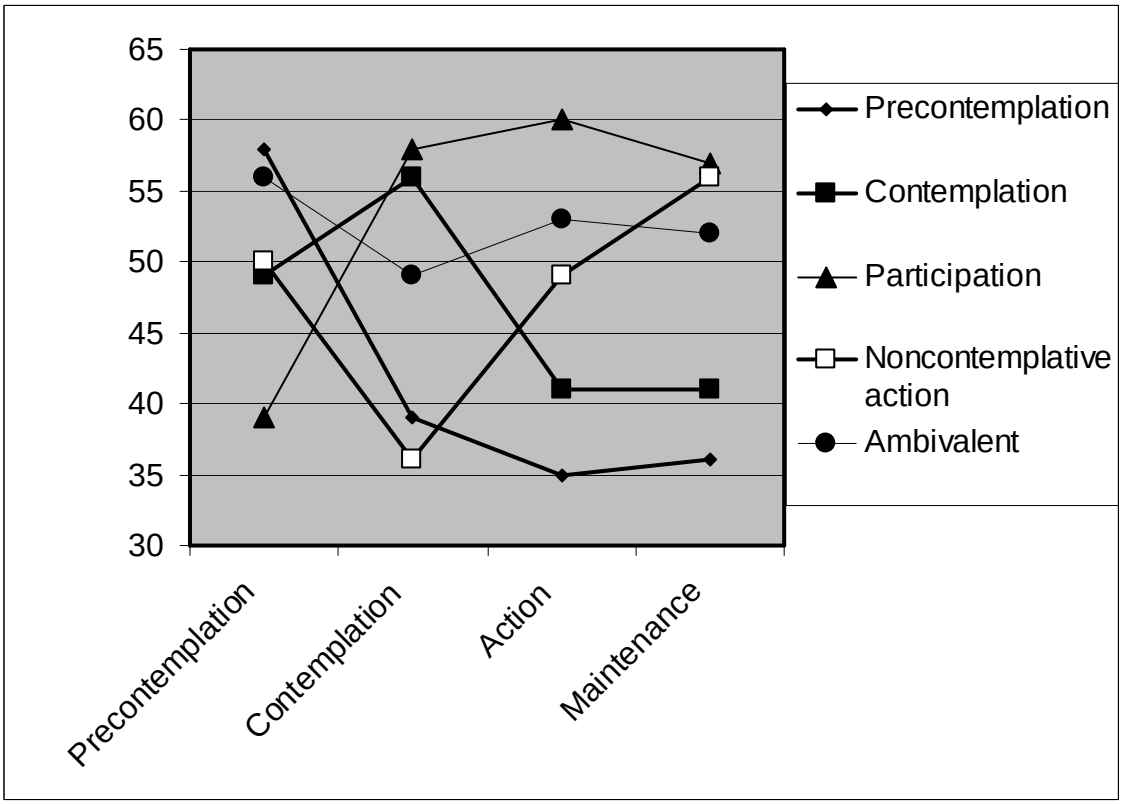
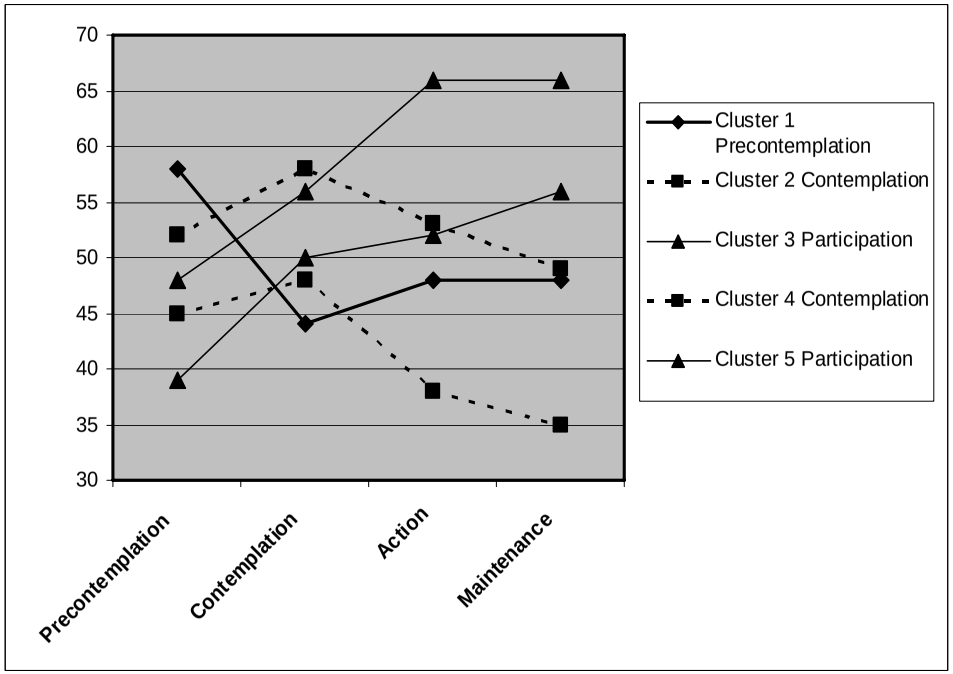


Table 1. Characteristics of the *four subscales* ("stages") of the Pain Stages of Change Questionnaire, and the *five profiles* as described by Kerns (Kerns et al., 2005). For the subscales examples of items for each of the four subscales are given.

Subscales		**Profiles**	**Characteristics of subjects**
Precontemplation	Not intending to change a specific behaviour *"All this talk about how to cope better with pain is a waste of my time".*	Precontemplation	Subjects perceive very little control over a strictly physical pain problem that requires medical attention. They believe that pain is a signal of damage that necessitates decreased activity.
Contemplation	Considering behavioural change *"I have been thinking that the way I cope with my pain could improve"*	Contemplation	Subjects believe that their pain problem is up to them to solve. They perceive a moderate level of control over their pain, and are aware that emotions affect their pain. They moderately believe that pain is a signal of damage and that activity should be avoided.
Activation	Working actively toward changing behaviour *"I am testing out some coping skills to manage my pain better."*	Participation	Subjects perceive themselves as in control of their pain. They are very active and do not believe that pain is a signal of damage that necessitates decreased activity. They do not see their pain condition as a physical problem in need of medical attention. These respondents report a high level of investment and involvement in self-management of their pain.
Maintenance	Working to maintain changes *"I have made lots of progress in coping with my pain"*	Noncontemplative Action	Subjects perceive themselves as in control of their pain. However, they do not believe that emotions influence pain. Rather, strongly believe that pain is a signal of damage and that activity should be avoided, and believe that the problem requires medical attention. These participants appear to be controlling their pain through decreased activity.
		Ambivalent	Subjects have little perception of personal responsibility for their pain, and only a moderate perception of control over their pain. They moderately believe that pain is a signal of damage that necessitates decreased activity. Yet, they are not interested in medication. They seem to be unsure of how to interpret and respond to their pain.

Fig.2 Classification of profiles according to cluster analysis by Ward's method with a single 5-cluster solution, and classification of profiles according to visual inspection.

Cluster profiles



Visually classified profiles

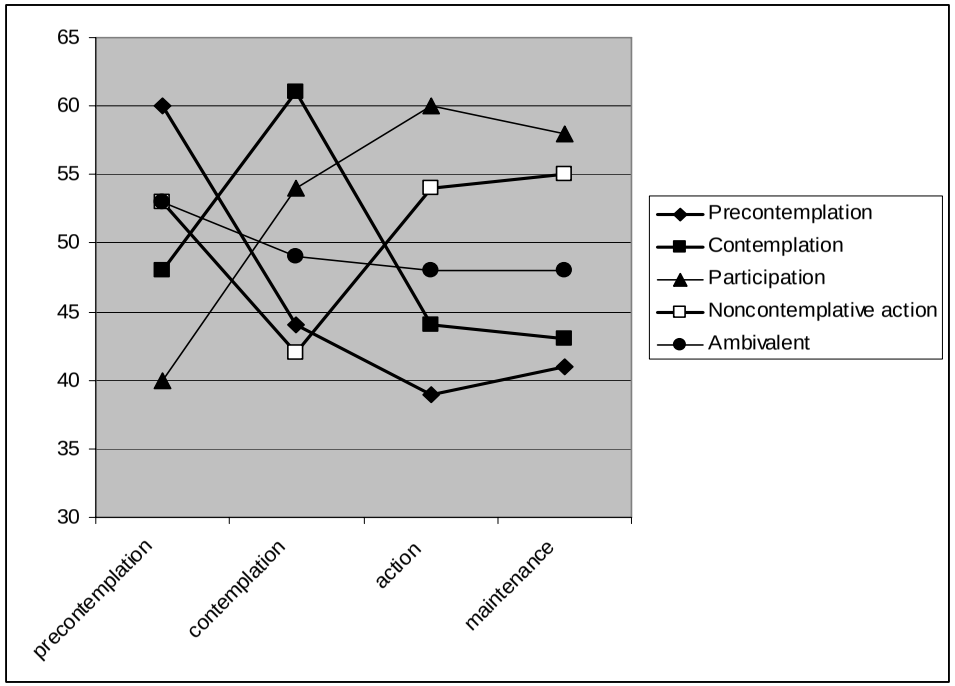


Table 2. Subscale scores by clusters for cluster analysis with Ward's method, reported in T-scores. N= 184.

Clusters		PSOCQ subscale			
	N (%)	Precontemplation Mean (SD)	Contemplation Mean (SD)	Action Mean (SD)	Maintenance Mean (SD)
1	57 (31%)	58.04 (7.76)	43.51 (8.36)	47.50 (8.80)	47.97 (6.97)
2	45 (24%)	51.79 (6.02)	57.92 (6.10)	53.02 (4.44)	48.61 (4.98)
3	37 (20%)	38.75 (6.71)	49.64 (6.45)	51.78 (9.32)	56.09 (4.94)
4	28 (15%)	45.39 (6.77)	47.77 (10.0)	38.24 (7.68)	35.46 (5.81)
5	17 (9%)	48.08 (8.79)	56.11 (10.32)	65.63 (4.05)	66.34 (4.48)
Total	184 (100%)	49.79 (9.98)	50.08 (9.77)	49.98 (10.21)	49.56 (9.93)

Table 3. Subscale scores by visually identified profiles, reported in T-scores. N= 184.

Profile	N (%)	PSOCQ subscale			
		Precontemplation Mean (SD)	Contemplation Mean (SD)	Action Mean (SD)	Maintenance Mean (SD)
Precontemplation	23 (12%)	60.08 (8.54)[1]	43.81 (10.26)	38.69 (8.56)	41.0 (5.69)
Contemplation	27 (15%)	48.23 (7.67)[2]	61.47 (7.55)	44.04 (8.24)	42.56 (8.88)
Participation	39 (21%)	40.30 (7.36)[3]	53.61 (6.91)	60.09 (7.16)	57.99 (5.97)
Noncontemplative action	29 (16%)	53.01 (7.32)[4]	41.73 (5.96)	54.28 (6.67)	54.88 (7.34)
Ambivalent	35 (19%)	53.30 (6.07)[4]	49.25 (6.62)	48.14 (6.68)	47.91 (7.93)
Not classified	31 (17%)	48.50 (10.77)	49.12 (8.92)	48.84 (9.01)	48.26 (10.84)
Total	184 (100%)	49.79 (9.98)	50.08 (9.77)	49.98 (10.21)	49.56 (9.93)

Fig.3 Three examples of not classified profiles of subscale scores of the Pain Stages of Change Questionnaire, named A, B and C.

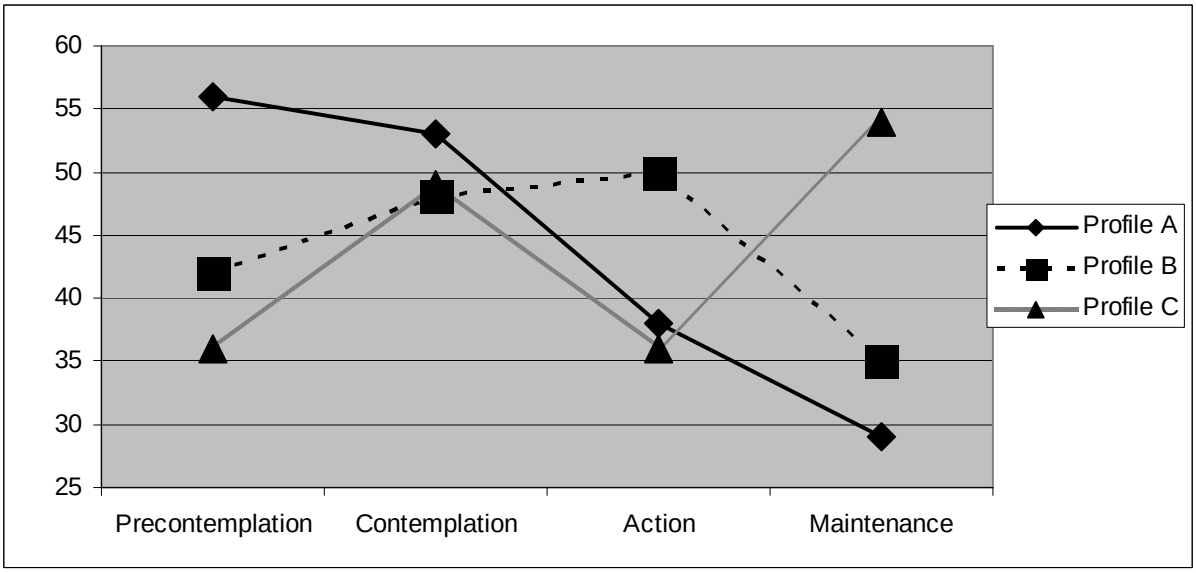


Table 4. Demographics and pain intensity in 184 participants classified into profiles based on scores of the Pain Stages of Change Questionnaire (PSOCQ). The visually identified profiles presented are the Precontemplation profile, the Contemplation profile and the Participation profile, while other profiles and those not classified are presented as one subgroup.

Demographics and pain intensity	Total	Profiles				
		Precontemplation	Contemplation	Participation	Other profiles and not classified	
		n=23	n=27	n=39	n= 95	p-values
Gender						
Men (n)	95	8	9	20	52	
Women (n)	89	15	18	19	43	ns
Age (mean SD)	41.5 (9.8)	42.1 (9.8)	41.2 (9.0)	42.4 (9.5)	41.0 (10.2)	ns
Highest Education						
Primary school (n)	34	7	2	5	20	
High school (n)	93	10	13	17	53	
College/ university (n)	55	6	11	16	22	ns
Pain intensity during rest (mean, SD) [a]	5.9 (3.7)	6.2 (2.4)	5.7 (2.0)	5.4 (2.7)	6.0	ns
Pain intensity during activity (mean, SD) [b]	7.3 (2.0)	7.8 (1.6) [b]	7.3 (1.5)	6.7 (2.3) [b]	7.5	p= 0.04 [b]

[a)] N= 181

[b)] Bonferroni corrected significance level $\alpha < 0.02$

Table 5. Scores on the Hopkins Symptom Checklist 25 (HSCL-25), the Tampa scale of kinesiophobia (TSK) and self-efficacy of pain by visually identified profiles. Percentages of subjects in each profile-group are given.

Profile	HSCL-25 N= 184 Mean (SD)	TSK N= 173 Mean (SD)	Self-efficacy N=182 Mean (SD)
Precontemplation (12%)	2.2 (0.6) [a]	31.9 (6.6) [b]	3.6 (1.5)
Contemplation (15%)	2.0 (0.4)	27.5 (6.7)	4.1 (1.6)
Participation (21%)	1.7 (0.4)	27.5 (6.6) [c]	5.3 (1.7) [d]
Noncontemplative Action (16%)	1.8 (0.4)	31.3 (6.2)	4.0 (1.7)
Ambivalent (19%)	1.9 (0.4)	33.5 (6.9)	3.7 (1.6)
Not classified (17%)	1.8 (0.5)	29.3 (10.09	4.2 (2.1)
Total (100%)	1.9 (0.5)	30.0 (7.5)	4.2 (1.8)

[a)] Significantly higher score on psychological distress in Precontemplation than in all other profiles except Contemplation profile ($p<0.01$)
[b)] Significantly higher score on Tampa scale in Precontemplation than Contemplation and Participation profile ($p<0.01$)
[c)] Significantly lower score on Tampa scale in Participation than in Precontemplation and Ambivalent profiles ($p<0.01$)
[d)] Significantly higher score on self-efficacy in Participation than in all other profiles ($p<0.01$)