LEVEL OF DEPRESSION, ANXIETY AND IMPAIRMENT OF SOCIAL RELATIONS WITH REGARD TO PAIN INTENSITY IN A NATURALISTIC SAMPLE OF PATIENTS AT THE OUTPATIENT CHRONIC PAIN CLINIC

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SUMMARY

Background: A high rate of concurrent depression and anxiety has been identified among the patients of pain clinics. Evaluation of own pain can appear as a perception of being negatively impacted by pain-related suffering in social relations.

Subjects and methods: A questionnaire with 228 variables was applied to 109 randomly chosen patients at outpatient pain clinic of the Ljubljana University Clinical Centre. Following summative scores were treated as a set of dependent variables in MANOVA, as a set of predictors in discriminant analysis: level of depression (Zung), level of anxiety (Zung), evaluation of the nature of pain and perceptions of negatively impacted social relations. Actual pain has been self-evaluated on a visual-analogue pain scale from 0 to 10 and recorded in subgroups with a low, middle and high intensity of actual pain (criterion variable).

Results: The average age of the participants was M=52.7 years (SD 13.9), 70.9 % of them female. Participants with a high intensity of pain were found to have the highest level of depression, the highest level of anxiety and were negatively impacted in their social relations to the greatest extent. Only the first discriminant function was found to be significant (p<0.05). The structure matrix showed a high correlation between anxiety level (0.88) and depression level (0.86), and a low correlation with the perception of negatively impacted social relations (0.57).

Conclusions: The results emphasize the connection between pain intensity, anxiety, depression and interpersonal relational issues in the context of patients with chronic pain at an outpatient pain clinic. Anxiety and mood were found to be the best predictors for the perception of pain intensity. The results are preliminary, but significantly support the multidisciplinary collaboration of treatment at a pain clinic with mental health professionals.

Key words: chronic pain - anxiety - depression - impact on social relations

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INTRODUCTION

A complex relationship exists between pain, depression, and anxiety, at least partly due to the overlapping neurobiology (Hooten 2016). The experience of pain consists of the bodily sensation (sensory component) and the negative/aversive emotion or mood. The subjective experience of pain is formed by the combination of information from the discriminatory/thalamocortical and limbic pathways; the latter is responsible for the emotional component of pain (Ploghaus et al. 2003). The main emotional-aversive aspects of pain are mediated through the anterior cingulate cortex, which also has a role in memory since the transient information is being stored in this area during the processing of pain (Larauche et al. 2012). The other essential part of the limbic pathway involved in the emotional/mood component of pain is the central part of the amygdala. It participates in the integration of the physical and mental components of the stress response, especially in generating anxiety and fear. The serotonergic and noradrenergic neurotransmitter systems form the joint neurotransmitter system for pain, cognitive and mood pathways (Chapman 2001).

A high rate of concurrent depression (59%) and anxiety (55%) has been identified among the patients of pain clinics (Rivera et al. 2005). Coexistence between chronic pain and depression tends to further aggravate the severity of both disorders (Sheng et al. 2017). The patients with concurrent depression and anxiety experienced more intense pain that lasted longer, and the presence of pain has negatively affected the recognition and treatment of the concurrent depression (Williams et al. 2012). It is common for people with chronic pain to be worried and anxious, especially if their symptoms are not clearly explainable (Hadjistavropoulos et al. 2011). Chronic pain is generally tied to a spectrum of mental disorders and not exclusively to depression (Goldenberg 2010).

One of the unique features of studying pain is that it is based on personal perceptions and experiences (Khan et al. 2020). Recent investigations showed that the socalled social pain (perception and experience during social detachment, alienation, even the experience of personal jeopardy as a consequence of characteristic activity during a manifestation of chronic pain) may partially have the same neurobiological substrate as physical pain (anterior cingulate cortex) (Eisenberger 2012). It was not until relatively recently that the social influence and communication about pain has become emphasised and researched (Hadjistavropoulos et al. 2012). The social role of persons with chronic pain may

change and there is an uncertainty about their contribution to the family and other people may perceive and value them differently. Social processes such as social alienation and lack of support may contribute to mutual sensitization and contribute to more intense pain and vice versa. Such social processes may be frequently experienced by chronic pain patients, e.g. interpersonal relations-related rejection; they may also have problems with intimate or family relations (Macdonald & Leary 2005, Smith 2003).

Pain has been unrecognised, poorly evaluated, underestimated and inappropriately treated (Burns et al. 1997). There is a constant tendency to underestimate the pain of others. The comparison of the self-evaluation of pain and the evaluation of pain as seen by family and medical workers, who have been significantly involved in the process of pain relief, has shown a systematic underestimation of the patient's pain in the eyes of the people involved with the suffering person's treatment (Hadjistavropoulos et al. 2012). For the most part, pain or the perception of pain cannot be measured directly since it has always been a subjective experience. This is why it is important how a suffering person manages to communicate their pain, so that they can receive appropriate help (Hadjistavropoulos et al. 2011) and so that helpers can approach the treatment of chronic pain with an understanding of the influence of emotions and mood. Without understanding and considering the psychological and social context, which can be greatly assisted through an interdisciplinary collaboration, chronic pain, according to the professional literature, is difficult to treat not only for the medical personnel but for the patient as well (Craig 2009), who needs information about the nature and possible modulation of pain for better control of it.

The focus of the present study could be defined by the following question: taking into account particular predictors (level of depression and anxiety, evaluation of the nature of own pain and its social consequences), can we predict the different intensities of actual pain self-evaluation (low, middle and high) in a naturalistic sample of patients at a pain clinic? The following variables are treated: a. - as a set of predictors in multivariate discriminant analysis, and b. - as a single dependent variable in the framework of univariate analysis: 1. self-perceived depression, 2. self-perceived anxiety, 3. evaluation of the nature of own pain and 4. perception of being negatively impacted socially in different social relations because of own public and manifest expression of pain-related behaviour. We expect that the intensity of actual pain in the patients of a pain clinic, with a suitable probability, can be predicted on the basis of the set of four predictors (the perception of one's own depression and anxiety, evaluation of the nature of one's own pain and the perception that one's own social relations are negatively

impacted due to public manifestation-related own pain) at the level of at least the first of the three possible discriminant functions. On the other hand, the study also has a very important utilitarian and applicative goal: that is to begin introducing the obtained findings into everyday clinical work.

SUBJECTS AND METHODS

Participants in the research

Questionnaires were applied to n=109 randomly chosen patients treated in the outpatient pain clinic of the Ljubljana University Medical Centre. N=87 patients answered the questionnaire and returned it to the interviewer (79.8 %). The study included a completely random selection of the naturalistic clinical population. Patients who consecutively visited the clinic were invited to participate in the study on days when a medical student / interviewer was present. He had no influence on which patients to invite. All the patients were invited to complete the questionnaire except for patients who were not able to fulfil the questionnaire alone according to clinical cognitive impression (cognitively compromised elderly patients with relatives who communicated with medical personnel). The participation was entirely voluntary and questionnaires were anonymised. The interviewer had acquired medical data from medical documentation (patients' identification numbers, diagnosis, medications, specialists involved in treatment). The participants could refuse to participate at any time without any consequences for their treatment. The participants in the study did not receive any monetary compensation.

The average age of the participants was M=52.7 years (SD=13.9). There were 70.9% female participants (aged on average M=54.0 years, SD=13.2) and 29.1% male participants (aged on average M=49.4 years, SD=15.8 years).

Instruments

A questionnaires with 228 variables were applied, including questions about the characteristics of personal, demographic, socio-economic and socio-cultural status, such as gender, age, marital status, nationality and number of children. The questionnaire included dependent variables regarding different self-evaluations of pain, level of mood (anxiety, depression), the profile of five personal traits BFI – Big Five Inventory (John et al. 1991), self-perception of the physiological response to pain and other social-cognitive characteristics of pain perception. From the whole study, only one, yet very relevant from a research aspect, has been included in the actual presentation. The following (dependent) variables have been included in the actual contribution:

- ***Zung's Self-Rating Depression Scale*** (Zung 1965): the instrument includes 20 questions; answers are formulated as a scale of perceived frequency from 1 (never, very rarely) to 4 (always). For clinically applicable evaluation, the entire summation is divided by 80 and then multiplied by 100 (with values from 25 to 49 points as the normal state, from 50 to 59 as mild depression, from 60 to 69 as moderate depression and 70 points and more as heavy depression). Cronbach alpha of internal consistency = 0.84.

- ***Zung's Self-Rating Anxiety Scale*** (Zung 1971): the instrument includes 20 questions; answers are formulated as a scale of perceived frequency from 1 (never, very rarely) to 4 (always). For clinically applicable evaluation, the entire summation is divided by 80 and then multiplied by 100 (with values from 25 to 49 points as the normal state, from 50 to 59 as mild anxiety, from 60 to 69 as moderate anxiety and 70 points and over as heavy anxiety). Cronbach alpha of internal consistency = 0.86.

The perception of being negatively impacted in different social relations (by the social environment owing to the manifestation of one's own pain): evaluation of the degree the perceptions of various other actors negatively impact various social relations and characteristics of self-perception. (»To what degree do you think that your pain experience, as perceived by various other people/environments, negatively impacts your (with single answers from 1 (no negative impact at all) to 5 (strong negative impact): … reputation / selfconfidence / self-respect / acceptance by your family / your friends / your co-workers … The whole scale includes 13 items with answers from 1 to 5 and the whole scale is treated as a summative value with relatively high internal consistency (Cronbach alpha = 0.93 with n=50 valid cases). A higher summative score means more expressive perceptions (by the participants) that their public manifestation of pain experience means that their social relations and self-concepts are more strongly impacted in a negative way by the relevant social environment. The final number of items in the scale was chosen from a larger number of antecedent items that had been selected according to typical personal and inter-personal life situations. Further constructional procedure strictly followed the demands of summative scale construction and it represents a suitable analogy of Likert's attitude scale; for each single item, its discriminative value was also identified; only those items were selected in the final form that suitably discriminated (which positively, significantly (p<0.05) and highly correlated with the summative score.

Evaluation of pain, as experienced by the participants in their own actual life situations (in total 15 bipolar continuums from 1 to 7); an example: »The pain is: inutile 1 2 3 4 5 6 7 utile). The internal consistency of the summative scale is high enough (Cronbach alpha = 0.82). The higher the final summative value, the more negative the evaluation of one's own pain. Being constructed as semantic differential, the scale is composed of single bipolar continuums (between two attributes – mostly adjectives with contrast connotative meaning). Positive and negative attributes were positioned respectively at the beginning (number 1) or end (number 7) of the continuum randomly. Positive or negative attributes are not only on one side of the bipolar continuums from 1 to 7. In the framework of statistical analysis, the single continuums (those with positive attributes on the left side) were recorded so they had the same sense – connotative meaning and a higher final summative value means a more negative evaluation of own pain.

Actual pain has been self-evaluated on a visual-analogue pain scale from 0 (no pain) to 10 (worst possible pain). Later, values from 0 to 4 were recoded as "lowintensity actual pain" (group 1), 5 as "middle-intensity actual pain" (group 2) and values from 6 to 10 were recoded as "high-intensity actual pain" (group 3).

To verify the alternative hypothesis that the estimation of the actual pain could be predicted to the level of at least one (at least the first) significant function (out of three possible canonical discriminant functions) the discriminant analysis was anticipated (taking into account the satisfied condition of the approximate normal distribution of the dependent variables and the homogeneity of covariances). The variables "self-rated depression, anxiety, evaluation of the nature of own pain and the feeling of negatively impacted social relations because of the pain" have been treated as a set of four predictive variables while three categories of self-estimation of one's own actual pain as a criterion variable (low, middle and high intensity actual pain). We paid attention to the homogeneity of covariances connected to a high enough risk level of the mentioned covariance testing (p> or p>>0.05). In the framework of an additional univariate analysis, the same variables were treated as single dependent variables with the intensity of actual pain (low, middle and high) being the independent variable. In the case of a multivariate approach (discriminant analysis), three possible intensities of pain (low, middle and high) have been treated as a classifying variable.

The study was approved by the Medical Ethics Commission of the Republic of Slovenia, No. 166/07/13.

RESULTS

The results of the discriminant analysis

Descriptive statistics (summative scores) for the variables – level of depression, level of anxiety, evaluation of own pain, perceptions of negatively impacted social relations – are presented in Table 1.

Table 1. Descriptive statistics (summative scores) for the level of depression, level of anxiety, perceptions of being threatened in social relations regarding three categories of perception of actual pain by clinical sample of patients, treated for chronic pain

Predictors	Criterion – intensity of actual pain	M	SD	N
Depression	Low	39.26	8.02	27
	Middle	42.92	10.03	12
	High	48.00	8.71	24
Anxiety	Low	36.70	8.96	27
	Middle	38.58	6.13	12
	High	45.75	10.11	24
Evaluation of the nature	Low	46.44	19.78	27
of own pain	Middle	50.08	25.44	12
	High	41.25	21.95	24
Perceptions of being threatened	Low	26.96	14.57	27
in social relations	Middle	32.75	10.41	12
	High	36.00	12.85	24

Note 1: Depression = higher value means higher level of depression;   Anxiety = higher value means higher level of anxiety
Evaluation of the nature of own pain = higher value means a more negative evaluation of their own pain;
Perceptions of being threatened in social relations = higher value means perception of more threatened social relations

The multivariate demand for the homogeneity of covariances is satisfied (Box's test of the equality of covariance – Box's M=19.98, F=0.88, p=0.61). The results of the variance multivariate test for the treated set of dependent variables regarding the perception of actual pain showed significant differences in each of the applied tests in the set of dependent variables regarding the three levels of variation of an independent one (Wilks' Lambda = 0.75, $F_{(8, 114)}$=2.15, p=0.036). The homogeneity of the variances as a demand for univariate analysis of the variance was also verified and the following results were found: Levene's test of the equality of error variances for depression ($F_{(2, 60)}$=0.31, p=0.73), anxiety ($F_{(2, 60)}$=1.36, p=0.26), evaluation of own pain ($F_{(2, 60)}$=0.51, p=0.60), and the feeling of negatively impacted social relations ($F_{(2, 60)}$ = 0.96, p=0.39). The homogeneity of the variances has been confirmed by each single dependent variable.

The tests of between-subject effects, derived from the multivariate analysis of variance for the three-level independent variable »intensity of actual pain«, found significant differences in each single dependent variable except for »evaluation of own pain«: depression ($F_{(2)}$ = 6.45, p=0.003, Eta^2=0.18), anxiety ($F_{(2)}$=6.77, p=0.002, Eta^2=0.18), evaluation of the nature, of own pain ($F_{(2)}$=0.74, p=0.48, Eta^2=0.02), and the feeling of negatively impacted social relations ($F_{(2)}$=3.03, p=0.056, Eta^2=0.09). The participants with a high intensity of pain were found to have the highest level of depression, the highest level of anxiety and were negatively impacted in their social relations to the greatest extent. The evaluation of (nature of) their pain did not differ in terms of the intensity of their actual pain.

The multivariate analysis of variance, together with univariate specifications, was complemented with discriminant analysis. Wilks' test of the equality of group means as a univariate option confirms the univariate results from the univariate option of MANOVA – multivariate analysis of variance. The results are as follows: depression: Wilks' Lambda = 0.82, $F_{(2, 60)}$=6.45, p=0.003; anxiety: Wilks' Lambda = 0.82, $F_{(2, 60)}$=6.77, p=0.00; evaluation of the nature of pain: Wilks' Lambda = 0.98, $F_{(2, 60)}$=0.74, p=0.48; perceptions of negatively impacted social relations: Wilks' Lambda = 0.91, $F_{(2, 60)}$=3.03, p=0.056.

The tests of the significance of the discriminant functions showed the following results: Wilks' Lambda for the first canonical function (= 0.75), Chi-sq. (8) = 16.47, p=0.036; Wilks' Lambda for the second canonical function (= 0.97), Chi-sq. (3) = 1.59, p=0.66. Only the first canonical function was found to be significant (eigenvalue of the first discriminant function = 0.29, canonical correlation = 0.47, percent of variance explained = 91). From the discriminant point of view, Box's test of equality of covariance was also found to be non-significant – Box's M = 19.98, F=0.88, p=0.61; the demand for the homogeneity of the covariances has been satisfied.

The structure matrix of the correlations between manifest variables (represented with summative scores), as predictors on the one hand and as the first and only significant discriminative function on the other, is shown in Table 2. The highest correlation could be identified between the first discriminant function and the summative score, which expresses the evaluation of anxiety (= 0.877). Relatively very high and similar correlations between the discriminant canonical function and the summative score of depression were also found. The perception of negatively impacted social relations due to pain is also worth mentioning due to the low correlation with the first discriminant canonical function.

Table 2. Structure matrix of correlation between canonical discriminant function and manifest variables from the set of predictors

	Functions	
	1	2
Perception of own anxiety	0.877	-0.331
Perception of own depression	0.860	0.180
Perceptions of being Threatened in social relations	0.571	0.487
Evaluation of own pain	-0.226	0.601

Note: only the first canonical function is significant

The centroids for the first discriminant function for the first group (low intensity of actual pain) = -0.520, for the second group (middle intensity of actual pain) =-0.119 and for the third group (high intensity of actual pain) = 0.64. It can be said that patients with a low, middle and high intensity of self-evaluated actual pain represent relatively different subgroups in terms of mood levels and feeling negatively impacted in the area of social relations due to pain. Relatively, the most diverse is the group of patients with a high intensity of actual pain. The first and third group (low and high intensity of pain) have similar values for the centroids, yet with opposite signs.

DISCUSSION

An alternative hypothesis was accepted for the set of dependent variables (self-evaluation of depression and anxiety, evaluation of the nature of own pain and the perception of negatively impacted social relations because of the pain) regarding three categories of independent variable, expressing the evaluation of actual pain intensity. The univariate option of MANOVA showed no significant difference in the dependent variable »evaluation of the nature of own pain«, but significant differences were established for each of the other single dependent variables (self-rated depression and anxiety, and the perception of negatively impacted social relations). Taking into account post-hoc analysis, a significant difference was found between the first and the third categories of independent variable "depression" and "perceptions of negatively impacted social relations". The participants who estimated their actual pain as (much) greater also perceived themselves as much more negatively impacted in the area of social relations than those who felt their actual pain was lower. A similar (analogous) difference between the lowest and highest intensity of actual pain was also found in selfrated depression and in self-rated anxiety: in the last case, the difference in anxiety between the middle and high intensity of actual pain was also found at the 6 % risk level. The discriminant analysis was realised in a complementary way and in addition to the multivariate analysis of variance. Only the first discriminant function was found to be significant ($p<0.05$) and the structure matrix showed relatively very high correlation not only of self-rated depression but of self-rated anxiety with the first and only significant canonical function as well.

Those participants who rate themselves as more depressive and anxious and also tend to perceive themselves as more negatively impacted in the area of social relations due to pain could also be classified to a significant degree as those with a high intensity of actual pain. From our data, it cannot be concluded whether participants with a higher intensity of pain, anxiety and depression evaluated their perception of negatively impacted social relations because of self-stigmatization or because of insecure attachment with non-supportive relationships. However, the results, even with this small sample, are worth thinking about. The results introduce a connection between pain intensity, anxiety, depression and relational issues in the context of patients with chronic pain. Connections between depression/anxiety and pain have been identified in the patients of a pain clinic and pain has been identified as being connected with depression as well; in a Slovenian study on painful physical symptoms in depressed psychiatric inpatients, patients with painful physical symptoms had more severe depressive symptoms, a lower level of functioning, and were prescribed more analgesics (Rijavec & Novak Grubič 2013). Concurrent emotional states or mood disorders cannot be the only cause but also a variously intensive consequence of the same pain problem as well. Anxiety and depression stand out when it comes to the bidirectional connection with chronic pain in the area of mental disorders (Simons et al. 2014). In the Dutch Study of Depression and Anxiety, 2676 participants were followed up for four years. The subjects with depression and/or anxiety reported more severe pain than the controls. However, even after the remission of depression and anxiety, the subjects reported higher pain ratings over time. It seems that depression and anxiety exert negative effects on pain ratings, even after remission (Gerrits et al. 2014). With regard to the study of Gerrits et al. (2014), participants in our study with a higher self-evaluation of anxiety and depression could be understood to be at risk of a long-term pain problem. In a study by Waugh et al. (2014), 92 adults with chronic pain responded to a questionnaire exploring the presence of an internalised stigma and its association with a range of psychological consequences. As predicted/foreseen/anticipated, a large percentage of people with chronic pain (38%) endorsed the experience of internalised stigma. The results showed that an internalised stigma has an adverse effect on self-esteem and pain self-efficacy, after controlling for the depression variable. According to the Social Pain Theory (MacDonald & Leary 2005), both social and physical pain involve the same neural system, presum-

ably because the physical pain system was already in place when social rejection became important in evolutionary history. Therefore, factors that cause either physical or social pain are associated with increases in both kinds of pain, and vice versa. Andersen et al. (2014) emphasised that besides the pain itself, people living with chronic pain are affected in other aspects of their lives. In particular, it is evident that they experience challenges in terms of depressive thoughts, disability, lower quality of life and conflicts in close relationships. The results from our sample are concordant with their notions. The authors (Andersen et al. 2014) support the idea that when designing interventions for people with chronic pain, it is essential to take into consideration the fact that living with chronic pain has far-reaching consequences beyond the pain suffered. Chronic pain has a severe detrimental effect on patients' social and family environment. Dueñas et al. (2016) emphasized that it would be beneficial to promote more social- and family-oriented research initiatives in chronic pain to obtain more comprehensive improvements for patients in familial and social contexts.

Advantages and imperfections of the study: we found out that the correlation between pain and mood is a well-known issue, however fears of social exclusion in terms of negatively impacted social relations is much rarer. A larger sample would increase the generalisation of the results towards the corresponding target population. Plans for the future include a more appropriate representativeness of the sampling and forming a wider multidisciplinary research team.

CONCLUSIONS

Since pain is not only a somatic problem but is always conceptualized as a subjective phenomenon or emotion/mood, which also influences interpersonal relations (Ploghaus et al. 2003), there are additional insufficiently recognized and utilized means of intervention when it comes to pain modulation at the level of mental processes in medicine (Simons et al. 2014). Regarding our results, self-evaluation of higher anxiety, depression levels and to a lesser extent perceptions of a negative social impact due to pain predict the intensity of the pain. The results are preliminary, but significantly support the multidisciplinary orientation of treatment at a pain clinic.

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