

Original Article

## Psychological interventions influence patients' attitudes and beliefs about their chronic pain

Audrey (Please add the affiliation "GIGA (ULg) B34, Quartier Hôpital, Sart-Tilman, Belgium" for Audrey Vanhauzenhuysse) Vanhauzenhuysse<sup>a,\*</sup>

avanhauzenhuysse@chu.ulg.ac.be

Aline Gillet<sup>b</sup>

Nicole Malaise<sup>a</sup>

Irène Salamun<sup>a</sup>

Stéphanie Grosdent<sup>c</sup>

Didier Maquet<sup>c</sup>

Anne-Sophie Nysse<sup>b,d</sup>

Marie-Elisabeth Faymonville<sup>a,d</sup>

<sup>a</sup>Algology-Palliative Care Department, University Hospital of Liège, University of Liège, Belgium

<sup>b</sup>Department of Work Psychology, University of Liège, Belgium

<sup>c</sup>Department of Motricity Sciences, University Hospital of Liège, University of Liège, Belgium

\*Corresponding author. Department of Algology and Palliative Care, University Hospital of Liège, University of Liège, Domaine Universitaire du Sart Tilman B35, B – 4000 Liège 1, Belgium. Fax: +32 4 366 70 13.

<sup>d</sup>Both authors contributed equally.

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### Abstract

#### **Background**

Patients' changing attitudes and beliefs about pain are considered as improvements in the treatment of chronic pain. Multidisciplinary approaches to pain allow modifications of coping strategies of patients, from passive to active.

#### **Methods**

We investigate how two therapeutic treatments impact patients' attitudes and beliefs regarding pain, as measured with the Survey of Pain Attitudes (SOPA). We allocated 415 patients with chronic pain either to psychoeducation combined with physiotherapy, self-hypnosis combined with self-care learning, or to control groups. Pain intensity, global impression of change, and beliefs and attitudes regarding pain were assessed before and after treatment.

#### **Results**

Our main results showed a significant effect of psychoeducation/physiotherapy on control, harm, and medical cure SOPA subscales; and a significant effect of self-hypnosis/self-care on control, disability and medical cure subscales. Correlation results showed that pain perception was negatively associated with control, while positively associated with disability, and a belief that hurt signifies harm. Patients' impression of improvement was associated with greater control, lower disability, and lower belief that hurt signifies harm.

#### **Conclusions**

The present study showed that self-hypnosis/self-care and psychoeducation/physiotherapy were associated with patients' evolution of coping strategies from passive to active, allowing them to reduce pain perception and

improve their global impression of treatment effectiveness.

**Keywords:** Chronic pain; Hypnosis; Psychoeducation; Coping

## 1 Introduction

In recent years, it has become increasingly clear that psychological factors play an important role in the experience of chronic pain<sup>1</sup> and studies have shown the effective benefits of non-pharmacological approaches, as well as a real need for assessments of combinations of pain treatments.<sup>2-4</sup> Multidisciplinary approaches usually encompass programs that adhere to the biopsychosocial conceptualization of chronic pain and include more than just physical treatment.<sup>5</sup> In a recent meta-analysis, the authors show that physical rehabilitation combined with psychological interventions (i.e., biopsychosocial approaches) were more effective than the usual treatments (i.e., care provided by a general practitioner or medical specialist) to decrease pain and disability in chronic pain patients.<sup>5</sup>

In addition, when pain becomes persistent, patients may modify their previously held cultural or personal beliefs and attitudes about pain to form views that are more consistent with their persistent pain experience. A number of studies have argued for the importance of considering patients' attitudes and beliefs about pain treatments, since it can influence the treatment outcome.<sup>6</sup> Multidisciplinary approaches to pain usually focus cognitive interventions on unhelpful pain cognitions and beliefs, such as fear-avoidance beliefs, catastrophic thought processes, and the belief that pain necessarily results from tissue damage.<sup>7</sup> Studies have shown that these program approaches have resulted in increased functional performance, produced positive changes in pain experience (i.e., measures of sensation and "unpleasantness" pain ratings), increased cognitive coping and appraisal (positive coping measures), and reduced behavioral expressions of pain.<sup>8</sup> Several scales exist to assess the attitudes and beliefs of patients regarding pain. The Survey of Pain Attitudes (SOPA) is one of these validated scales developed to identify pain-related beliefs, and was shown to be useful in chronic pain management.<sup>9,10</sup> Previous results have highlighted that the belief that one is disabled by pain was associated with both psychological and physical dysfunction, that a greater belief that hurt signifies physical injury was associated with greater physical dysfunction, and the belief that emotions affect pain was associated with psychosocial dysfunction.<sup>11</sup>

The main objectives of this study were longitudinal and descriptive with an observational methodology. We here investigate how two therapeutic treatments routinely delivered in the Algology and Palliative Care Department of the University Hospital of Liège (Belgium) impact patients' attitudes and beliefs regarding pain, as measured with the SOPA. The overarching motivation for this work is that understanding how patients cope with their chronic pain, and how treatments impact their coping, will help to improve treatment outcomes and the design of care delivery for chronic pain patients.

## 2 Materials and methods

### 2.1 Population

Two therapeutic interventions (self-hypnosis combined with self-care learning, and physiotherapy combined with psycho-education) were proposed to chronic pain patients in our Algology and Palliative Care Department. Patients were included from January 2007 to December 2012. Only patients on stable pharmacological medication during the last four months before screening were allowed to participate in this study.

The multidisciplinary team allocated 415 patients with chronic pain (348 females [mean age  $54 \pm 11$  years; mean duration of pain  $124 \pm 123$  months], 67 males [ $53 \pm 11$  years;  $107 \pm 115$  months]) to the treatment program. Of these 415 patients, 89 were assigned to the control group, 169 to physiotherapy/psycho-education group, and 157 to self-hypnosis/self-care group [different chronic pain etiologies were equally represented across groups<sup>12</sup>]. [Table 1](#) presents characteristics of patients for each treatment group. The mean duration between pre- and post-intervention health assessment was  $9 \pm 4$  months.

**Table 1** Mean and standard deviation (SD) for age and pain duration of patients according to gender and therapeutic group. y, year; m, months.

Therapeutic group	Number of patients (N)	Gender	Mean age (SD)	Mean duration of pain (SD)
Control	89	23 Male	53y (13)	122 m (150)
		66 Female	56y (13)	121 m (133)
Psycho-education and physiotherapy	169	19 Male	55y (9)	72 m (84)
		150 Female	54y (10)	114 m (113)

Self-hypnosis/self-care learning	157	25 Male	50y (10)	125 m (89)
		132 Female	54y (11)	141 m (130)
Total	415	67 Male	53y (11)	107 m (115)
		348 Female	54y (11)	124 m (123)

## 2.2 Design

The method used was the same as previously published by Vanhauzenhuysse et al.<sup>4</sup> Briefly, the design included four phases: (1) an initial screening phase during which the algologist elaborated an appropriate pain diagnosis, checked if pain treatment was stable and proposed the patient as suitable for a multidisciplinary approach, (2) a baseline pre-treatment assessment of patients' health using questionnaires conducted by a nurse, (3) a treatment delivery phase, and (4) a post-treatment assessment of patients' health using the same questionnaires conducted by a nurse (Fig. 1). Between phases 2 and 3, patients have to meet all experts of the pain team encompassing the algologist, nurses, physiotherapist and psychologist. Once patients have met each expert, pain diagnosis was elaborated based on discussion during weekly multidisciplinary meetings. The multidisciplinary team allocated patients to a treatment group based on patients' physical and psychological conditions, patients' individual pain history, patients' daily functioning as well as previous treatments tested by patients. Patients were thus included in a treatment group when the clinical team had recorded a pain problem for which the patient had tested several treatments that had not significantly resolved this pain problem. Based on our clinical experience and existing guidelines, pain diagnosis includes the research of chronic pain etiology, specific pain symptoms and signs, as well as medical and psychiatric comorbidities. Patients were informed about all the possibilities. Preferences about the type of treatment approach were also discussed with the patients during the psychological evaluation by our pain psychologist. Patients' agreement with approaches proposed by the team and patients' agreement to actively participate were mandatory. Treatment was proposed according to our clinical experience, supported by previous results showing the benefit of physiotherapy, self-hypnosis and psycho-education in chronic pain management.<sup>4</sup> In this study, we compared the two treatment plans, i.e., physiotherapy combined with psycho-education and self-hypnosis/self-care learning, with a control group.

- (1) Control group. This included patients who were not able to participate in an intervention group for various reasons, such as a long distance between home and the centre, difficulty travelling, lack of interest in regard to the treatments proposed. Patients included in this group were invited to complete pre- and post-assessment health questionnaires after a waiting period of 9 months.
- (2) Psycho-education combined with physiotherapy. The physiotherapy program was conducted by a rehabilitation specialist, physiotherapists and an occupational therapist and combined 'back school' with physical training programs. A complete description of the physiotherapy program can be read in.<sup>13</sup> The 'back school' consisted of theoretical information on spinal functional anatomy and pathophysiology, identification of risks associated with daily activities and description of preventive measures. A number of exercises were used to put this information into practice, targeting muscle awareness and proprioception, breathing and relaxation, handling of loads and adjustment of daily activities. The physical training program included graded exercise therapy encompassing training on a cycle ergometer, muscle toning, stretching and individually tailored exercises. These exercises comprised active mobilization of the trunk muscles. Psycho-education was conducted by two psychologists, experts in pain management. Psycho-education is 'designed to train patients in the skills of self-managing or adapting treatment to their particular chronic disease, and in coping processes and skills'.<sup>14</sup> This intervention involves supportive and non-directive group discussions. These discussions aim to empower patients to become active participants in their own treatment, and to provide patients with a comprehensible model of pain mechanisms, an understanding of the rationale for pharmacological, physical and psychological therapy, and an acceptable rationale for making life style changes. Each group included 8–10 patients. Patients in this group simultaneously received 10–12 physiotherapy sessions of 2 h <sup>min</sup> and 8–10 psychoeducation sessions lasting 2 h.
- (3) Self-hypnosis/self-care learning was conducted by a pain specialist. Teaching self-hypnosis and self-care effectively is primarily based on good communication between the health care provider and patient, involving interventions tailored to the kind of problems that chronic pain patients often encounter. We created a negotiating approach that fosters shared decision making through using tasks centered on general well-being rather than on the pain problem itself. Patients were asked to be actively involved and to give their consent in introducing changes to their usual daily functioning. Self-hypnosis/self-care learning was used as a process of activating patients by rejecting the passive role often encountered in this patient group, to expand awareness and amplify positive experiences. The following topics were addressed through tasks: adjusting self-expectations; revision of self-narrative; reinforcing sense of self-worth; adaptation of social roles; identification of situations and feelings of powerlessness; finding one's own boundaries and personal needs; accepting that not everything is controllable; and differentiating self from illness. Patients were given homework assignments during the time between sessions and were encouraged to practice skills to consolidate learning. Patients were also required to keep a 'work-diary'; these diaries were reviewed at the beginning of each session. At the end of the session, a 15-min hypnosis exercise was conducted with the group of patients. They also received individual CDs containing the hypnosis exercise from the session, and were invited to perform this exercise on a daily basis. Each group included 8–10 patients. Patients received six sessions of 2 h at 5 week intervals.

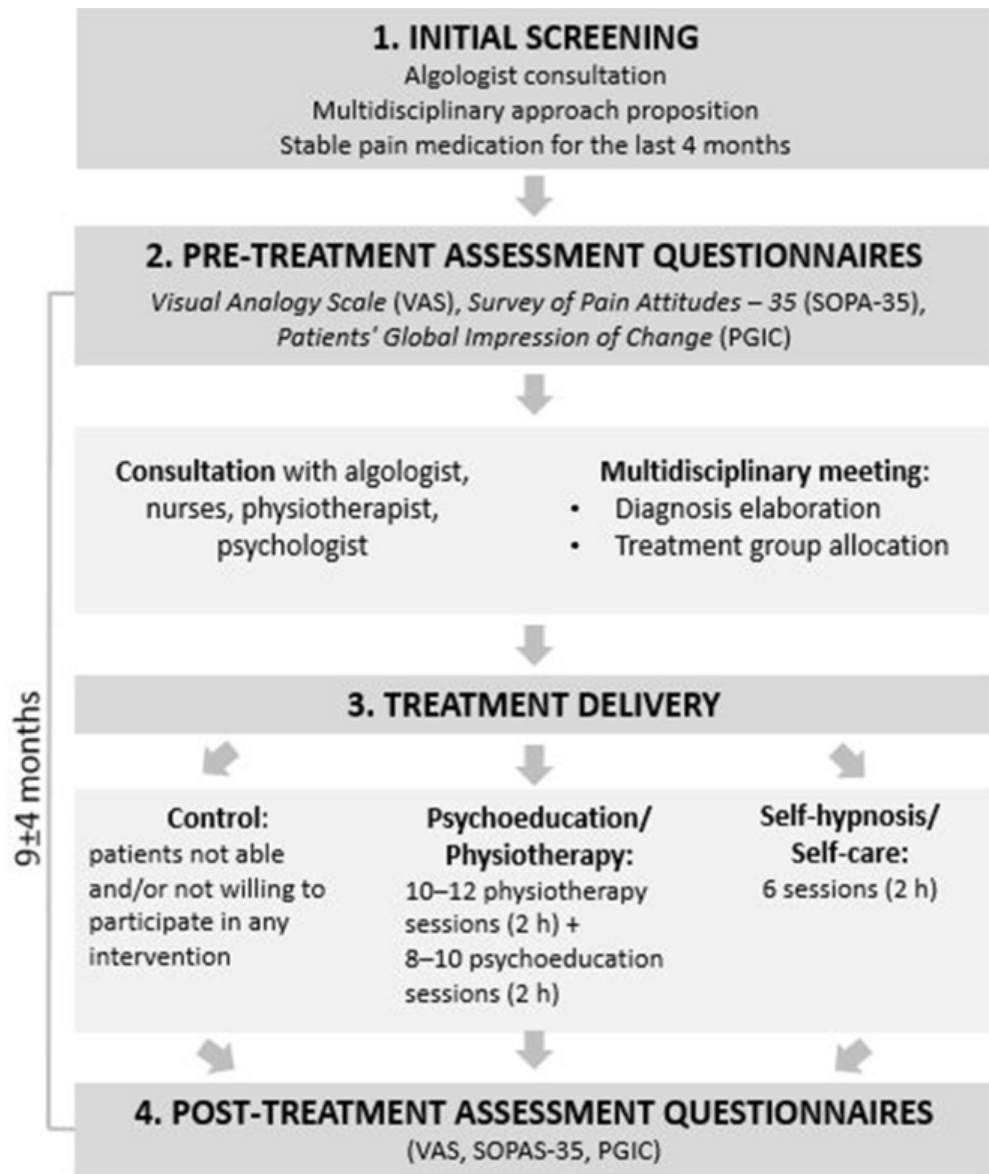


Fig. 1 Flow diagram of patient screening and treatments administered.

alt-text: Fig. 1

### 2.3 Data collection

The following questionnaires were contained in the pre- and post-intervention assessment battery:

- The Visual Analogic Scale (VAS) was used in order to assess pain. The VAS score helps to determine the intensity of pain, as subjectively assessed by the patient, on a scale ranging from 0 to 10. In this study, patients were asked to assess the pain felt during the past four weeks.
- The Survey of Pain Attitudes – 35 (SOPA-35)<sup>9</sup> was used in order to identify and monitor pain-related beliefs, and is composed of 7 subscales. Each subscale is scored from 0 to 20: the higher the score the more the relative belief is endorsed. Patients scored on a 5-point agreement

scale (0: This is very untrue for me, 1: This is somewhat untrue for me, 2: This is neither true nor untrue for me, 3: This is somewhat true for me, 4: This is very true for me). Five subscales assess maladaptive beliefs, which might contribute to greater pain and disability over time:

- Disability: measures the belief that one is disabled by pain.
- Harm: assesses the belief that hurt signifies physical injury.
- Medication: assesses the extent to which a patient believes that medication is an appropriate treatment for his/her chronic pain.
- Solitude: assesses the belief that it is the responsibility of others to assist the patient with his/her pain experience.
- Medical cure: assesses the extent to which a patient believes in a medical cure for his/her pain problem, and that it is the responsibility of the doctor to reduce or cure the pain problem.

The remaining two subscales assess adaptive beliefs, which might lead to a decrease of pain and disability over time:

- Control: measures the sense of control that the patient experiences over his/her pain.
- Emotion: assesses the degree to which the patient believes that his/her emotions impact on his/her pain.

- The Patients' Global Impression of Change (PGIC) scale<sup>15</sup> assesses overall quality of life by considering pain intensity and disability during daily living activities, and anxiety, depression, fear-avoidance and locus of control behavior during social activities. In this study, because of technical encoding, low scores mean improvement of global impression, while high scores mean aggravation of global impression (1: great deal better, considerable improvement making all the difference – 4: change has not made any real difference – 7: condition has got worse).

## 2.4 Statistical analysis

The acquired data were processed using statistical data processing software Statistica 10 (StatSoft, Tulsa, OK, USA). Multivariate analyses (MANOVA) were calculated regarding duration, therapeutic group and gender. The pre- and post-assessment comparison of each measure (SOPA, VAS) within each group was made using a post-HOC Tukey test (HSD for unequal sample sizes). **P**-**v**Values < 0.008 were considered as statistically significant after applying a Bonferroni correction for multiple comparisons. We also calculated Pearson's correlation coefficient between the three scale scores. **P**-**v**Values < 0.017 were considered as statistically significant after applying a Bonferroni correction for multiple comparisons.

## 3 Results

### 3.1 Baseline

Table 2 presents mean scores of the SOPA and the VAS questionnaires on pre- and post-assessment according to the group assignment. In the pre-treatment assessment, the three coping strategies most used by chronic pain patients were emotion, disability and medication.

**Table 2** Mean scores and standard deviation for each measure in pre- and post-health assessment according to the treatment group.

Control Mean (SD)		Psycho- education & physiotherapy Mean (SD)		Self-hypnosis & self-care Mean (SD)		
				Pre	Post	
<b>Visual analogy scale</b>						
5.5 (1.6)	5.7 (2.3)	6.1 (1.7)	5.8 (2.2)	5.3 (1.8)	<b>4.6 (2)<sup>a</sup></b>	
<b>Patients' global impression of change</b>						
n/a	3.7 (1.6)	n/a	3.4 (1.5)	n/a	2.7 (1)	

Survey of pain attitudes – 35						
Control	6.01 (3.89)	7.36 (4.81)	5.67 (3.78)	<b>7.72</b> <b>(4.43)<sup>a</sup></b>	8.57 (3.36)	<b>11.99 (3.51)<sup>a</sup></b>
Disability	14.4 (4.02)	14.27 (4.56)	13.99 (3.81)	13.49 (3.84)	13.06 (3.7)	<b>11.71 (4.16)<sup>a</sup></b>
Harm	10.56 (4.43)	10.21 (4.23)	8.79 (3.9)	<b>7.36</b> <b>(4.3)<sup>a</sup></b>	8.51 (3.95)	7.84 (3.95)
Emotion	11.71 (5.44)	11.75 (5.73)	12.27 (5.31)	13.2 (4.3)	15.01 (3.96)	14.94 (4.18)
Medication	13.58 (4.49)	14.22 (4.57)	13.46 (4)	13.78 (4.18)	13.1 (4.32)	12.09 (4.39)
Solicitude	8.57 (5.63)	8.07 (5.5)	9.46 (5.02)	9.07 (5.12)	8.9 (5.21)	8.49 (4.95)
Medical Cure	11.81 (3.65)	10.78 (3.57)	11.7 (3.46)	<b>9.41</b> <b>(3.32)<sup>a</sup></b>	10.35 (3.44)	<b>9.22 (3.33)<sup>a</sup></b>

<sup>a</sup> Comparison pre-versus post-assessment, p < 0.008, corrected for multiple comparisons. SD, standard deviation.

Regarding the typology of pain in patients included in this study, all pain diagnoses were equally represented across the different groups of treatment. We previously characterized patients presenting with chronic pain to the Algology and Palliative Care Department of the University Hospital of Liège. We observed that among patients referred to our center over a five year period, diagnosis was fibromyalgia in 29%, rachialgia in 20%, somatic symptom disorder in 17%, polyalgia in 15%, neuropathic pain in 7%, osteoarticular pain in 4%, psychiatric in 2% and visceral pain in less than 1%.<sup>12</sup>

### 3.2 Global effects

A multivariate analysis with repeated measures on time of evaluation (i.e., pre- and post-treatment) indicated a significant effect of time (F (7) = 26.07; p < 0.001) and group (F (14) = 13.41; p < 0.001). We also observed a significant interaction between group and time (F (14) = 3.8; p < 0.001).

### 3.3 Pre- and post-treatment changes

The pre-treatment to post-treatment changes in VAS scores are shown in Table 2. Diminution of pain intensity between pre- and post-assessment was observed only for self-hypnosis/self-care treatment (p < 0.008, corrected for multiple comparisons).

A significant increase in pain control was observed for both treatment groups. A decrease in the search for medical cure was observed for both physiotherapy/psycho-education and self-hypnosis/self-care treatments. A decrease on the harm subscale was observed in patients in the physiotherapy/psycho-education treatment group. Finally, patients in the self-hypnosis/self-care group also showed decreases in pain disability. All p < 0.008, corrected for multiple comparisons.

### 3.4 Correlations analysis – post-treatment

Table 3 shows existing correlations between post-treatment perceived pain intensity as measured with the VAS, and all scores of the SOPA for each group. Significant negative correlations were found between VAS and control for all groups (i.e., control as well as both treatment groups), meaning that a lesser perception of pain was associated with an increase of perceived control over pain. Significant positive correlations were observed between VAS and disability score for all groups, meaning that a lesser perception of pain was associated with a lesser belief that one is necessarily disabled by pain. Significant positive correlations were observed between VAS and harm scores for all groups, meaning that a lesser pain perception was associated with a lesser belief that hurt signifies physical injury. Finally, a positive correlation was observed between VAS and medication scores for the self-hypnosis/self-care group only, meaning that the lesser pain perception was in these patients, the lesser was the belief that medication is an appropriate treatment for chronic pain.

**Table 3** Correlation between post-treatment Visual Analogic Scale scores per group and Survey of Pain Attitudes (SOPA) subscales.

alt-text: Table 3

Correlation values between VAS post-treatment and SOPA subscales

	Control	Disability	Harm	Emotion	Medication	Solicitude	Medical cure
Control	-0.35*	0.45*	0.32*	-0.12	-0.12	0.22	-0.39
Physiotherapy/Psyo-education	-0.41*	0.41*	0.29*	-0.11	0.14	0.12	-0.11
Self-hypnosis/Self-care	-0.46*	0.37*	0.28*	-0.15	0.22*	0.14	-0.6

\*p < 0.017, corrected for multiple comparisons.

Table 4 shows existing correlations between the patients' global impression of change (PGIC), and all scores of the SOPA for each group. Significant negative correlations were found between PGIC and control scores for all groups, meaning that a greater perception of improvement was associated with an increase in perceived control over pain, even in the control group. Significant positive correlations were observed between PGIC and disability scores for all groups, meaning that a better perception of improvement was associated with a lesser perception of disability. Significant positive correlations were observed between PGIC and harm scores for the control group and physiotherapy/psychoeducation group, meaning that a better perception of improvement was associated with a lesser belief that hurt signifies physical injury. Significant negative correlations were found between PGIC and emotion scores for the physiotherapy/psychoeducation group only, meaning that for these patients a perception of improvement was associated with a belief that pain experience is influenced by emotional state.

**Table 4** Correlation between the Patients' Global Impression of Change (PGIC) and Survey of Pain Attitudes (SOPA) subscales.

alt-text: Table 4

	Correlation values between PGIC and SOPA subscales						
	Control	Disability	Harm	Emotion	Medication	Solicitude	Medical cure
Control	-0.33*	0.31*	0.33*	-0.13	-0.02	0.28	-0.76
Physiotherapy/Psyo-education	-0.48*	0.25*	0.40*	-0.22*	-0.02	0.06	-0.06
Self-hypnosis/Self-care	-0.53*	0.30*	0.19	-0.18	0.18	0.13	0.04

\*p < 0.017, corrected for multiple comparisons.

## 4 Discussion

The aim of our study was to explore the effectiveness of biopsychosocial approaches as treatments in modifying pain-related beliefs and attitudes. In an earlier study, we showed the preferential effect of self-hypnosis/self-care treatment on psychological factors such as anxiety, depression, pain interference and quality of life, as compared to other treatments (physiotherapy alone, psycho-education alone, and psycho-education combined with physiotherapy).<sup>4</sup> Psycho-education combined with physiotherapy was shown to have positive effects on pain interference and anxiety, while physiotherapy alone, and psychoeducation alone both showed fewer effects on the management of chronic pain. These previous results justified our choice to concentrate the aim of this study on self-hypnosis/self-care and psycho-education combined with physiotherapy treatments.

We showed a global effect of time as well as an effect of group on the different subscales of the SOPA, meaning that treatment intervention and the time elapsed impact on the coping strategies for pain. These observations support our previous results highlighting the significant effects of biopsychosocial treatments on psychological factors in chronic pain patients.<sup>4</sup>

### 4.1 Control over pain

Research on how patients manage their pain has differentiated coping strategies into active (involving active behaviors to manage or alter the course of chronic pain), and passive (characterized by avoidance, assistance and relinquishment of pain control).<sup>16</sup> Active coping strategies include participating in therapy treatment, while passive coping includes withdrawing from social activities.<sup>17</sup> Passive reactions regarding pain were shown to be associated with general psychological distress, disability and depression,<sup>10,18</sup> and have a negative impact on daily functioning and the ability to maintain a professional and social life. In our study, we were able to evaluate the appropriateness of coping strategies by using VAS and PGIC scales.

In the studied population, we showed that a better sense of control over pain is associated with an impression of improvement and a decreased pain perception in all groups. Patients who were enquiring for a pain management approach in our algology center seem to show an active mobilization process to better cope with their pain. We also observed that an improvement of sense of control was more important for patients included in the self-hypnosis/self-care group when compared to

psychoeducation/physiotherapy group. The main goals of the self-hypnosis/self-care approach are to actively invert the passive position usually adopted by chronic patients by mobilizing their resources to physically move and by reinforcing their sense of self-worth. Through the tasks proposed during self-hypnosis/self-care, we aim to make patients fully aware of their abilities to modulate pain by adopting daily life strategies. It is well known that self-efficacy as well as sense of control are two important mediating variables in effective coping with chronic pain.<sup>19</sup> Keefe et al.<sup>1</sup> have previously stressed the need for treatment approaches that aim to enhance self-efficacy in patients whose motivation for managing pain is dramatically low because they lack confidence in their own abilities. Previous studies have also shown that the control score of the SOPA is defined as positively correlated with active coping strategies (e.g., relaxation techniques) and negatively correlated with passive coping strategies.<sup>20,21</sup>

Some studies discuss the effectiveness of pain control as an adapted strategy to relieve pain, showing that an exclusive focus on pain control may lead to cognitive, affective and behavioral costs.<sup>22,23</sup> The authors argue that attempts to control pain may lead to hypervigilance and prioritize attention towards pain.<sup>23</sup> We should note that, in these studies, pain control can be defined as behaviors to avoid/relieve pain (e.g., fast button press to avoid painful stimulation, medical consultation shopping) and can be considered as maladaptive strategies. In our study, control strategies were rather part of internal psychological coping strategies not leading to control of pain but rather to reinforce self-confidence in patients' own abilities to modulate pain.

## 4.2 Disability

Our results, characterizing patients consulting our algology center, depict the relationship between feelings of disability and pain severity perception, and between disability and impressions of a worse global condition. These results are in line with a previous study showing that SOPA-disability attitudes were associated with self-reported pain behaviors, i.e., distorted ambulation or facial/audible expressions of pain and passive coping behavior.<sup>21</sup> Our results also showed that self-hypnosis/self-care treatment reduces the mobilization of this type of coping with pain when compared to psychoeducation/physiotherapy and control groups. Other studies have shown a negative association between SOPA disability and psychological well-being in chronic pain patients.<sup>24</sup>

## 4.3 Harm

Not surprisingly, in the studied population, we found that a harm score is linearly correlated with pain perception in all groups, and with a negative impression of improvement in patients included in physiotherapy/psychoeducation and control groups. A previous study showed that the harm subscale correlated negatively with active coping and positively with passive coping strategies, pain intensity, and disability.<sup>25</sup> We also found positive effects of psychoeducation/physiotherapy on the SOPA harm subscale. Other studies have demonstrated beneficial effects of psycho-education combined with physiotherapy on various factors of pain.<sup>4,26,27</sup>

## 4.4 Emotion

Our results showed that a positive global impression of change is associated with the mobilization of emotions as a coping strategy with pain only in patients included in the physiotherapy/psychoeducation treatment approach proposed in our algology center. During psychoeducation, we provided patients with a comprehensible model of pain mechanisms, and an understanding of the rationale for pharmacological, physical and psychological therapies. We broached how emotional events can profoundly influence feelings of pain, as well as the relationship that exists between emotion and the variation of pain perception. This better understanding of emotion seems to allow patients to better regulate their emotions leading to a better changing impression of treatment.

Our results are interesting as in the literature the usual thinking is that emotions affect pain, and are associated with psychological dysfunction, as well as with facial expressions of pain and pain extent (reflecting an array of dysfunctional responses to pain).<sup>11,25</sup> In addition, some studies showed that SOPA-emotion is associated with pain behaviors,<sup>21</sup> pain intensity,<sup>28</sup> depression, passive coping, affective distress, and helpseeking.<sup>25</sup> The belief that emotions exacerbate pain represents negative attitudes and reflects the belief that pain is damaging and uncontrollable.<sup>25</sup> Conversely, other studies have considered that higher scores on the emotion subscale can be seen as an adaptive belief<sup>29</sup> and showed that after pain education information, patients are more likely to believe that pain is influenced by emotional states.<sup>7</sup> An increase in emotion, as measured with the SOPA, is considered as positive (i.e., as an improvement in pain cognition), rather than a maladaptive strategy.<sup>7</sup>

## 4.5 Medication

An association is observed in patients included in the self-hypnosis/self-care group only between the tendency to think that medication is the best treatment for their pain and their pain perception. In this treatment group, patients learned self-hypnosis that they can use to modulate pain rather than only having a pharmacological treatment strategy. Future studies should investigate drug doses used by chronic pain patients before and after self-hypnosis/self-care treatment, with short and long term assessment.

## 4.6 Solicitude

In this study, no significant changes were found between pre- and post-assessment on the solicitude subscale, while some authors have suggested that solicitous support regarding pain may be related to disability levels because these behaviors could motivate efforts to obtain specific forms of support (i.e., pain behavior could be a method to elicit solicitude from the entourage).<sup>30</sup> Psychological interventions we proposed in our algology center did **not** seem to impact this coping strategy in the patients we included in this study.

## 4.7 Medical cure

Both treatments have a positive effect on medical cure. As discussed above, psychoeducation and self-hypnosis/self-care treatments aimed to engage patients in an active process regarding their pain by re-endorsing the active/control position rather



than passive/victim attitudes. These results are in line with previous studies that have shown greater pain tolerance and significant reduction of general practitioner visits in patients involved in treatments based on pain acceptance.<sup>31</sup>

One limitation of our study is the non-randomized design. Indeed, clinicians allocated patients based on their experience and their interpretation of which treatment is suitable for which patient, regardless of the results of the pre-treatment questionnaire. In addition, for ethical reasons, patients' agreement was needed before inclusion in a treatment group.

## 5 Conclusions

In conclusion, the present findings help to better characterize the way patients cope with chronic pain. When they arrived at the pain clinic, patients reported a combination of passive coping methods that principally include emotion, medication and disability based strategies. This study showed that, in the studied population, self-hypnosis/self-care and psychoeducation/physiotherapy were associated with patients' evolution of coping strategies from passive to active, allowing them to reduce pain perception and improve their global impression of treatment effectiveness.

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## Conflict of interest

None declared.

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## References

1

. F.J. Keefe, M.E. Rumble, C.D. Scipio, L.A. Giordano and L.M. Perri, Psychological aspects of persistent pain: current state of the science, *J Pain Off J Am Pain Soc* **5** (4), 2004, 195–211, <http://dx.doi.org/10.1016/j.jpain.2004.02.576>.

2

. A.L. Hassett and D.A. Williams, Non-pharmacological treatment of chronic widespread musculoskeletal pain, *Best Pract Res Clin Rheumatol* **25** (2), 2011, 299–309, <http://dx.doi.org/10.1016/j.berh.2011.01.005>.

3

. T. Adachi, H. Fujino, A. Nakae, T. Mashimo and J. Sasaki, A meta-analysis of hypnosis for chronic pain problems: a comparison between hypnosis, standard care, and other psychological interventions, *Int J Clin Exp Hypn* **62** (1), 2014, 1–28, <http://dx.doi.org/10.1080/00207144.2013.841471>.

4

. A. Vanhauzenhuysse, A. Gillet, N. Malaise, et al., Efficacy and cost-effectiveness: a study of different treatment approaches in a tertiary pain centre, *Eur J Pain Lond Engl* **19** (10), 2015, 1437–1446, <http://dx.doi.org/10.1002/ejp.674>.

5

. S.J. Kamper, A.T. Apeldoorn, A. Chiarotto, et al., Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: cochrane systematic review and meta-analysis, *BMJ* **350**, 2015, h444.

6

. J. Strong, R. Ashton and D. Chant, The measurement of attitudes towards and beliefs about pain, *Pain* **48** (2), 1992, 227–236.

7

. G.L. Moseley, Evidence for a direct relationship between cognitive and physical change during an education intervention in people with chronic low back pain, *Eur J Pain Lond Engl* **8** (1), 2004, 39–45, [http://dx.doi.org/10.1016/S1090-3801\(03\)00063-6](http://dx.doi.org/10.1016/S1090-3801(03)00063-6).

8

. S. Morley, C. Eccleston and A. Williams, Systematic review and meta-analysis of randomized controlled trials of cognitive behaviour therapy and behaviour therapy for chronic pain in adults, excluding headache, *Pain* **80** (1–2), 1999, 1–13.

**9**

. M.P. Jensen, J.A. Turner and J.M. Romano, Pain belief assessment: a comparison of the short and long versions of the surgery of pain attitudes, *J Pain* **1** (2), 2000, 138–150, [http://dx.doi.org/10.1016/S1526-5900\(00\)90099-3](http://dx.doi.org/10.1016/S1526-5900(00)90099-3).

**10**

. M.P. Jensen, J.A. Turner and J.M. Romano, Changes after multidisciplinary pain treatment in patient pain beliefs and coping are associated with concurrent changes in patient functioning, *Pain* **131** (1–2), 2007, 38–47, <http://dx.doi.org/10.1016/j.pain.2006.12.007>.

**11**

. M.P. Jensen, J.A. Turner, J.M. Romano and B.K. Lawler, Relationship of pain-specific beliefs to chronic pain adjustment, *Pain* **57** (3), 1994, 301–309.

**12**

. M.-E. Faymonville, A. Blavier, V. Palmaricciotti, et al., Analyse des caractéristiques biopsychosociales observées chez 1832 patients consultant pour des douleurs chroniques dans le service d'algologie du CHU de Liège, *Douleur Analgésie* **27** (3), 2014, 181–191, <http://dx.doi.org/10.1007/s11724-014-0378-8>.

**13**

. C. Demoulin, S. Grosdent, L. Capron, et al., Effectiveness of a semi-intensive multidisciplinary outpatient rehabilitation program in chronic low back pain, *Jt Bone Spine Rev Rhum* **77** (1), 2010, 58–63, <http://dx.doi.org/10.1016/j.jbspin.2009.11.003>.

**14**

. World Health Organization Regional Office for Europe Copenhagen, Therapeutic Patient Education Continuing Education Programmes for Health Care Providers in the Field of Prevention of Chronic Diseases, 1998.

**15**

. H. Hurst and J. Bolton, Assessing the clinical significance of change scores recorded on subjective outcome measures, *J Manip Physiol Ther* **27** (1), 2004, 26–35, <http://dx.doi.org/10.1016/j.jmpt.2003.11.003>.

**16**

. G.K. Brown and P.M. Nicassio, Development of a questionnaire for the assessment of active and passive coping strategies in chronic pain patients, *Pain* **31** (1), 1987, 53–64.

**17**

. N.N. Niu, A.M. Davis, L.M. Bogart, et al., Patient disease perceptions and coping strategies for arthritis in a developing nation: a qualitative study, *BMC Musculoskelet Disord* **12**, 2011, 228, <http://dx.doi.org/10.1186/1471-2474-12-228>.

**18**

. A.L. Snow-Turek, M.P. Norris and G. Tan, Active and passive coping strategies in chronic pain patients, *Pain* **64** (3), 1996, 455–462.

**19**

. S.P. Buckelew, J.C. Parker, F.J. Keefe, et al., Self-efficacy and pain behavior among subjects with fibromyalgia, *Pain* **59** (3), 1994, 377–384.

**20**

. M.P. Jensen, P. Karoly and R. Huger, The development and preliminary validation of an instrument to assess patients' attitudes toward pain, *J Psychosom Res* **31** (3), 1987, 393–400.

**21**

. M.J. Shen, W.H. Redd, G. Winkel and H. Badr, Associations among pain, pain attitudes, and pain behaviors in patients with metastatic breast cancer, *J Behav Med* **37** (4), 2014, 595–606, <http://dx.doi.org/10.1007/s10865-013-9529-2>.

**22**

. E. Lauwerier, S. Van Damme, L. Goubert, K. Paemeleire, J. Devulder and G. Crombez, To control or not? A motivational perspective on coping with pain, *Acta Neurol Belg* **112** (1), 2012, 3–7, <http://dx.doi.org/10.1007/s13760-012-0020-6>.

**23**

. L. Notebaert, G. Crombez, J. Vogt, J. De Houwer, S. Van Damme and J. Theeuwes, Attempts to control pain prioritize attention towards signals of pain: an experimental study, *Pain* **152** (5), 2011, 1068–1073, <http://dx.doi.org/10.1016/j.pain.2011.01.020>.

**24**

. M.P. Jensen and P. Karoly, Pain-specific beliefs, perceived symptom severity, and adjustment to chronic pain, *Clin J Pain* **8** (2), 1992, 123–130.

**25**

. R.C. Tait and J.T. Chibnall, Development of a brief version of the Survey of pain attitudes, *Pain* **70** (2–3), 1997, 229–235.

**26**

. C. Comer, A.C. Redmond, H.A. Bird, E.M.A. Hensor and P.G. Conaghan, A home exercise programme is no more beneficial than advice and education for people with neurogenic claudication: results from a randomised controlled trial, *PLoS One* **8** (9), 2013, e72878, <http://dx.doi.org/10.1371/journal.pone.0072878>.

**27**

. G.C. Miyamoto, L.O.P. Costa, T. Galvanin and C.M.N. Cabral, Efficacy of the addition of modified Pilates exercises to a minimal intervention in patients with chronic low back pain: a randomized controlled trial, *Phys Ther* **93** (3), 2013, 310–320, <http://dx.doi.org/10.2522/ptj.20120190>.

**28**

. W.S. Wong, M.P. Jensen, K.H. Mak and R. Fielding, Pain-related beliefs among Chinese patients with chronic pain: the construct and concurrent predictive validity of the Chinese version of the Survey of Pain Attitudes-14 (ChSOPA-14), *J Pain Symptom Manage* **42** (3), 2011, 470–478, <http://dx.doi.org/10.1016/j.jpainsymman.2010.12.009>.

**29**

. G.P. Bostick, L.J. Carroll, C.A. Brown, D. Harley and D.P. Gross, Predictive capacity of pain beliefs and catastrophizing in Whiplash associated disorder, *Injury* **44** (11), 2013, 1465–1471, <http://dx.doi.org/10.1016/j.injury.2012.10.007>.

**30**

. L.A. McWilliams, B.D. Dick, K. Bailey, M.J. Verrier and J. Kowal, A psychometric evaluation of the Pain Response Preference Questionnaire in a chronic pain patient sample, *Health Psychol Off J Div Health Psychol Am Psychol Assoc* **31** (3), 2012, 343–351, <http://dx.doi.org/10.1037/a0027014>.

**31**

. L.M. McCracken, K.E. Vowles and C. Eccleston, Acceptance-based treatment for persons with complex, long standing chronic pain: a preliminary analysis of treatment outcome in comparison to a waiting phase, *Behav Res Ther* **43** (10), 2005, 1335–1346, <http://dx.doi.org/10.1016/j.brat.2004.10.003>.

**Graphical abstract**



## Queries and Answers

**Query:** As per journal style, there should be a minimum of five and maximum of six keywords, hence please provide “one” more keyword.

**Answer:** Pain beliefs

**Query:** Please check the layout of “Table 1” and correct if necessary.

**Answer:** ok

**Query:** Please provide a definition for the significance of the values in bold in Table 2.

**Answer:** <sup>a</sup> Pre and post assessment results were significantly different with a  $p < 0.008$ , corrected for multiple comparisons.

**Query:** Please confirm that given names and surnames have been identified correctly.

**Answer:** ok