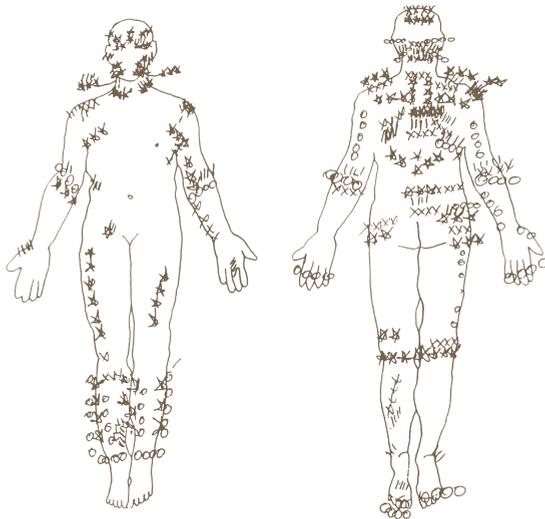CHAPTER 5

Somatization is associated with worse outcome in a chiropractic patient population with neck pain and low back pain

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ABSTRACT

Aim
To determine if psychosocial factors are associated with outcome in patients with neck pain or low back pain.

Methods
In a prospective, multi-center chiropractic practice-based cohort study in Belgium and The Netherlands, 917 patients, of which 326 with neck pain and 591 with low back pain, completed self-administered questionnaires at baseline, following the second visit, and at 1, 3, 6 and 12 months. Psychosocial factors assessed at baseline were: distress, depression, anxiety and somatization via the Four Dimensional Symptom Questionnaire, patient's beliefs regarding the effect of physical activity and work on their complaint via the Fear Avoidance beliefs Questionnaire, and social support via the Feij social support scale. Primary outcome measures were perceived recovery, pain intensity, and functional status which was measured with the Neck Disability Index and Oswestry Disability Index. A univariable regression analysis to estimate the relation between each psychological variable and outcome was followed by a multivariable multilevel regression analysis.

Results
There were no differences in baseline patient characteristics between the patient population from Belgium and the Netherlands. Somatization scores are consistently associated with perceived recovery, functional status and pain for both neck pain and low-back pain. Depression was associated with poorer functioning in patients with LBP. There was a small association between fear and function and pain for patients with neck pain or low-back pain.

Conclusion
Somatization was the only variable consistently found to be associated with diminished perceived recovery, higher degree of neck or low back disability, and increased neck or low back pain.

Neck pain and low-back pain are first and fourth on the list of the 30 leading diseases with the largest number of years lived in disability (US Burden of Disease Collaborators, 2013; Hoy et al, 2014) and are associated with an enormous financial burden (Woolf and Pfleger, 2003; Dagenais et al, 2008; Gore et al, 2012). Given the potentially disabling character of spinal pain and the costs associated with its management in primary care, it is important to identify which factors can influence outcome. These considerations are of particular importance to chiropractors because the vast majority of their patients present with neck pain and low-back pain (Scherer et al, 1982; Ailliet et al, 2010).

It is widely held that neck pain and low-back pain (LBP) are best understood as biopsychosocial phenomena (Burton, 1997; Peters et al, 2005; Sterling, 2006). Recent efforts have been directed towards attempting to help the clinician identify the key biopsychosocial factors that can influence outcome. An example of such efforts is the STarT back screening tool, which was introduced as a tool designed to assist general practitioners' decision-making concerning initial treatment options for patients with LBP in primary care (Hill et al, 2008). The STarT back screening tool has also been examined in a chiropractic setting (Field and Newell, 2012; Kongsted et al, 2011). Notwithstanding the fact that most research within the chiropractic profession has focused on biomedical factors that predict or influence outcome (Kongsted and Leboeuf-Yde, 2010; Malmqvist et al, 2008; Peterson et al, 2012; Rubinstein et al 2008a, Rubinstein et al, 2008b), fear (George, 2006), catastrophizing (Mercado et al, 2005), poor self-efficacy (Woby et al, 2007), and depression (Carroll et al, 2004) have been found to be associated with the development and perpetuation of neck pain and LBP and their related disability in a chiropractic and physiotherapy population.

Nevertheless, even after 25 years of research on the role of biopsychosocial factors more research on the topic seems warranted: the position statement of the 12th International LBP forum clearly indicated that clarity about which predictors of outcome are prognostic factors and which are potential treatment effect modifiers may help guide best practice treatment and prevent disability (Pincus et al 2013). Also, on the first research agenda for the chiropractic profession in Europe academics and clinicians working in a chiropractic setting ranked research into biopsychosocial variables as predictors of outcome 5th in order of importance out of 19 research priorities (Rubinstein et al 2014). For that reason we were interested which psychosocial factors are associated with the outcome in patients with neck pain or LBP.

The challenge for the practicing clinician in a busy clinical environment is to try to capture at a first consultation as much information as possible regarding the presence of factors, including psychological and social factors, that may have clinical relevance and/or may have an impact on decisions regarding whether or not or how to treat the patient. Overburdening the patient with multiple and time-consuming questionnaires should be avoided, thereby, at the same time, ensuring minimal disturbance of normal office routine.

We conducted a prospective study in a chiropractic setting in Belgium and The Netherlands. The purpose of this study is to determine whether there is an association between certain psychological or social factors and outcome in patients with neck pain and/or LBP treated by chiropractors.

METHODS

Study design and population

A prospective, multi-center practice-based cohort study was conducted for patients with neck pain and/or LBP. Participants were recruited by 97 chiropractors in their clinics in Belgium and The Netherlands. All patients received standard chiropractic care, consisting of spinal manipulation. Treatment was left to the discretion of the chiropractor: the use of soft tissue techniques, ergonomic advise or instruction with regards to home exercises was allowed. The study was approved by the medical ethics committees of the University Ghent, Belgium under registration number B67020095664 and VU University Medical Center, Amsterdam, the Netherlands with reference number 08/232.

Recruitment of chiropractors and patients

CHIROPRACTORS

All 72 Dutch speaking Belgian chiropractors, and all 189 members of the Netherlands Chiropractors' Association were invited to participate. Recruitment was conducted in various ways: through personal email communication to all members, an email sent by the respective professional associations to all their members, and through a presentation at a the general meeting organized by the professional associations.

PATIENTS

Chiropractors were asked to recruit 15 patients each for the study. Recruitment took place between August 26th and December 30th 2010. All patients with neck pain and/or LBP that had not been treated by a chiropractor within the prior six months were eligible. Interested patients were contacted by the same research assistant who explained the entire study protocol. After consenting over the telephone, patients were included. Patients from Belgium were also required to complete a written informed consent form.

INCLUSION/EXCLUSION CRITERIA

Patients between 18 and 64 years old, with neck and/or low-back pain with or without radiation to an extremity as their chief complaint were eligible. Patients had to have a

basic understanding of the Dutch language, both in reading and writing. Subjects were excluded if they had a "red flag" (such as a suspected tumor, fracture or infection) or any condition considered to be a contraindication for spinal manipulative therapy such as severe osteoporosis, acute rheumatic episode, extremely high blood pressure values.

Data collection and variables of interest

PROCEDURE

Self-administered patient questionnaires were sent at baseline, at the end of the second visit, and at 1, 3, 6 and 12 months. Patients could choose for paper- or web-based questionnaires. The participating chiropractors completed a paper questionnaire at baseline, which included a description of clinical variables, the diagnosis and the prognosis for each particular patient. A web-based questionnaire was sent to the participating chiropractors at 12 months to collect data on number of treatments per patient and on patient status. The responses of the web-based questionnaires were collected by NetQ, an online data collection system. Paper questionnaires were returned to and processed at the data collection centers in Belgium and the Netherlands.

Prior to the start of the study, one information session was provided to the participating chiropractors and their office staff at 11 separate occasions divided over Belgium and the Netherlands.

At baseline, the following items were assessed: 1) participant characteristics: age and gender, level of education and employment status 2) biomedical items such as the duration and type of complaint, BMI and baseline pain 3) social and psychological factors: distress, depression, anxiety and somatisation (via the 4 scales of the Four Dimensional Symptom Questionnaire or FDSQ) (Terluin, 1996), the patient's beliefs with regard to the effect of physical activity and work on their spinal complaint (via the Fear Avoidance Beliefs Questionnaire or FABQ) (Vendrig et al, 1998), and social support (by using the Feij Social Support scale) (Scherer et al, 1982).

The Dutch version of the FDSQ was used (Terluin, 1996). It consists of 50 questions, aimed at psychosocial complaints. There are 4 subdomains: distress (16 items), depression (6 items), anxiety (12 items) and somatization (16 items). The 50 items have 5 response categories (range 0-4, with 0 = no, 1 = sometimes, 2 = regularly, 3 = often and 4 = very often or continuously). As suggested by the developer, we made subcategories for each domain with 0 = no, 1 = sometimes and 2 is regularly, often or very often/continuously (Vendrig et al, 1998). For distress, with a total score range from 0-32 points, slightly elevated scores are between 10 and 20, and strong is > 20. For depression, with a total score range of 0-12, the cut-off points for slight and strong were 2-5, and > 5, respectively. For anxiety, with a total score range of 0-24, the cut-off points for slight and strong were 4-9, and > 10, respectively (Terluin et al, 2014). For somatisation, with a total score range of 0-32, the cut-off points for slight and strong were 10-20, and > 20, respectively. These categories were considered to be ordinal variables (Terluin, 2002).

The Dutch translation of the FABQ was used (Vendrig et al, 1998). The FABQ has 16 items and consists of 2 subscales which facilitate the identification of the patient's beliefs about how work and physical activity affect their current spine pain. The first subscale (items 1-5) is the Physical Activity subscale, and the second subscale (items 6-16) is the Work subscale. Each subscale is graded separately by summing the responses on the respective scale items (0-6 for each item); for scoring purposes, only 4 of the physical activity scale items are scored (sum items 2,3,4 and 5 resulting in 24 possible points) and only 7 of the work items (sum items 6,7,9,10,11,12 and 15 resulting in 42 possible points) (Waddell et al, 1993). The scores on the 2 subscales of the Fear Avoidance Beliefs Questionnaire were represented as a dichotomous 0 and 1 score, where 0 represents a low score and 1 a high score. For the FABQWork, 3 separate cut-off points (19, 29 and 34) were chosen, based on the most cited cut-off points proposed in the literature (Childs et al, 2004; Fritz and George, 2002; George et al, 2008). For the FABQPhysical activity subscale, a score of 15 was taken as cut-off point (Crombez et al, 1999).

The Feij Social Support Scale has 12 items, scored from 1 "no, not at all" to 5 "very clearly" and ranges from 12 to 60. Higher scores represent acceptable or high social support.

Outcome variables

The primary outcome measures were perceived recovery, average pain intensity over the past week and functional status. Perceived recovery was measured on a 7-point Likert scale, ranging from completely recovered (=0) to worse than ever (=6). The scores were dichotomized into recovered (completely recovered and much improved) and not recovered. Pain intensity was measured on a numeric rating scale ranging from 0 to 10, with 0 corresponding to no pain and 10 corresponding to worst imaginable pain. Functional status was measured by the Neck Disability Index for patients with neck pain, and by the Oswestry Disability Index for patients with LBP.

Analysis

All psychosocial variables were coded such that the higher score represents an unfavorable psychological condition.

We first ran a univariable regression analysis to estimate the relationship between each psychological variable and the outcome, and to examine whether there was interaction with the subsequent time points. Variables and their interaction with time which showed associations with p-values of $p < 0.05$ in the univariable analysis were included in the multivariate regression analysis, and finally a backward stepwise regression was performed in which all possible combinations of variables were tested.

Multivariable multilevel regression analysis was used in order to build the association model. Three levels were identified: time (level 1: all time points up to the 12 months data collection period), patient (level 2) and chiropractor (level 3). In all models we

corrected for country of origin, age and gender of the patient. For the outcomes functional status and pain, a multivariable linear regression analysis was used. An unstructured within-subjects covariance matrix was used for the continuous outcome variables (pain and functioning), whereas a compound symmetric within-subjects covariance matrix was used for the dichotomous outcome variable (perceived recovery). Effect and interaction with time were determined.

Results are reported as mean values and associated standard deviations and percentages. Results of the multivariate analyses are reported as odds ratios or regression coefficients and 95% confidence intervals depending upon whether it was a dichotomous outcome or continuous outcome respectively.

Multivariable multilevel analyses were performed in Stata 11.2 for dichotomous outcomes and in SPSS 20 for continuous outcomes.

RESULTS

In total 917 patients, 398 males (42%) and 519 females (58%), participated in this study. Of those 917 patients, 326 (110 males, 216 females) presented with neck pain (35.6%) and 591 or 64.4% (288 males, 303 females) presented with LBP. 259 patients presented with both neck pain and LBP; based on their prerogative these patients were either categorized as neck pain (104) or LBP patients (155).

Of the participating patients 95% (872/917) chose the web-based questionnaires over the paper version. The response rate was 81.4% and 77.4% after 3 and 6 months respectively. At 12 months, 73.2% of the patients were still in the study. Response rate did not significantly differ between males and females, between patients with neck pain and LBP, and between Belgian and Dutch patients (data not presented).

Table 1 shows sociodemographic and the baseline psychosocial characteristics of the participating patients, divided into neck pain and LBP. Patients were middle-aged, predominantly female, educated, in good overall health with low scores on the functional status scales and moderate pain scores. A strong minority of the patients had high scores on the psychologic subdomains.

Table 2 illustrates that the percentage of patients with neck pain reporting that they were recovered is the highest at 3 months, and that is the case for both males and females. For both male and female patients with LBP, this percentage is highest at 6 months as illustrated in Table 3. Tables 2 and 3 also show that approximately one third of the patients report not being recovered at 12 months.

Based on the results of the univariable analysis (data not shown), in the multivariable analysis we included time, somatization, somatization × time, distress, distress × time,

TABLE 1. SOCIODEMOGRAPHIC AND BASELINE PSYCHOSOCIAL CHARACTERISTICS OF THE PATIENTS (N=917)

VARIABLES	LOW-BACK PAIN (N=591)		NECK PAIN (N=326)	
	mean, [SD]	*%*	*mean, [SD]*	*%*
Sociodemographic variables				
Gender (%males)		51.3		66.3
Age	41.7 [11.7]		42.2 [11.8]	
Highest level of education				
Elementary		11.9		11.1
High school		25.3		31.0
Technical school		50.3		47.8
University/post graduate		12.4		10.1
Employment status				
Full time/part time		82.1		87.0
Not working		14.1		9.8
Sick leave		3.8		3.2
Clinical variables				
BMI	25.27 [3.92]		24.91 [4.12]	
Duration of the presenting complaint				
1 day – 6 weeks		37.2		23.1
6 weeks – 3 months		16.8		16.5
> 3 months		46.0		60.4
Previous episode with this complaint		87.4		81.6
Radiating pain in leg/arm		39.8		28.8
Imaging for this complaint		37.4		31.7
Previous neck pain		58.0		N/A
Previous low-back pain		N/A		77.7
Previous surgery on lumbar/cervical spine		3.6		0.3
Ever treated by a chiropractor before		29.3		28.4
Apprehensive towards chiropractic therapy (0-10)	1.71 [2.55]		1.55 [2.41]	
Patient expectation of therapy (0-10)	6.99 [1.81]		6.99 [1.79]	
Function at baseline (0-50)				
NDI			10.68 [7.70]	
ODI	12.84 [6.18]			
Baseline **pain (0-10)**	4.78 [2.21]		4.94 [2.21]	
Baseline psychosocial values				
4DSQ				
Distress				
0 (normal scores)		70.7		62.7
1 (slightly elevated scores)		22.6		27.5
2 (strongly elevated scores)		6.7		9.8
Depression				
0 (normal scores)		89.8		89.0
1 (slightly elevated scores)		6.7		8.2
2 (strongly elevated scores)		3.5		2.8
Fear				
0 (normal scores)		97.0		93.4
1 (slightly elevated scores)		1.8		5.1
2 (strongly elevated scores)		1.2		1.5

VARIABLES	LOW-BACK PAIN (N=591)		NECK PAIN (N=326)	
	mean, [SD]	%	*mean, [SD]*	%
Somatization				
0 (normal scores)		74.4		49.4
1 (slightly elevated scores)		21.8		42.4
2 (strongly elevated scores)		3.7		8.2
FABQ	33.57 [17.33]		29.87 [16.48]	
FABQwork	13.90 [10.58]		12.61 [9.13]	
FABQwork>34		2.4		1.1
FABQwork>29		14.1		7.7
FABQwork>19		32.4		22.1
FABQphysAct	13.93 [4.95]		11.21 [5.26]	
FABQphysAct		38.9		22.7
Feij Social Support				
Mean (Range)	43.86 [13-60]		43.97 [12-60]	

BMI = Body Mass Index, NDI = Neck Disability Index, ODI = Oswestry Disability Index, 4DSQ = Four Dimensional Symptom Questionnaire, FABQ = Fear Avoidance Beliefs Questionnaire

TABLE 2: PERCENTAGE OF RECOVERED AND NOT-RECOVERED PATIENTS WITH NECK PAIN AT THE DIFFERENT FOLLOW-UP INTERVALS

NECK PAIN	TOTAL *(n=326 at baseline)*	
RECOVERED	YES	
	N	%
2nd visit	93/299	31.1
1 month	164/277	59.2
3 months	193/267	72.3
6 months	177/253	70.0
12 months	156/244	64.0

TABLE 3: PERCENTAGE OF RECOVERED AND NOT-RECOVERED PATIENTS WITH LBP AT THE DIFFERENT FOLLOW-UP INTERVALS

LOW-BACK PAIN	TOTAL *(n=591 at baseline)*	
RECOVERED	YES	
	N	%
2nd visit	204/545	37.4
1 month	303/480	63.1
3 months	319/479	66.6
6 months	332/457	72.6
12 months	290/427	67.9

depression, depression × time, fear, fear × time, FABQ, FABQ × time, FABQwork, FABQwork × time, FABQphysact, FABQphysact × time, and Feij social support for patients with LBP as potential prognostic factors for all outcome variables. For patients with neck pain, we included time, somatization, distress, depression, depression × time, fear, FABQ, FABQ × time, FABQwork, FABQwork × time, FABQphysact and FABQ-physact × time for all three outcome variables.

The probability of recovery of patients with neck pain and patients with LBP with different degrees of somatization is depicted in Figure 1 and 2.

The results from the multivariable models for the outcomes perceived recovery (expressed as odds ratios (OR) with 95% confidence intervals (CI)) and for functional status and pain (expressed as regression coefficient and 95%CI) are presented in Table 4. Lower scores on somatization are consistently positively associated with perceived recovery, functional status and pain for both neck pain and LBP (see Table 5). Also the FABQ shows a statistically significant association with functional status and pain for neck and LBP patients. Depression is associated with function in LBP patients. The other variables – distress, anxiety and social support – show no significant association.

To illustrate the interpretation of these data: a person with neck pain with a mildly elevated score (score 1) for somatization is 1.55 times more likely to report that he or she has not recovered. An increase from 1 to 2 produces an odds ratio of $(1.55)^2 = 2.40$, meaning that a person with a strongly elevated score (score 2) on somatization is 2.40 times more likely than a person who does not somaticize (score 0) to report that he or she is not recovered. In the STATA analyses we considered time as a categorical variable. This implies that time will not show a linear evolution. As a result, although our data do support the position that, in general, a person with a strongly elevated score on somatization is 2.4 times more likely to report that he/she is not recovered compared to a person with a somatization score of 0, the probability of being recovered or not being recovered is not the same for the separate follow-up measurements. This is illustrated in Figure 1.

Results for the continuous outcomes function and pain are reported as regression coefficients, not as odds ratios. The interpretation is thus different. Taking the example of somatization again, for each increase in score (from 0 to 1 and from 1 to 2), the score on the NDI (for neck pain patients) increases by 3.10 and by 11.60 on the ODI (for patients suffering from LBP). Patients presenting with a strongly elevated score on somatization (score 2) score 6.20 (3.10 x 2) and 23.20 (11.60 x 2) points higher on the NDI and the ODI respectively than a person who does not somaticize (score 0 on somatization).

FIGURE 1: PROBABILITY OF RECOVERY FOR PERSONS WITHOUT DISTRESS AND WITH VARIOUS
DEGREES OF SOMATIZATION PRESENTING WITH NECK PAIN
(0 representing no somatization, 1 representing mild somatization and 2 representing severe
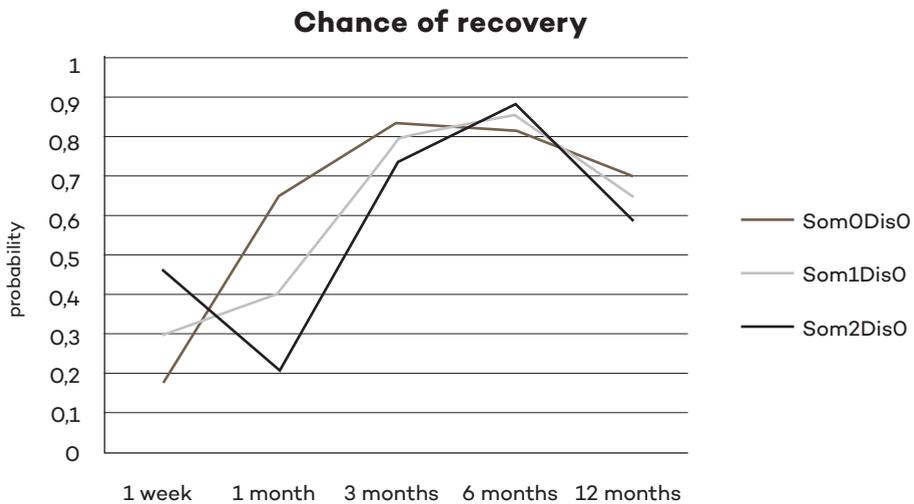somatization)

TABLE 4: RESULTS OF THE MULTIVARIATE ANALYSIS FOR NECK PAIN PATIENTS

NECK PAIN			
	NOT RECOVERED OR (95% CI)	FUNCTION NDI RC (95% CI)	NECK PAIN RC (95% CI)
Distress			
Depression			
Anxiety			
Somatization	1.55 (1.28–2.20)	3.10 (2.26–3.94)	0.82 (0.54–1.09)
Social support			
FABQ		0.12 (0.08–0.16)	0.02 (0.01–0.04)
FABQ Work			
FABQ Phys Act			
Time x distress		Time=1: 2.15 (1.25–3.05) Time=2: 1.76 (0.72–2.81)	
Time x depression			
Time x anxiety			
Time x somatization			
Time x Social support			
Time x FABQ			
Time x FABQ Work			
Time x FABQ Phys Act		Time=4: −2.99 (−4.82 to −1.15) Time=5:-2.24 (−4.05 to −0.42)	

OR = Odds Ratio RC = Regression Coefficient. FABQ = Fear Avoidance Beliefs Questionnaire
Empty cells mean that there was no association found in the multivariate analysis.

FIGURE 2: PROBABILITY OF RECOVERY FOR PERSONS WITHOUT DISTRESS AND WITH VARIOUS
DEGREES OF SOMATIZATION PRESENTING WITH LOW-BACK PAIN
(0 representing no somatization, 1 representing mild somatization and 2 representing severe
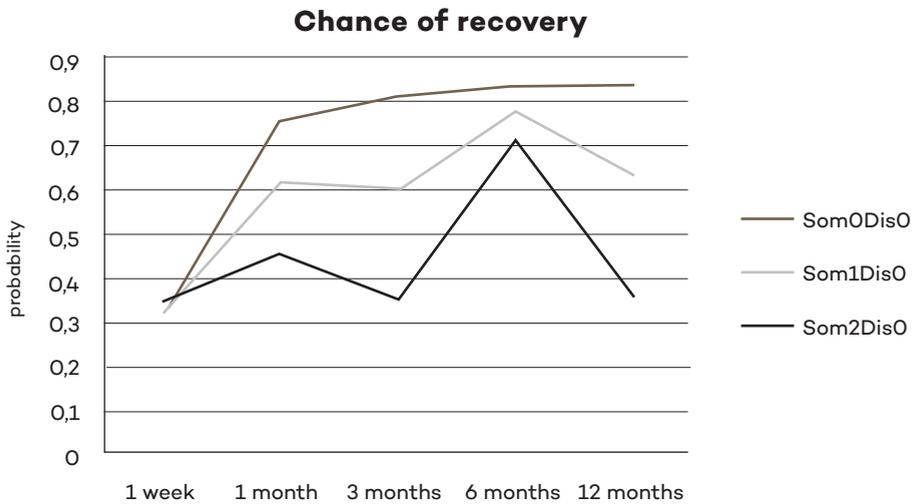somatization)

TABLE 5: RESULTS OF THE MULTIVARIATE ANALYSIS IN LBP PATIENTS

LBP			
	NOT RECOVERED OR (95% CI)	FUNCTION ODI CR (95% CI)	LOW BACK PAIN CR (95% CI)
Distress			
Depression		2.74 (0.66–11.32)	
Anxiety			
Somatization	1.84 (1.46–2.69)	11.60 (5.26–25.55)	0.77 (0.49–1.04)
Social support			
FABQ		1.04 (1.00–1.07)	0.02 (0.01–0.03)
FABQ Work			
FABQ Phys Act			
Time x distress			Time=3: 0.68 (0.30–1.06)
Time x depression		Time=3: 18.56 (4.17–82.66)	
Time x anxiety		Time=2: 0.01 (0.00–0.15)	Time=1: -0.89 (−1.67 to −0.11)
		Time=3: 0.02 (0.00–0.24)	Time=3: -1.00 (−1.89 to −0.12)
			Time=4: 0.99 (0.09–1.88)
Time x somatization	1.43 (1.20–2.08)		
Time x Social support			
Time x FABQ		Time=1: 1.12 (1.08–1.17)	
		Time=2: 1.10 (1.06–1.14)	
		Time=4: 1.03 (1.00–1.07)	
Time x FABQ Work			
Time x FABQ Phys Act			Time=1: 0.91 (0.50–1.32)
			Time=2: 0.54 (0.10–0.97)

OR = Odds Ratio RC = Regression Coefficient. FABQ = Fear Avoidance Beliefs Questionnaire
Empty cells mean that there was no association found in the multivariate analysis.

DISCUSSION

This prospective cohort study among patients with neck pain or LBP presenting to chiropractors in Belgium and the Netherlands showed an association of somatization with perceived recovery, function and pain. Somatization is a tendency to experience and communicate psychological distress in the form of somatic symptoms and to seek medical help for them. More commonly expressed, it is the generation of physical symptoms of a psychiatric condition such as anxiety (Lipowski, 1998).

In addition, we demonstrated an association between depression at baseline and reported functional status for patients with LBP and a very small, albeit statistically significant association between fear and reported functional status and pain, both for patients with neck pain and patients with LBP.

We did not find any association between distress, anxiety or social support with any of the 3 outcome measures. In a previous systematic review, distress was found to be implicated in the transition to chronic LBP (Pincus et al, 2002); however, this systematic review did not include any studies on a chiropractic population. With regards to anxiety, the factor 'fear of movement' as measured by the FABQ was consistently and significantly present in the univariable analyses for all outcomes measured in one study on patients with sub-acute neck pain (Pool et al, 2010). On the contrary, results from the study by Myburgh and colleagues challenge the notion that neck pain is necessarily significantly associated with heightened levels of anxiety (Myburgh et al, 2010). There is not much research on the impact of "social" in the biopsychosocial model. To our knowledge, only the study by Herwitz et al found some evidence that certain coping strategies and types of social support are associated with pain and disability outcomes in a population of largely subacute and chronic neck pain patients in a chiropractic setting (Herwitz et al, 2006).

Our study confirmed the assumption made by practicing chiropractors that their patients in general do not present with complicated psychological profiles. Less than 1% (6/917) scored the highest score on all subdomains of the 4DSQ. This finding was also supported by research from Denmark (Leboeuf-Yde et al, 2009). Our study showed that patients with the highest score on the somatization scale scored 6 and 23 points higher on the Neck Disability Index and the Oswestry Disability Scale respectively compared to patients with the lowest possible score. Consequently, for those patients with the highest scores, it would appear plausible to first treat the underlying psychological or psychosocial problem rather than choosing a mechanical approach like chiropractic or usual medical care.

Strengths: Our study on a large sample of patients is the first study in a chiropractic setting to examine the association between psychosocial baseline variables and outcome for both patients with neck pain and patients with LBP. The treatments provided were reflective of the real situation in clinical practice; therefore, our findings should

be considered broadly generalizable. In addition, we examined various psychosocial variables for patients with neck and LBP using validated instruments, so our findings should also be viewed to be comprehensive. We used questionnaires that had been validated and applied in previous studies. This allows for pooling of data of similar studies using similar questionnaires. We analyzed the data by modelling the trajectories of subjects in a longitudinal design, rather than is typically done with longitudinal data sets, which is to compare a particular follow-up measurement to baseline. Those types of analyses result in different sets of regression coefficients for each association variable at each different time interval. The real advantage of the technique we used is that it allows to determine how within-individual changes in the outcome variable are related to selected covariates. In other words, it allows one to look at the response to an intervention over time.

Limitations: The principal aim of the 4DSQ is to distinguish between stress-related syndromes (denoted as 'stress', 'burnout', 'nervous breakdown') and psychiatric disorders (i.e. depression and anxiety disorders). We used it as a screening tool in unselected consecutive patients. As a result, since patients presenting to chiropractors in general do not have complicated psychological profiles, our data showed only a small frequency of high scores on the 4DSQ. The confidence intervals around the regression coefficients in the multivariable linear regression analysis of the outcome functional status should be interpreted with caution because the assumption of homoscedasticity was not completely satisfied.

Implications: This study tells chiropractors confronted with a patient with neck pain or LBP, whose profile matches that of the study participants, that there is an association between somatization and perceived recovery, reported functional status and pain.

CONCLUSION

Patients consulting Belgian and Dutch chiropractors do not present with complicated psychological profiles. Of all the psychosocial variables examined in this study, somatization was the only variable consistently found to be associated with diminished perceived recovery, diminished functional status, and increased neck or LBP. Other psychosocial variables such as depression and fear showed an association with selected outcomes, thereby demonstrating an inconsistent pattern. As a result, these variables would appear less clinically relevant.

ACKNOWLEDGMENTS

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