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Causal symptom attributions in somatoform disorder and chronic pain

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Abstract

Objective: Somatoform disorders (SFD) are defined by symptoms that lack medical explanation. This study examined the type and pattern of patients' causal attributions using a new semistructured interview technique **Methods:** The Causal Attributions Interview allows to assess and weigh 15 common explanations of physical symptoms. Attributions given by 79 patients with SFD were compared with those obtained from 187 chronic pain patients. **Results:** The test–retest reliabilities of the interview-elicited attributions were satisfactory to good. SFD patients attributed most of their symptoms to mental/emotional problems (46.9%) and somatic disease (41.1%), while the pain sample preferred physical overloading/exhaustion (56.1%), daily hastiness/time pressure (41.7%), somatic disease (39.6%), and weather influence (39.0%). On average, SFD patients chose 2.57 and pain patients 3.86 different attributions for each symptom. These numbers were substantially larger than those of initial spontaneous attributions. Correspondence analysis revealed underlying dimensions with three groups labeled "environmental," somatic," and "psychological/stress." While pure environmental attributions were rare (1.1%), somatic factors were chosen for 28.3% of the symptoms, psychological/stress for 22.1%, and the combination of both for 25.6%. Approximately 10% were attributed in a multicausal sense to all three groups. Depression was found to correlate positively with psychological/stress and negatively with somatic attributions. **Conclusion:** The results do not support the perspective that SFDs generally result from poor acknowledgement of emotional factors. SFD and chronic pain showed distinguishable attributional patterns.

Keywords: Somatoform disorder; Somatization; Pain; Medically unexplained symptoms; Causal symptom attributions

Introduction

Physical complaints represent one of the most fundamental experiences of human life. The detection and evaluation of symptoms is of great importance to most people, mainly because symptoms may indicate the development of a somatic disease and enable the person to search for professional help. When presented to the physician, medical examinations and tests can be performed to determine the underlying disease. In many cases, however, negative or nondistinctive findings result from even thorough medical evaluation, in which case other possible causes have to be considered. Several studies demonstrated that 25–40% of all symptoms presented in the primary care setting are of unclear origin [1]. Patients with such symptoms are often diagnosed as somatoform disorder (SFD) whenever their medically unexplained symptoms have resulted in significant distress or psychosocial impairment [2]. The SFDs belong to the most common mental disorders with estimated lifetime prevalence rates of up to 20% [3–5].

Various attempts have been made during the past years to explain the pathogenetical and etiological mechanisms that underlie SFDs. The suggestions made in the literature range from biological abnormalities [6] to physiological sensitization [7] and dysfunctions of perception and

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cognition [8–10]. Some authors consider unexplained physical symptoms as an "idiom of distress" [11], although the exact pathways between a circumscribed psychological conflict and the development of its somatic expression still remain to be specified. Explanations are further complicated by the heterogeneous nature of the somatoform symptoms with respect to type of symptom, clinical presentation, severity, and duration. Therefore, the attribution of ambiguous symptoms to a single and simple cause is questionable and not consistent with our current state of knowledge. Professionals are often left with the situation that explanations they give to the patient are to some extent merely plausible presumptions.

Despite the lack of scientific clarity, assumptions about the nature and origin of symptoms play an important role in patients' perspectives. It has been hypothesized that patients with SFD tend to consider their complaints as organic, while neglecting or even denying the impact of psychological and psychosocial factors. Rief et al. [12] found that primary care patients diagnosed as SFD had elevated scores on two questionnaire dimensions labeled "vulnerability to infection and environmental factors" and "organic causes including genetic and aging factors." In contrast, scores indicating psychological factors and personal distress as possible causes were not different from those of patients without SFD. Henningsen et al. [13] reported that organic attributions were prominent only in patients with "pure" SFDs, whereas there was a balance between organic and psychological attributions when the SFD was accompanied by a comorbid depressive or anxiety disorder.

However, there are increasing doubts as to whether it is appropriate to simply dichotomize patients as attributing either organically or psychologically. In the study of Rief et al. [12], most patients reported not only one but multiple attributions. When patients suffer from several symptoms, it is not unlikely that the subjective explanations change from symptom to symptom. Furthermore, attributions do not necessarily have to be present in the form of absolute convictions, as patients may consider alternative explanations to be more or less probable or even additive. It also appears oversimplified to classify patients with SFD as global "somatizers" whose thinking is limited to a unidimensional style of biomedical attribution. For example, subgroups of patients with medically unexplained symptoms in the study of Henningsen et al. [13] reported psychosocial causes spontaneously or were even considered as "psychologizers" with predominant psychological explanations. Robbins and Kirmayer [14] introduced an additional dimension "normalizing" as opposed to pathological explanation. It was shown that frequent attenders of general practices [15] as well patients with high anxiety and hypochondriasis scores [16] responded less with normalizing attributions when asked to specify possible causes of common somatic symptoms.

When causal attributions are studied in patients with SFD, interpretation is often limited due to methodological problems of assessment. Most published studies have used self-report measures such as the Symptom Interpretation Questionnaire [14]. This instrument allows to choose between physical, psychological or normalizing explanations for 13 common bodily sensations or symptoms such as "you feel your heart pounding" or "you notice your mouth is dry." However, these perceptions do not have to correspond to the existing symptoms of the patient and responses can therefore be merely theoretical judgments. Other instruments such as the Illness Perception Questionnaire have the disadvantage that ratings can only be made globally for all current symptoms, not separately for each symptom [12,17]. It appears that the usefulness of self-ratings is at best moderate for the differential assessment of symptom perceptions and interpretations.

We therefore decided to investigate causal symptom attributions using an interview technique. The Causal Attributions Interview (CAI) was developed in a way to overcome the limitations of self-rating scales. In particular, attributions can be assessed separately for a freely chosen number of individual symptoms, the responder is not forced into an all-or-nothing and the difference between spontaneously expressed and cue-elicited attributions is taken into account. The CAI also assesses how the person developed his attributions and to what degree they are stable.

The goal of this study is to introduce the CAI and characterize the pattern of causal attributions in patients diagnosed as SFD. This group will be compared with chronic pain patients treated in a specialized tertiary care hospital. There is evidence in the literature that pain can be distinguished from SFDs with regard to clinical characteristics and course of treatment [18,19]. Previous studies have addressed illness attributions in patients with different pain conditions (e.g., Refs. [20,21]). Our comparison group consists of patients with various types of pain, including those with clear or predominant organic causes. It must therefore be expected that the proportion of biomedical attributions should be greater in the pain sample.

After reporting the psychometric properties of the CAI, we will focus on four major questions: (1) Are there specific attributional profiles for the two clinical groups and to what degree are attributions specific for pain, gastrointestinal and pseudoneurological symptoms? (2) Can attributions be classified into meaningful superordinate clusters? (3) Can SFD patients be characterized by a tendency to consider their symptoms as primarily due to biomedical factors? (4) Is there a relationship between symptom attributions and psychopathology?

Materials and methods

The CAI

This semistructured interview was designed to identify the type and pattern of subjective symptom attributions in

patients with SFD. Attributions are not assessed for the disorder as a whole but for individual symptoms. Spontaneously reported causes are differentiated from those given after systematic questioning. The CAI also takes into consideration that attributions are not necessarily held in a sense of all or nothing and that different attributions do not exclude each other.

Before administering the CAI, the interviewer has to determine which and how many physical symptoms are currently present. A symptom is considered as somatoform if it cannot be sufficiently explained by a known general medical condition or substance intake. We recommend using structured interviews such as the Structured Clinical Interview for *DSM-IV* (SCID) [22] or other well-established tools such as the International Diagnostic Checklists (IDCL) [23]. The CAI then evaluates each identified symptom according to the following procedure:

(i) *Spontaneous reporting of one or more assumed causes.* The patient is asked, "What do you believe is the cause of your [symptom, e.g., back pain]?" to identify attributions uninfluenced from suggestions of the interviewer.

(ii) *Selection from a list of predefined causes.* A sheet displaying 16 potential causes is presented to the patient. The causes had been selected from suggestions made in the literature (e.g., Refs. [17,24]). The CAI includes the following categories: (A) somatic disease, (B) inheritance, (C) unhealthy lifestyle, (D) environmental harm, (E) consequence of accident or consequence of medical treatment, (F) physical overloading/exhaustion, (G) suppressed inner conflicts, (H) daily hastiness and time pressure, (I) negative life events, (J) conflicts at work or at school/education, (K) family or interpersonal problems, (L) weather influence, (M) social situation, (N) hormonal changes, (O) mental or emotional problems, (P) other causes. All causes are carefully explained to the patient (see Appendix A). The patient then selects one or more causes for a specified symptom by checking the options presented on the sheet. The coding of the causes is accurately operationalized in the CAI manual.

(iii) *Weighing the causes.* If more than one cause is selected, the patient is asked to weigh them using by using percentage values that have to sum up to 100%. For example, a patient might consider his symptom as due to 60% unhealthy lifestyle and 40% somatic disease.

(iv) *Origin of the attribution.* The patient is then asked how his or her causal belief had developed and can select from the following five sources: (1) health professional (e.g., physician, psychologist, healer); (2) media (e.g., television, radio, internet); (3) relatives or friends; (4) own insight; (5) other sources. Coding of source categories are defined in the CAI manual. Each symptom is once again coded separately.

(v) *Stability of attributions over time.* In a last step, it is evaluated whether the current attributional beliefs are the same as those held at the time when symptoms began. If not, the patient is questioned as to how their attributions have changed over time.

Sample 1

To evaluate the usefulness and psychometric properties of the CAI, the instrument was applied to a sample of 79 patients diagnosed as SFD. All patients were admitted as inpatients to the Roseneck Center of Behavioral Medicine in Prien, Germany, a research-oriented hospital affiliated with the Medical Faculty of the University of Munich. We consecutively selected patients who had reported medically unclear somatic symptoms on a screening questionnaire prior to admission. All patients received a thorough medical examination and medical charts were carefully reviewed to exclude any symptoms due to known organic disease. Diagnostic interviews according to *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*) criteria were performed following the strict guidelines and procedures given by the SCID and IDCL (see above). Whenever a patient received the *DSM-IV* diagnosis of a SFD, the CAI was administered by trained clinical psychologists during the first 7 days after admission. Patients additionally completed self-rating scales of psychopathology including the Beck Depression Inventory [25], the Screening for Somatoform Symptoms (SOMS), and the Whiteley Index of Hypochondriasis [26].

The sample consisted of 27 men and 52 women with a mean age of 45.4 years (S.D., 11.0): 57.0% had a school education ≤8 years and 7.6% had an university degree; 2.6% were still in vocational training, 58.2% were in part-time or full employment, 7.6% were housewives or house husbands, 17.7% were jobless. and 13.9% were retired. The *DSM-IV* diagnoses made were 15.2% somatization disorder, 68.4% undifferentiated somatoform disorder, 46.8% pain disorder, 1.3% conversion disorder, and 5.1% hypochondriasis (comorbid diagnoses were allowed). Apart from the SFDs, the most common comorbid diagnosis were major depression (lifetime 72.0%), dysthymic disorder (17.7%), panic disorder (27.8%), social phobia (25.4%), and substance dependence (22.4%).

To determine the reliability of the CAI, a subsample of 34 patients were retested 4 days after the first interview. The second diagnostician was kept blind to the results of the first investigation. Patients were instructed to consider each examination as independent rather than the second interview as a continuation of the first. They were all informed of the reasons for being questioned twice. There were no patients refusing the second interview. The retest sample consisted of 12 men and 22 women with a mean age of 44.7 years (S.D.,

11.8). Educational and socioeconomic status variables were similar to those of the entire sample.

Sample 2

An independent comparison sample of chronic pain patients was recruited in the Red Cross Pain Clinic in Mainz, Germany. This institution provides specialized in- and outpatient services as part of the general health care system. The CAI was administered by trained psychologists to 187 patients who suffered from pain that had lasted for >3 months. Patients with malignant diseases and psychotic or organic mental disorders were excluded. The interview took place during the first 2 days after admission. The gender distribution of the sample was 76 male and 111 female with a mean age of 45.6 years (S.D., 10.6); 53.6% had a school education ≤8 years and 12.3% had a university degree; 38.5% worked as white-collar employees, 19.8% were laborers, and 2.6% were retired.

The medical diagnoses of the pain group were 35.3% back pain, 29.4% headache, 13.9% facial pain, and 21.4% other forms of pain; 85.2% reported that their pain was continuously present and 7.0% experienced pain several times a day; 33.3% were unable to work because of their pain. The SCID was used to diagnose mental disorders according to *DSM-IV*. The most common comorbid conditions were affective disorders with rates of 17.6% for current major depressive episode and 4.3% for dysthymic disorder.

Statistical methods

Test–retest reliability will be expressed in terms of overall percentage agreement, κ, and Yule's *Y*. Unlike percentage agreement, κ is a chance-corrected measure with values ≤0.50 considered as satisfactory [27]. Although κ is the current standard statistic to express diagnostic agreement, it is strongly influenced by the base rate of the variable under study and tends to decrease rapidly under low base rate conditions. Yule's *Y* has been suggested as an alternative because it is independent from base rates and can be regarded as an approximation to maximum κ across all possible base rate situations [28]. Odds ratios (ORs) were computed to compare the proportions of causal attributions given by the somatoform and the pain sample.

Correspondence analysis, an exploratory visualization technique for picturing the associations between the levels of a two-way contingency table, was used to explore potential structures that underlie the causal factors [29]. The results provide information which is similar in nature to those produced by factor analysis. We intended to characterize the patients' pattern of causal attributions by investigating whether attributions for different symptoms could be separated into consistent symptom/attribution dimensions. Because of the hierarchical structure of the CAI with causal attributions nested in symptoms, and these again nested in patients, analysis had to be carried out on symptom level rather than patient level.

Results

Test–retest reliability and validity of the CAI

The test–retest analyses were performed across 187 pain, gastrointestinal, and pseudoneurological somatoform symptoms that had been reported by the patients. Table 1 shows that the overall percentage agreement between test and retest

Table 1
Test–retest reliability of the CIA causal attribution categories

	Distribution			
	++/+−/−+/−−	%	κ	Yule's *Y*
(A) Somatic disease	76/5/20/86	86.6	0.73	0.78
(B) Inheritance	7/9/5/166	92.5	0.46	0.67
(C) Unhealthy lifestyle	21/14/10/142	87.2	0.56	0.64
(D) Environmental harm	5/2/2/178	97.9	0.70	0.87
(E) Consequence of accident or medical treatment	13/9/8/157	90.9	0.55	0.68
(F) Physical overloading/exhaustion	33/20/11/123	83.4	0.57	0.62
(G) Suppressed inner conflicts	19/12/16/140	85.0	0.49	0.58
(H) Daily hastiness and time pressure	24/17/19/127	80.7	0.45	0.51
(I) Negative life events	12/16/10/149	86.1	0.40	0.54
(J) Conflicts at work or at school/education	8/7/5/167	93.6	0.54	0.72
(K) Family or interpersonal problems	10/15/5/157	89.3	0.44	0.64
(L) Weather influence	18/7/7/155	92.5	0.68	0.77
(M) Social situation	9/9/8/161	90.9	0.46	0.64
(N) Hormonal changes	2/3/7/175	94.7	0.26	0.61
(O) Mental or emotional problems	64/14/17/92	83.4	0.66	0.66
(P) Other causes	2/1/3/181	97.9	0.49	0.83

%, overall percentage of agreement.
Data from Sample 1 (n=79).
++, test positive, retest positive; +−, test positive, retest negative; −+, test negative, retest positive; −−, test negative, retest negative.

results was generally >80% and even >90% for eight of the 16 categories. All chance-corrected κ values were statistically significant ($P<.05$). Highest congruence with $\kappa \geq 0.70$ was found for the causal attributions of somatic disease and environmental harm. Good to acceptable values between 0.50 and 0.70 were obtained for six other categories. Only the attribution of hormonal causes remained clearly unsatisfactory with $\kappa<0.40$. However, all Yule's *Y* values in Table 1 were >0.50 and, thus, higher than the corresponding κ values, which indicates that κ is likely to underestimate the true reliability especially for categories with $\kappa<0.50$. Higher κ values can be expected in studies with greater base rates of these causal conditions. The test–retest reliabilities for the weighing of the causes were highest for somatic disease (Spearman rank correlation, 0.75), consequences of accident/medical treatment (0.73), mental or emotional problems (0.72), weather influence (0.71), and environmental harm (0.71).

Type of symptoms and causal attributions in Sample 1

The 79 patients of this sample reported a total of 392 symptoms from the *DSM-IV* somatization disorder list (mean 4.96, S.D. 2.87). The most frequent symptoms were back pain (reported by 65.8% of the patients), pain in the head (53.2%), bloating (43.0%), abdominal pain (39.2%), pain in arms or legs (31.7%), joint pain (27.9%), chest pain (26.6%), difficulty swallowing or lump in the throat (26.6%), nausea (25.3%), and food intolerances (20.3%), whereas pain during urination, vomiting throughout pregnancy, urinary retention, blindness, and loss of consciousness were rare with rates <2%.

There was a large difference between the number of spontaneous and interview-elicited attributions given by the patients. The 392 symptoms were explained with 749 causes when patients answered the initial open question (mean 1.91 attribution per symptom, S.D. 1.39) but with 1009 causes when guided by the predefined categories (mean 2.57, S.D. 1.56, difference $P<.01$). The number of categories chosen to explain one's symptoms ranged from 1 to 15 (median, 5) and the mean number of categories per symptom ranged from 0.29 to 3.0 (median, 1.25). Table 2 shows that, by far, the most common attributions were mental/emotional problems and somatic disease (chosen for >40% of the symptoms), followed by physical overloading/ exhaustion and daily hastiness/time pressure (>20%). These categories were also the ones that received the highest weights. On the other hand, environmental harm and "other causes" were chosen in only <5% of all symptoms.

When asked for the origin of their beliefs, 53.8% of the patients responded that the attributions had developed primarily through their own reflection and insight; 37.3% acquired their attributions from health professionals, 6.6% from the media, 1.7% from relatives or friends, and 0.7% from other sources. The distribution of origins was very similar across the different types of attributions. Time stability of the attributions was generally limited. The patients reported for 259 of the 392 symptoms (66.1%) that their attributions had changed over the course of time. They specified only 567 attributions for the point of

Table 2
Distribution of causal attribution

	Sample 1 (*n*=79)			Sample 2 (*n*=187)	
	Somatoform			Pain	
	Frequency[a] %	Mean weight[b] (S.D.)	Time stability[c]	Frequency[d] %	Mean weight[b] (S.D.)
(A) Somatic disease	41.1	54.4 (30.7)	− 8.2	39.6	37.8 (29.4)
(B) Inheritance	6.9	31.8 (29.4)	+ 2.8	21.9	19.6 (20.5)
(C) Unhealthy lifestyle	18.6	35.6 (27.2)	+ 6.9	16.6	18.8 (19.7)
(D) Environmental harm	3.8	16.3 (11.1)	+ 2.6	5.9	10.8 (7.7)
(E) Consequence of accident or consequence of medical treatment	9.4	44.7 (34.9)	+ 3.8	36.9	51.3 (32.2)
(F) Physical overloading/exhaustion	29.1	42.3 (29.7)	+ 15.1	56.1	32.5 (26.1)
(G) Suppressed inner conflicts	17.6	34.4 (24.4)	+ 12.0	17.1	18.4 (17.5)
(H) Daily hastiness and time pressure	21.4	28.0 (16.7)	+ 14.8	41.7	19.9 (14.6)
(I) Negative life events	14.8	34.2 (24.1)	+ 7.7	28.9	17.6 (16.1)
(J) Conflicts at work or at school/education	8.9	24.7 (12.8)	+ 5.6	16.6	19.7 (14.2)
(K) Family or interpersonal problems	13.3	28.0 (17.5)	+ 9.2	19.3	17.2 (10.2)
(L) Weather influence	8.9	20.3 (10.1)	+ 4.8	39.0	14.5 (16.5)
(M) Social situation	6.9	23.1 (16.1)	+ 5.4	5.9	9.2 (7.2)
(N) Hormonal changes	7.1	41.0 (32.8)	+ 3.1	13.4	22.2 (19.3)
(O) Mental or emotional problems	46.9	44.0 (26.7)	+ 35.3	23.5	16.9 (12.4)
(P) Other causes	2.6	64.0 (36.9)	− 8.2	3.2	29.2 (14.0)

[a] Sum of frequencies >100% since values refer to number of symptoms (392) and not number of attributions (1009).

[b] Values were computed only from cases in which the category under question had been chosen by the patient.

[c] Frequency difference between time at symptom onset and present time; positive values=choice of category has increased; negative values: choice of category has decreased.

[d] Sum of frequencies >100% since values refer to number of symptoms (187) and not number of attributions (721).

symptom onset but 1009 for the present time of investigation. There was a remarkable increase of 35.2% for attributions of mental and emotional problems, while somatic disease was the only specific category that became less relevant when compared with the time of symptom onset (Table 2). We also observed considerable increases of ≥12% for attributions of physical overloading/exhaustion, daily hastiness/time pressure, and suppressed inner conflicts. The category "other causes" had been chosen relatively frequently for time of onset because many of these patients had considered their symptoms as "normal" or "transient".

Causal attributions in sample 2

The CAI was administered in the pain sample only for the major pain symptom that had been the reason for the present treatment. When asked the initial open question, patients reported a total of 266 causal attributions for 187 symptoms (mean 1.42, S.D. 0.83). When explored with the CAI, a significantly larger number of 721 attributions were given (mean 3.86, S.D. 2.21; difference t=16.4, P<01). When compared with the somatoform patients of Sample 1 (see Table 2), pain patients attributed their symptoms more often to weather influence (OR 6.53, 95% CI 4.14–10.29), consequences of accident/medical treatment (OR 5.61, 95% CI 3.58–8.80), inheritance (OR 3.80, 95% CI 2.25–6.40), physical overloading/exhaustion (OR 3.12, 95% CI 1.77–5.48), daily hastiness/time pressure (OR 2.61, 95% CI 1.42–4.80), negative life events (OR 2.27, 95% CI 1.14–4.52), conflicts at work/school (OR 2.04, 95% CI 0.86–4.86), while mental and emotional problems were chosen less frequently (0.35, 95% CI 0.20-0.61). The pain patients gave highest weights to accident/medical treatment, somatic disease and physical overloading/exhaustion with values >30%; 51.6% reported they had acquired their attributions from health professionals, 39.7% from their own reflection and insight, 6.5% from relatives or friends, 1.1% from the media, and 1.1% from other sources; 62.3% had changed their attributions over the course of time.

When the back pain and headache groups were compared, we found that back pain patients gave significantly more attributions of physical overloading/exhaustion (68.2% vs. 47.3%; χ^2=5.41, P<05), while headache patients attributed more to inheritance (36.4% vs. 19.7%; χ^2=4.20, P<05), suppressed inner conflicts (27.3% vs. 12.1%; χ^2=4.47, P<05), daily hastiness/time pressure (61.8% vs. 34.8%; χ^2=8.76, P<01), negative life events (41.8% vs. 22.7%; χ^2=5.08, P<05), weather influence (56.4% vs. 37.9%; χ^2=4.12, P<05), hormonal changes (23.6% vs. 9.1%; χ^2=4.80, P<05), and mental/emotional problems (36.4% vs. 18.2%; χ^2=5.10, P<05).

Correspondence analysis

To determine whether the different causes can be grouped into a smaller number of underlying classes, a correspondence analysis was performed using the SFD sample. Only symptoms reported by at least 10% of the patients were included. The contingency table was constructed using the frequencies for the individual interview-elicited causes as being assigned to the individual symptoms. Weights of the causal attributions were ignored. Each row of the contingency table mirrors one symptom, and each column contains one causal attribution. Hence, the patterns of symptom frequencies in the columns display the coherence of an attribution with its corresponding symptoms. Correspondence analysis expresses differences between the symptom patterns of the individual causal attributions as χ^2 distances and permits visualizing similarities and differences in a one- or more-dimensional plot. Adjacent attributions show similar symptom patterns. The distance between attributions and the center of the plot is equivalent to the extent of deviation from the mean pattern. The overall amount of dependency between symptoms and causal attributions is calculated as the inertia of the contingency table. After exclusion of inheritance (B), unhealthy lifestyle (C), weather influence (L), and hormonal changes (N) from the contingency table, three groups of causal attributions could be clearly separated (see Fig. 1). The contingency table showed a moderate interrelationship between symptoms and causal attributions with inertia of 0.21. A two-dimensional plot explained 75.2% of this inertia.

Fig. 1 shows that a strong first dimension separated two groups located around category K at the negative and around category F at the positive pole. The first group is defined by family/ interpersonal problems (K), social situation (M), and conflicts at work/school (J), while the second group includes physical overloading/exhaustion (F), somatic disease (A) and consequence of accident/medical treatment (E). We labeled the first group "environmental" and the second group "somatic." A third group ("psychological and stress") was constituted by the categories suppressed inner conflicts (G), negative life events (I), daily hastiness/time pressure (H), and mental/emotional problems (O). We also found interesting relationships between individual symptoms and causal

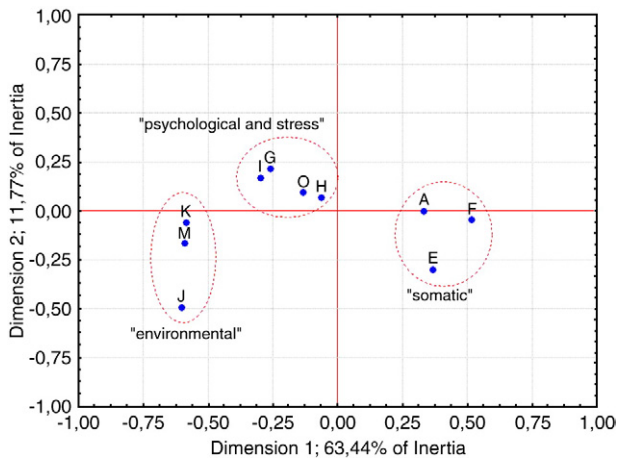

Fig. 1. Correspondence map.

attributions, "environmental" was attributed more frequently for nausea, bloating, and vomiting, whereas "somatic" was more closely associated with back pain, joint pain and pain in extremities.

Overlap between attributional groups

We next analyzed the overlap between the three derived groups. Fig. 2 shows Venn diagrams for symptom as well as patient overlap in the SFD sample: 24.0% of the symptoms were attributed to environmental (E), 65.4% to somatic (S), and 68.9% to psychological/stress (PS). The largest overlaps were between PS and S (25.6%) and between PS and E (11.4%). Almost 10% of all symptoms were attributed to a combination of all three factors. If overlap is analyzed across all symptoms on patient basis (see lower Venn diagram in Fig. 2), it becomes apparent that the vast majority attributed to all three factors (40.5%) or a combination of S and PS (36.7%). Only about 9% used environmental or somatic attributions only. In all, these data show that the use of psychological and stress attributions as well as multiple attributions seem to be the rule rather than the exception in this sample of patients with somatoform disorders.

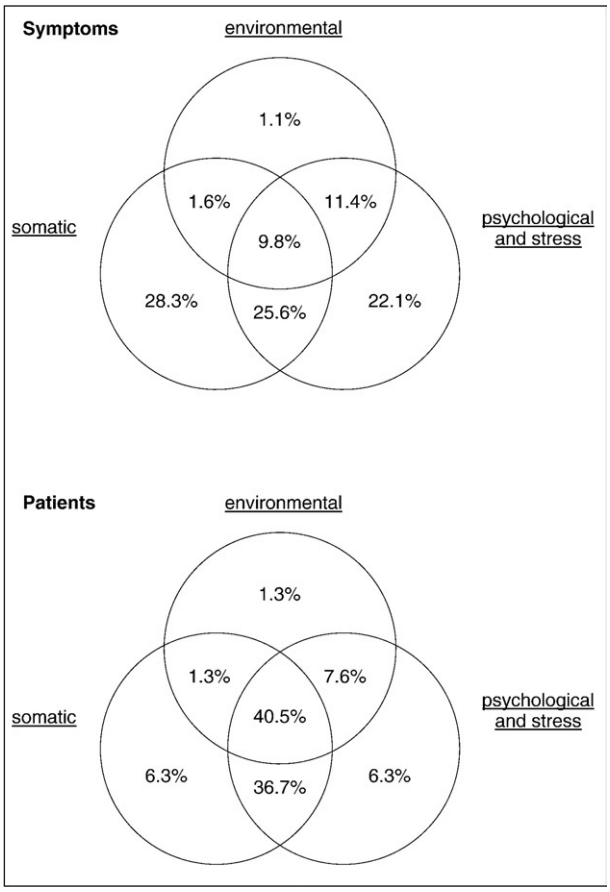

Fig. 2. Venn diagrams illustrating the overlap between attributional groups for symptoms (above) and patients (below).

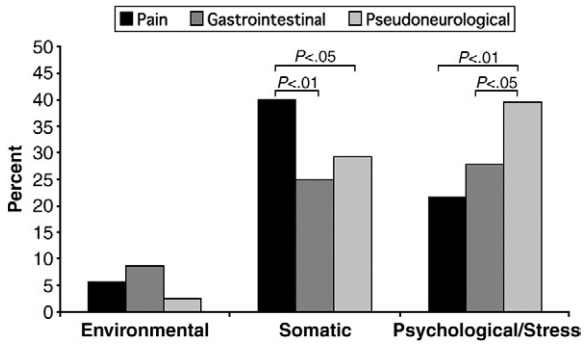

Fig. 3. Weighted attributions in relation to symptom type.

Comparing attributions between symptom types

A subsequent question was whether attributions differed between the three major symptom groups defined by *DSM-IV*, i.e., pain, gastrointestinal, and pseudoneurological. Fig. 3 shows that the SFD patients rated somatic factors as more significant for pain symptoms (F=6.71, df 2.366; P<.01) and psychological/stress factors as more significant for pseudoneurological symptoms (F=10.97, df 2.366; P<.01). Fig. 3 demonstrates that attributions for somatoformsymptoms are not uniform but to some degree specific to symptom types.

Association with psychopathological variables

Depression was positively correlated with psychological/stress and negatively with somatic attributions (Table 3). Environmental attributions also had a positive but weaker correlation with depression. There were no significant correlations with hypochondriasis and somatization.

Discussion

The defining feature of SFDs are symptoms that are not attributable to medical disease or the effects of a substance. In the study presented here, we aimed to investigate the beliefs patients hold about the nature and origin of such symptoms. Causal assumptions cannot be classified as either right or wrong, as research on SFDs has not yet been

Table 3
Pearson correlations between attributional variables and psychopathology

	Hypochondriasis	Somatization	Depression
	WI	SOMS	BDI
Environmental	0.14	−0.03	0.27 *
Somatic	−0.14	−0.08	−0.36 **
Psychological and stress	0.13	0.13	0.32 **

WI, Whiteley Index; SOMS, Screening for Somatoform Disorders Questionnaire, Intensity Index; BDI, Beck Depression Inventory.
Data from Sample 1 (n=79).

* P<.05.
** P<.01.

successful in revealing etiological and pathogenetical mechanisms that are sufficiently general and unambiguous. On the other hand, patients as well as clinicians seek to find "explanations" or give "meaning" to the symptoms. Although such explanations remain scientifically speculative in most cases, they increase the perceived control of patients and professionals when involved with counseling and treatment [30,31].

To study symptom attributions, some particular methodological requirements must be considered. First, patients with SFD usually have multiple symptoms for which different causal assumptions may exist. Second, there exists a large variety of potential causes which are not limited to the simple dualism "organic versus psychological." Thirdly, the number and type of causes given by the person may strongly depend on whether he or she responds to an open question or selects from predefined categories. With one exception [13], only self-report instruments have been used until now to investigate causal attributions in SFDs [12,14,32], although the requirements mentioned above can at best partly be reached with such instruments. We therefore developed the CAI as a new semistructured interview technique. This article describes the psychometric properties of the CAI and analyzes the pattern of causal symptom attributions in patients with SFD and an independent comparison sample of chronic pain patients.

The test–retest reliability of the CAI was found to be satisfactory to good. This means that a high degree of objectivity can be reached due to the clear instructions and rules given to the diagnostician. Excellent reliability values were obtained for the categories of somatic disease, environmental harm, weather influence, and mental/emotional problems. For eight categories with κ values <0.50, we had evidence that reliability was confounded with the statistical problem of low base rates. However, the corresponding values for Yule's Y indicated that good reliability could be expected in samples with higher base rate conditions. When interpreting the reliability results, it should also be considered that patients frequently do not give identical answers when being interviewed twice, especially when their assumptions are insecure and unstable. This source of variation therefore does not necessarily reflect a weakness of the interview technique but is also part of the underlying phenomenon.

Analyses of the attributional patterns in both samples yielded expected as well as new results. Contrary to common expectations made in the literature, patients with SFD considered mental/emotional problems as highly relevant causes of their symptoms. This category was chosen with the highest obtained frequency rate of 46.9%, followed by somatic disease with 41.1% and physical overloading/exhaustion with 29.1%. These attributional preferences differed strongly from those made by the pain sample. More than half of the pain patients regarded physical overloading/exhaustion as the major cause of their symptoms, while only about one fourth specified mental/emotional problems. Pain patients even rated consequences of accident/ medical treatment and weather influences as more relevant than mental/emotional problems. We also found that inheritance played a greater role in the pain sample than among SFD patients. The stronger tendency of pain patients to choose somatic explanations corresponds with our finding that SFD patients rated their pain symptoms as more "somatic" than their gastrointestinal and pseudoneurological symptoms. Another interesting finding is that the relevance of somatic disease attributions seems to decrease over the course of time, while attributions of mental/emotional problems become more relevant the longer a symptom persists.

A finding with high theoretical and clinical implications is the multi-causal perspective of the patients. Even when asked with an open-ended question at the beginning of the interview, SFD patients specified 1.91 causes on average for each symptom. When confronted with the predefined categories, this number increased to 2.57. This demonstrates that mono-causal attribution is the exception rather than the rule. Based on the results of a correspondence analysis, we subdivided the causal categories into the broader dimensional groups "environmental," "somatic," and "psychological/stress." It became apparent that these dimensional groups often coexisted in the patients' perspectives, as almost 50% of all somatoform symptoms were attributed to more than one attributional group and about 40% of the patients referred to all three groups across symptoms. We therefore believe that simple dualistic concepts, such as dividing patients into "somatizers" and "psychologizers" [13,33], is questionable. Our data also contradict the common assumption that explanatory models held by SFD patients are generally unbalanced and biased towards biomedical causes. Another substantial result was that psychological/stress attributions were related to a higher degree of depression, whereas the contrary was true for somatic attributions. Lundh and Wangby [34] reported similar findings and emphasized that such data are incongruent with the classical view of psychosomatic medicine that somatization results from poor acknowledgement of emotional factors.

Some limitations of the present study should be mentioned. First, the CAI assessment procedures were not completely identical between the two study groups. While several physical symptoms were addressed in the SFD sample, we examined only the most prominent pain symptom in the pain patients. Another approach could have been to include all pain symptoms whenever patients report more than one. Somewhat different proportions could have resulted after differentiating between primary and additional pain symptoms. It may also be that the two groups actually made very similar attributions for their primary complaints and it were only the secondary symptoms that attracted multiple attributions. A second limitation results from our finding that patients' causal attributions change over time. Since we did not assess symptom duration, this

determinant of their attributions remained unclear and we do not know whether the two groups were comparable in this regard. Another possible bias might be due to the fact that our samples were recruited in two different hospitals. Patients admitted to a specialized Pain Clinic can be considered to have more organic morbidity than patients of a behavioral medicine (psychosomatic) hospital. It is unclear whether the higher proportion of males in the pain group results from these particular clinical settings. It should also be taken into consideration that patients of our tertiary care setting might be more open for psychosocial interpretations than average primary care patients.

A comparison of our results with those from other studies on cognitive processing in SFD allows interesting considerations. Rief et al. [12] as well as Henningsen et al. [13] found that patients gave more mixed organic and psychosocial attributions when there was comorbidity between SFD and depressive/anxiety disorders, as compared with SFD patients without additional diagnosis. However, since various studies have demonstrated that comorbidity rates with depression of 50–80% must generally be expected in SFD patients [35,36], pure SFD seems to be a rather small group. Relatively large samples would therefore be needed to examine whether the attributional pattern of pure SFD differs to that of comorbid SFD.

It will be an important task of future research to link findings about attributional processes in SFDs with general attributional theory (e.g., Refs. [37,38]). In a recent meta-analytic review, Roesch and Weiner [39] found that causal attributions influenced certain types of coping behavior, which again influenced psychological adjustment to illness. Causal attributions were arranged along the dimensions internal vs. external (e.g., self-blame vs. environment), stable vs. unstable (e.g., hereditary vs. distress), and controllable vs. uncontrollable by self (e.g., effort vs. chance). Other characteristics of illness representations are the timeline (course) of an illness or disorder, beliefs about the possibilities for cure, and beliefs about the consequences for the person's life [40,41]. Heijmans [42] assessed these dimensions in patients with chronic fatigue syndrome and found that impairment was stronger and outcome less favorable when patients considered their disorder to be serious and saw little chance for cure. It is likely that similar results would be found in the clinical population of SFD. There is evidence that attributions held by patients with unexplained somatic symptoms are not congruent with those of medically ill patients [43]. For example, it might be expected that normalizing attributions [44] are highly relevant for patients with SFDs but play only a minor role for those with manifest organic disease.

Another central goal of this work was the introduction of a new instrument to assess causal attributions. The CAI can be used both for scientific and clinical purposes. When administering the interview, the diagnostician can be sure that the patient's attributions are not merely theoretical but refer to an existing symptom. Different symptoms can be addressed and the patient has the opportunity to specify different causes or constellations. Weighing the causes allows to differentiate primary from secondary attributions. An obvious advantage of the interview method is that potential causes can be explained to the patient, whereupon he or she is enabled to make deliberate choices. When used in a clinical setting, the CAI may be valuable to elicit what patients think about the origin of their symptoms and discuss the adequacy of their convictions. We frequently observed that patients responded with great interest to the contents of the interview and subsequently began to reconsider their beliefs. As the CAI has a high degree of face validity and assesses attributions in a more multifaceted way than questionnaires, we did not intend to study validity by directly comparing the CAI with other instruments.

The assessment of multiple attributions for one or more symptoms of a patient yields a hierarchical dependence structure of attributions nested in symptoms nested in patients. These dependencies could be analyzed by multilevel analysis [45] with three levels. As an interesting variant, Dorenbos et al. [46] used item response theory in a multilevel framework to investigate the relationship between patient characteristics and symptoms, reported as multiple-item responses. Future research could adopt these approaches to analyze CAI data.

Conclusion

The present study introduced a new technique and evaluated causal attributions in patients with SFDs. A comparison with a sample of pain patients demonstrated that different attributional patterns exist, although this difference was somewhat less clear when only pain symptoms were compared. SFD patients cannot be described as attributing only or predominantly in terms of organic factors. Psychosocial causes were frequently chosen, and many patients were able to combine the different attributional perspectives. There is a need of further studies to evaluate in more detail how causal attributions are related to other clinical characteristics and to what degree they can be used to predict course and outcome.

Appendix A. The different causes of the CAI as explained to the subject

"I will now show you a list of different possible causes that could be responsible for bodily complaints such as those just mentioned by you. I will shortly explain these causes. Afterwards, I will ask you to judge the relevance of these causes for each of your symptoms.

(A) *Somatic disease:* means that your complaints are due to organic causes, for example natural "wear and tear," any kind of medical disease, or other forms of physical causes that have not

yet been found in your case. (Coding includes natural musculoskeletal "wear and tear", general organ weakness, allergies, anatomical abnormalities, cancer and metastases, infectious disease, fungus disease, undiscovered somatic disease, and others.)

(B) *Inheritance:* means that the causes of your symptoms are to be found in the genes of your family.

(C) *Unhealthy lifestyle:* includes everyday habits that are likely to be harmful, such as lack of physical activity, overly consumption of alcohol, not getting enough relaxation or sleep, unbalanced nourishment or similar.

(D) *Environmental harm:* includes factors such as electromagnetic pollution, poisoning environments, amalgam fillings, or similar. (Coding includes amalgam, car exhaust gas, electromagnetic energy from electrical device, wire, computer or mobile phone, unpleasant noise, radioactivity, sick building conditions, toxic vapor, ozone, radioactive contamination, etc.)

(E) *Consequence of accident or consequence of medical treatment:* means that your current complaints have resulted from surgery in the past, faulty medical treatments, or from car or other accident.

(F) *Physical overloading/exhaustion:* includes factors such as overload of physical activity at work or in leisure time, or malposition.

(G) *Suppressed inner conflicts:* with this, we mean inner conflicts, which are most probably unconscious to you and have their origin in your childhood.

(H) *Daily hastiness and time pressure:* this circumscribes the general hectic of today's life.

(I) *Negative life events:* includes incidences such as the death of a loved person, moving house, change of the workplace, unemployment, or any kinds of sustained losses.

(J) *Conflicts at work or at school/education, and (K) Family or interpersonal problems:* refers to problems with other people, which you believe have their source in personality attributes and behaviors of these people.

(K) *Weather influence:* includes the impact of both weather and climate.

(L) *Social situation:* includes financial worries, dissatisfaction with familial status such as living single or not, or related factors.

(M) *Hormonal changes:* means that hormonal processes in your body are responsible for your complaints.

(N) *Mental or emotional problems:* this category includes different types of anxieties, anger or aggression, low or depressed mood, feeling inner tension or nervousness, lack of self confidence, dissatisfaction, or feeling helpless with one's problems or similar."

(Patients were encouraged to ask for more details whenever an explanation was not fully understood.)

References

[1] Kroenke K, Mangelsdorff AD. Common symptoms in ambulatory care: incidence, evaluation, therapy, and outcome. Am J Med 1989;86: 262–6.

[2] American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington (DC): APA, 1994.

[3] De Waal MWM, Arnold IA, Eekhof JAH, Van Hemert AM. Somatoform disorders in general practice: prevalence, functional impairment and comorbidity with anxiety and depressive disorders. Br J Psychiat 2004;184:470–6.

[4] Jacobi F, Wittchen H-U, Holting C, Hofler M, Pfister H, Müller N, Lieb R. Prevalence, co-morbidity and correlates of mental disorders in the general population: results from the German Health Interview and Examination Survey (GHS). Psychol Med 2004;34: 597–611.

[5] Hiller W, Rief W, Brähler E. Somatization in the population: from mild bodily misperceptions to disabling symptoms. Soc Psychiatry Psychiatr Epidemiol 2006;41:704–12.

[6] Rief W, Exner C. Psychobiology of somatoform disorders. In: D'haenen JA, den Boer JA, Willner P, editors. Biological psychiatry. New York: Wiley, 2002. p. 1063–77.

[7] Eriksen HR, Ursin U. Subjective health complaints, sensitization, and sustained cognitive activation (stress). J Psychosom Res 2004;56: 445–8.

[8] Pennebaker JW. The psychology of physical symptoms. New York: Springer, 1982.

[9] Barsky AJ. Amplification, somatization, and the somatoform disorders. Psychosomatics 1992;33:28–34.

[10] Lim SL, Kim JH. Cognitive processing of emotional information in depression, panic, and somatoform disorder. J Abnorm Psychol 2005; 114:50–61.

[11] Kirmayer LJ. Rhetorics of the body: medically unexplained symptoms in sociocultural perspective. In: Ono Y, Janca A, Asai M, Sartorius N, editors. Somatoform disorders. A worldwide Perspective. Tokyo: Springer, 1999. p. 271–86.

[12] Rief W, Nanke A, Emmerich J, Bender A, Zech T. Causal illness attributions in somatoform disorders. Associations with comorbidity and illness behavior. J Psychosom Res 2004;57:367–71.

[13] Henningsen P, Jakobsen T, Schiltenwolf M, Weiss MG. Somatization revisited: diagnosis and perceived causes of common mental disorders. J Nerv Ment Dis 2005;193:85–92.

[14] Robbins JM, Kirmayer LJ. Attributions of common somatic symptoms. Psychol Med 1991;21:1029–45.

[15] Sensky T, MacLeod AK, Rigby MF. Causal attributions about common somatic sensations among frequent general practice attenders. Psychol Med 1996;26:641–6.

[16] MacLeod AK, Haynes C, Sensky T. Attributions about common bodily sensations: their associations with hypochondriasis and anxiety. Psychol Med 1998;28:225–8.

[17] Weinman J, Petrie KJ, Moss-Morris R, Horne R. The Illness Perception Questionnaire: a new method for assessing the cognitive representation of illness. Psychol Health 1996;11:114–29.

[18] Hiller W, Heuser J, Fichter MM. The *DSM-IV* nosology of chronic pain: a comparison of pain disorder and multiple somatization syndrome. Eur J Pain 2000;4:45–55.

[19] Hiller W, Nilges P. Does the somatoform disorder approach broaden our perspectives in pain? In: Maj M, Akiskal HS, Mezzich JE, Okasha A, editors. Somatoform disorders. Chichester: Wiley, 2005. p. 114–7.

[20] Kraaimaat FW, Van Schevikhoven RE. Causal attributions and coping with pain in chronic headache sufferers. J Behav Med 1988;11: 293–302.

[21] Reich JW, Olmsted ME, van Puymbroeck CM. Illness uncertainty, partner caregiver burden and support, and relationship satisfaction in fibromyalgia and osteoarthritis patients. Arthritis Rheum 2006;55: 86–93.
[22] First MB, Spitzer RL, Gibbon M, Williams JBW. Structured Clinical Interview for *DSM-IV* Axis I Disorders (SCID-I). Washington (DC): American Psychiatric Press, 1997.
[23] Hiller W, Zaudig M, Mombour W. Development of diagnostic checklists for use in routine clinical care. Arch Gen Psychiat 1990; 47:782–4.
[24] Shiloh S, Rashuk-Rosenthal D, Benyamini Y. Illness causal attributions: an exploratory study of their structure and associations with other illness cognitions and perceptions of control1. J Behav Med 2002;25:373–94.
[25] Beck AT, Steer RA, Garbin MG. Psychometric properties of the Beck Depression Inventory: twenty-five years of evaluation. Clin Psychol Rev 1988;8:77–100.
[26] Hiller W, Janca A. Assessment of somatoform disorders: a review of strategies and instruments. Acta Neuropsychiat 2003;15:167–79.
[27] Fleiss JL. Statistical methods for rates and proportions. 2nd ed. New York: Wiley, 1981.
[28] Spitznagel EL, Helzer JE. A proposed solution to the base rate problem in the kappa statistic. Arch Gen Psychiat 1985;42:725–8.
[29] Greenacre MJ. Theory and applications of correspondence analysis. London: Academic Press, 1984.
[30] Steven ID, McGrath B, Qureshi F, Wong C, Chern I, Pearn-Rowe B. General practitioners' beliefs, attitudes and reported actions towards chronic fatigue syndrome. Aust Fam Physician 2000;29: 80–5.
[31] Raine R, Carter S, Sensky T, Black N. General practitioners' perceptions of chronic fatigue syndrome and beliefs about its management, compared with irritable bowel syndrome: a qualitative study. Br Med J 2004;328:1354–7.
[32] Garcia-Campayo J, Larrubia J, Lobo A, Pérez-Echeverría MJ, Campos R. Attribution in somatizers: stability and relationship to outcome at 1-year follow-up. Acta Psychiat Scand 1997;95:433–8.
[33] Kirmayer LJ, Robbins JM. Patients who somatize in primary care: a longitudinal study of cognitive and social characteristics. Psychol Med 1996;26:937–51.
[34] Lundh LG, Wangby M. Causal thinking about somatic symptoms. How is it related to the experience of symptoms and negative affect? Cogn Ther Res 2002;26:701–17.
[35] Brown FW, Golding JM, Smith GR. Psychiatric comorbidity in primary care somatisation disorder. Psychosom Med 1990;52:445–51.
[36] Rief W, Schaefer S, Hiller W, Fichter MM. Lifetime diagnoses in patients with somatoform disorders: which came first? Eur Arch Psychiat Clin Neurosci 1992;241:236–40.
[37] Folkman S Lazarus RS, Gruen RJ DeLongis A. Appraisal, coping, health status, and psychological symptoms. J Pers Soc Psychol 1986; 50:571–9.
[38] Amirkhan JH. Attributions as predictors of coping and distress. Pers Soc Psychol Bull 1998;24:1006–18.
[39] Roesch SC, Weiner B. A meta-analytic review of coping with illness. Do causal attributions matter? J Psychosom Res 2001;50:205–19.
[40] Leventhal H, Meyer D, Nerenz DR. The commonsense representation of illness danger. In: Rachman S, editor. Medical Psychology, vol II. New York: Pergamon, 1980. p. 7–30.
[41] Lau RR, Hartman KA. Common sense representations of common illnesses. Health Psychol 1983;2:167–85.
[42] Heijmans MJ. Coping and adaptive outcome in chronic fatigue syndrome: importance of illness cognitions. J Psychosom Res 1998;45: 39–51.
[43] Heijmans M, de Ridder D. Assessing illness representations of chronic illness: explorations of their disease-specific nature. J Behav Med 1998;21:485–503.
[44] Sensky T. Causal attributions in physical illness. J Psychosom Res 1997;43:565–73.
[45] Hox JJ. Multilevel Analysis: Techniques and Applications. Mahwah: Lawrence Erlbaum, 2002.
[46] Dorenbos AZ, Verbitzky N, Given B, Given CW. An analytic strategy for modelling multiple-item responses: a breast cancer example. Nurs Res 2005;54:229–34.