

Dimensions of Coping in Chronic Pain Patients: Factor Analysis and Cross-Validation of the German Version of the Coping Strategies Questionnaire (CSQ-D)

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Purpose: The Coping Strategies Questionnaire (CSQ) by Rosenstiel and Keefe (1983) is one of the most widely used measures of coping strategies in pain patients, although its construct and factorial validity is dissatisfying. Verra, Angst, Lehmann, and Aeschlimann (2006) translated the full measure, which assesses eight different coping strategies, into German (CSQ-D). Our aim was to identify stable latent dimensions and present a shorter and more valid version of the CSQ-D. **Methods:** A principal axes factor analysis (PFA) and a confirmatory factor analysis (CFA) were performed for specification and cross-validation of the new model. Thus, two independent samples of patients with fibromyalgia-like symptoms ($n = 321$, $n = 162$) completed questionnaire batteries that included the CSQ-D and measures of fibromyalgia (FM) impact, pain, depression, and anxiety. **Results:** The most interpretable result appeared to be a six-factor model with an acceptable fit. The first four factors, (1) Catastrophizing (2) Ignoring Pain (3) Diversion, and (4) Reinterpreting Pain, resemble the original scales by Rosenstiel and Keefe (1983). The Praying or Hoping scale split up into distinct (5) Praying and (6) Hoping dimensions. Except Praying, all coping strategies were significantly associated with measures of psychological health outcomes, pain, overall FM impact, or social support. **Conclusions:** The new short form, called CSQ-DS, is a valid and reliable instrument, composed of 26 items and assessing six coping strategies. Future investigations are recommended to further prove both the external and construct validity of the CSQ-DS.

Keywords: CSQ, factor analysis, coping, fibromyalgia, chronic pain

Impact and Implications

- Although the Coping Strategies Questionnaire (CSQ) is a well researched and widely used instrument to capture pain coping strategies, so far there is no validation of the factor structure for the German version (CSQ-D).
- This study is the first to examine the factor structure using a cross-validation procedure (exploratory and confirmatory analyses) with two independent samples of pain patients and to review the factorial structure in a German population.
- This study confirms some weakness in the factor structure of the CSQ-D, although the effects of dimensions of coping are partly replicated (i.e., Catastrophizing, Ignoring Pain, Diversion, and Reinterpreting Pain Sensations). The introduced short version (CSQ-DS) is an applicable and economical measure to capture pain coping behavior in pain patients.

Introduction

“Better to light a candle than to curse the darkness.”—Chinese proverb

Today, pain is defined as an “unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (Merskey & Bogduk, 1994). This definition includes the subjective and complex nature of pain in terms of its sensory and emotional aspects. The perception of pain is determined by many factors, such as culture, experience, the meaning of a situation, and the level of arousal (Katz, Ritvo, & Irvine, 1996; Stoney, 2012). It is therefore not surprising that patients suffering from chronic pain, defined as persisting pain of minimum 3-months duration, can vary strongly in their adjustment to the ongoing experience of pain. The influence of coping with chronic pain on psychological and physical health outcomes therefore has received heightened awareness in recent years (Jensen, Turner, Romano, & Karoly, 1991).

Chronic Pain and Fibromyalgia

In recent years there have been significant advances in chronic pain research, leading to a greater understanding of its etiology, diagnosis, and therapy (Turk & Monarch, 2002). This progress has important health care implications, as epidemiological research has shown that chronic pain and chronic recurrent pain (episodes of pain alternating with pain-free periods over months or years)

This article was published Online First October 14, 2013.

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have prevalence rates ranging from 10% to 20% of adults in the general population (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). Often patients with back or neck pain, rheumatoid arthritis, or fibromyalgia are studied, as representative of chronic pain patients. According to the American College of Rheumatology 1990 criteria (Wolfe et al., 1990), fibromyalgia (FM) patients are viewed as a homogeneous group within the entirety of chronic pain patients. However, FM patients often turn out to be extremely heterogeneous with regard to their biopsychosocial impairments and responsiveness to interventions (Verra et al., 2009). FM is a complex chronic pain disorder characterized by widespread pain and a heightened and painful sensitivity to pressure (Wolfe et al., 1990). Nevertheless, chronic pain syndromes such as FM often lack unique pathophysiological characteristics and are commonly comorbid with mood disturbances, which raises questions regarding the nature and independence of these illnesses. The treatment of FM is highly relevant for health policy, as diagnosed patients cause high direct costs with their use of health care (Penrod et al., 2004; White & Speechley, 1999) as well as indirect costs (e.g., disability pensions) (Henriksson, Liedberg, & Gerdle, 2005). Estimations of prevalence based on population-based studies range from 0.5 to 5.8% (Gran, 2003). Intensified research on the treatment of FM thus is needed for both medical and economic reasons.

Few studies exist that evaluate the impact of a broad range of coping strategies in FM (Martin et al., 1996; Nicassio, Schoenfeld-Smith, Radojevic, & Schuman, 1995; Nielson & Jensen, 2004; Raak, Hurtig, & Wahren, 2003). Instead, the focus often lies on pain catastrophizing, as it seems to be the most relevant maladaptive coping strategy in terms of associations with outcome measures and treatability through cognitive-behavioral interventions (Hassett, Cone, Patella, & Sigal, 2000; Hirsh, George, Riley, & Robinson, 2007). Indeed, there is increasing evidence that various coping efforts play an important role in adaption to pain in FM (Garcia-Campayo & Pascual, 2007; Martin et al., 1996; Mellegård, Grossi, & Soares, 2001).

Coping With Chronic Pain

The current concept of coping was originally related to work conducted on defense mechanisms and mainly dates back to Lazarus (Lazarus & Folkman, 1984). Coping can be defined as “. . . cognitive and behavioral efforts to manage specific external or internal demands” (Lazarus & Folkman, 1984). In consequence, two points have to be considered when conceptualizing coping: 1) Coping does not need to be a successful act, but it has to be associated with an effort, and 2) This effort can be expressed in a behavioral or cognitive way (Schwarzer & Schwarzer, 1996).

In the research of chronic pain, coping comprises efforts patients make to minimize, reduce, or tolerate their pain. There has been much attention paid to the role coping plays in moderating adjustment to pain (Geisser, Robinson, & Henson, 1994; Jensen et al., 1991; Turner, Jensen, & Romano, 2000). To identify adaptive and maladaptive strategies, it is necessary to categorize coping along several dimensions. A common classification distinguishes active and passive strategies (Brown & Nicassio, 1987; Jensen et al., 1991; Snow-Turek, Norris, & Tan, 1996). Active strategies are responses characterized by an internal control belief and instrumental actions (such as exercise) to reduce pain. In contrast, passive strategies such as catastrophizing involve withdrawal and

giving up control to an external force (Jensen et al., 1991). Another system of classification is divided into cognitive and behavioral strategies (Fernandez, 1986). Cognitive strategies represent pain-management techniques such as distraction or reinterpreting pain. Behavioral strategies refer to actions that deal with the pain, such as taking medication, participating in leisure time activities, or resting in bed. Other classifications have been developed on the basis of factor analyses and empirical data and are discussed below (Rosenstiel & Keefe, 1983).

The Coping Strategies Questionnaire and Aspects of Validity

The CSQ is one of the most popular and influential international coping instruments in chronic pain research. It is a 48-item questionnaire, in which patients rate on a seven-point Likert-type scale from 0 (“not at all”) to 6 (“always”) the extent to which they use a given coping strategy. The CSQ measures six different cognitive coping strategies and two behavioral strategies. The cognitive strategies include Catastrophizing (CAT), Diverting Attention (DA), Reinterpreting Pain Sensations (RPS), Coping Self-Statements (CSS), Ignoring Pain Sensations (IPS), and Praying or Hoping (PH). The behavioral strategies include increasing activity levels (IAL) and increasing pain behavior (IPB) (Rosenstiel & Keefe, 1983). Each scale is composed of six items.

Unfortunately, previous studies analyzing the factor structure of the CSQ have failed to find a reliable and valid factor structure, although some similarities could be found using different samples, cultures, and methods (Harland & Georgieff, 2003; Robinson et al., 1997; Rosenstiel & Keefe, 1983; Swartzman, Gwady, Shapiro, & Teasell, 1994; Tuttle, Shetty, & DeGood, 1991; Utne et al., 2009). Moreover, the CSQ scales rarely relate to adjustment to pain and psychological functioning (Jensen et al., 1991). Verra et al. (2006) translated the original version of the CSQ into German (CSQ-D) according to the international guideline for self-report measures published by the American Association of Orthopedic Surgeons Outcomes Committee. The CSQ-D was tested by patients with chronic pain symptoms, in particular, back pain, fibromyalgia, and generalized widespread pain syndromes ($N = 62$, age: $M = 44$ years, 77% female). The validation of the CSQ-D on the basis of a German pain questionnaire (Fragebogen zur Erfassung der Schmerzverarbeitung; Geissner, 2001), the German “gold standard” for pain coping behavior, failed. According to the authors, both the validity of the original measure and the factorial and construct validity of the German version are low (Verra et al., 2006). They argued that these inconsistencies could be due to the theorized scales by Rosenstiel and Keefe (1983), their operationalization, and the differences in using coping strategies that result from the diversity of pain diseases and cultures. Therefore, it is necessary to find reproducible, valid, and reliable factors of the CSQ-D.

Aims

The aims of this paper are to analyze the factor structure of the German version of the CSQ (CSQ-D; Verra et al., 2006) in a sample of patients with fibromyalgia-like symptoms ($N = 321$) in order to achieve a more reliable and shorter version of the questionnaire and subsequently cross-validate this new version (CSQ-

DS) in another, independent sample ($N = 162$). In particular, we explore the comparability of the new CSQ-DS with several models from previous item-level factor analyses. Correlations between the newly derived factors and measures of chronic pain, psychological distress, and other coping resources (i.e., social support) are used as estimators for the external validity.

Method

Participants

Two samples provided the basis for the analysis of the CSQ-D. The inclusion criterion was the affirmation of a question concerning an existing FM diagnosis. Due to the lack of clinical diagnosis, we labeled the participants as chronic pain patients or patients with fibromyalgia-like symptoms. Data from the first and larger sample were used for an exploratory factor analysis. An examination of the model fit was performed with data from the second sample. Data from both samples provided a basis to assess external validity through correlations with different health outcomes.

Sample 1 ($n = 321$) was recruited online from FM-relevant sites, including official FM information sites, self-help forums, and Facebook groups in September and October of 2011. The study was designed as an online survey using the software Unipark. In total, 289 persons (90%) were female. The mean age was 48.1 ($SD = 8.9$) years, while a mean pain duration of 15.3 ($SD = 10.4$) years was reported.

Sample 2 ($n = 162$) answered the questionnaires in a paper-and-pencil version. The participants were recruited from FM self-help groups, the Web site and journal of the German Fibromyalgia Association, and several FM-specific information events in 2008. In total, 155 (96%) were female, with a mean age of 52.6 ($SD = 9.7$) years and an average pain duration of 17.5 ($SD = 10.8$) years.

A MANOVA was conducted to compare the descriptive variables of both samples. The results revealed significant differences in age: $F(1, 454) = 25.39, p < .01$; pain duration: $F(1, 454) = 4.71, p = .03$; and the time that had passed since the diagnosis: $F(1, 454) = 8.62, p < .01$. The distribution of gender, however, was similar: $F(1, 454) = .11, p = .74$. The sample description and MANOVA results are summarized in Table 1.

Instruments

As the patients in the online survey were of German and Swiss origin, they received the German equivalents of all measures. In

both samples, the full 48-item version of the CSQ-D (in the translation by Verra et al., 2006) was used to assess coping strategies. In addition, the participants completed questionnaire batteries, including measures of depression and anxiety (HADS-D), pain (MPI-D), and overall FM impact (FIQ-D).

HADS-D. The Hospital Anxiety and Depression Scale (HADS-D) is a self-report scale constructed for screening the depression and anxiety disorders of patients in hospital settings (Herrman, Buss & Snaith, 1995). It contains 14 items that are rated on a four-point (0–3) scale, in which higher scores suggest higher depression and anxiety values.

FIQ-D. The Fibromyalgia Impact Questionnaire (FIQ-D) contains 10 questions and was developed to capture the entire spectrum of problems related to fibromyalgia (Offenbaecher, Waltz, & Schoeps, 2000). Thus, it is a measure of the total FM impact. The first question contains 11 items related to perceived physical functioning, which are rated on a four-point scale. Items 2 and 3 refer to the number of days patients have felt well and the number of days they have been unable to work because of fibromyalgia symptoms. Items 4 to 10 are visual analogue scales on which the patients rate the perceived intensity of different symptoms.

MPI-D. The Multidimensional Pain Inventory (MPI-D) consists of 52 items and is constructed with a focus on chronic pain patients (Flor, Rudy, Birbaumer, Streit, & Schugens, 1990). It is split up into three sections with 12 scales measuring the impact of pain on patients' lives, social responses to pain-related communication, and participation in daily life. Only the "pain severity" subscale and subscales measuring perceived social support ("social support," three items; "solicitous response," five items; and "distracting response," three items), were relevant for this study. The scales "solicitous response" and "distracting response" assess pain-related reactions of the relatives and are an additional option to measure social support. Both perceived social support and subjective pain were measured on a seven-point Likert-type scale (from 0, *not at all*, to 6, *extremely/very often*).

Approach to the Data Analysis

Analysis of Sample 1 ($n = 321$)

A factor analysis using SPSS 19 and Mplus 5.21 was applied to set up a new CSQ-D model. This included a principal axis factor analysis (PFA). This approach differed from former CSQ validation studies, which mostly used principal component analyses (PCA) (Harland & Georgieff, 2003; Robinson et al., 1997; Swartzman et al., 1994). To identify latent dimensions in a factor analytic sense, however, a PFA should be given priority over a PCA (Eid, Gollwitzer, & Schmitt, 2010). Factors were varimax-rotated to obtain a simple structure and independent factors and to ensure comparability with previous models. To determine the adequate number of latent dimensions four criteria were used: (1) The Kaiser-Guttman criterion considers factors with eigenvalues > 1 in order to explain variance of more than one item. (2) A parallel analysis compares random and empirical eigenvalues and recommends factors that are more likely than random ones (Horn, 1965). (3) A scree plot shows the empirical eigenvalues in descending order and suggests that relevant factors are situated above the sharp bend or "elbow" (Cattell, 1966). (4) Velicer's MAP test extracts components from the initial correlation matrix as long as

Table 1
Means, Standard Deviations, and Results of MANOVA for
Different Descriptive Variables in Both Samples

	Sample 1	Sample 2	$F(1, 154)$	p
	($n = 321$)	($n = 162$)		
	$M(SD)$	$M(SD)$		
Gender	—	—	0.11	0.74
Age	48.12 (8.80)	52.63 (9.68)	25.39	<0.01
Pain ^a	15.30 (10.42)	17.55 (10.86)	4.71	0.03
Diagnosis ^b	4.90 (4.79)	6.27 (4.67)	8.62	<0.01

^a duration in years. ^b years since diagnosis.

they account for more systematic than unsystematic variance (O'Connor, 2000). The item selection followed the same criteria as in previous studies (Harland & Georgieff, 2003; Robinson et al., 1997; Swartzman et al., 1994). The items were retained if (1) primary loadings were greater than .40 and (2) the difference of magnitude between primary and secondary loadings exceeded .20.

A CFA can be used to revise and refine factorial structures (Floyd & Widaman, 1995), and was therefore computed to test the model resulting from the PFA. A subsequent analysis with emphasis on the reasons for the bad model fit and correlated errors led to further adjustment. The resulting and final model is called the CSQ-DS (short form).

Analysis of Sample 2 ($n = 162$)

We evaluated the extent to which the structure of the CSQ-DS derived from the online sample corresponded to the data of the independent paper-and-pencil sample. Therefore, CFAs were used to compare the model fit to those of previous studies examining the CSQ's factor structure (Harland & Georgieff, 2003; Robinson et al., 1997; Swartzman et al., 1994; Tuttle et al., 1991). A full information maximum likelihood estimation procedure (FIML) as implemented in Mplus was used to test all models.

Following Marsh, Hau, and Wen (2004), several criteria and cut-off values were used to evaluate and compare model fits. The Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) usually reflect an acceptable fit with values greater than .90 and a good fit with values greater than .95. If the Root Mean Square Error of Approximation (RMSEA) values are less than .05 and .08, they represent a close fit and a reasonable fit, respectively. The standardized root-mean-square residual (SRMR) indicates an acceptable fit if its values are less than .10 (Hu & Bentler, 1999; Marsh et al., 2004). The χ^2 test statistic has to be interpreted carefully as it is influenced by the violation of different assumptions, model complexity, and sample size. As there are no empirically confirmed standards, χ^2/df ratios smaller than 2 and 3 are suggested to represent good and acceptable fits, respectively (Schermelleh-Engel, Moosbrugger, & Müller, 2003).

Analysis of Both Samples

For the purpose of external validity, we used bivariate correlations of the CSQ-DS with several measures of mental distress and pain as well as coping resources such as social support. Reliability was estimated through the internal consistencies of all measures.

Results

Construction of the CSQ-DS - Sample 1

To identify stable latent dimensions underlying the data, we employed a varimax-rotated PFA and four abort criteria. The Kaiser-Guttman criterion considered the extraction of 12 factors with eigenvalues larger than 1, which is considerably higher than a meaningful number. Velicer's MAP test resulted in the extraction of eight components (O'Connor, 2000). A parallel analysis (Horn, 1965) compared random and empirical eigenvalues and generated a five-factor solution. The scree plot revealed six factors above the kink (Cattell, 1966).

A six-factor solution, which explains 52.76% of the variance, appeared to be the most interpretable because it achieved a good match between the theoretically derived constructs by Rosenstiel and Keefe (1983) and the empirical data. To ensure optimal comparability, item selection followed identical criteria to those in previous studies (Harland & Georgieff, 2003; Robinson et al., 1997; Swartzman et al., 1994). Thus, items were retained if primary loadings were greater than .40 and possible cross-loadings were at least .20 less. This led to the exclusion of 18 items, resulting in a 30-item solution.

Nevertheless, a subsequent CFA revealed a poor model fit and correlated errors for the model resulting from the PFA, which may have arisen from the relatively weak inclusion criteria described above. In fact, items 4, 27, 35, and 44 showed high cross-loadings and were therefore excluded from further analysis, in accordance with the axioms of classical test theory.

The new model, called the CSQ-DS, is a six-factor model consisting of 26 items. The first four factors—CAT, IP, DIV, and RPS—are very similar to the factors theorized by Rosenstiel and Keefe (1983), despite small differences concerning both the number of items and their respective affiliations with the factors. The original PH scale has been split into two separate factors; the effects of CSS and both behavioral coping strategies (IPB, IAL) could not be replicated.

Confirming the results of previous studies, the effect of the first factor, CAT, was replicated with the original six items (Harland & Georgieff, 2003; Robinson et al., 1997; Swartzman et al., 1994; Tuttle et al., 1991). Factor 2 consisted of two items from the IPS subscale and two items from the CSS subscale. These two items ("I tell myself I can't let the pain stand in the way of what I have to do"; "I see it as a challenge and don't let it bother me") fit into the IPS subscale as they also represent some form of not paying attention to the pain. It is therefore labeled Ignoring Pain (IP) to emphasize the differences from the original IPS. Factor 3 contains four items from DA and one item from IAL. Similarly to the studies of Harland and Georgieff (2003) and Swartzman et al. (1994), the IAL item ("I do something I enjoy, such as watching TV or listening to music") represents behavioral rather than cognitive diversion. DA is thus considered to be both cognitive and behavioral, and labeled "Diversion" (DIV). Factor 4 corresponds to the original RPS subscale with five of six items and keeps RPS as its label. PH is split up into factor 5, "Praying" (PRAY), and factor 6, "Hoping" (HOPE), which are distinct dimensions in this analysis, as was the case for Robinson et al. (1997).

Reliability of the New Scales

Cronbach alphas were used to estimate each factor's internal consistencies (see Table 2). Except HOPE, all scales' consistencies were uniformly high and ranged from .80 to .89. Although HOPE had quite a low alpha level ($\alpha = .603$), it was not excluded from further analysis as in recent studies (e.g., Harland & Georgieff, 2003); it was retained for three reasons: (1) An investigation of at least tau-equivalence of the data is required for Cronbach's alpha to be an appropriate estimator of the internal reliability, otherwise it represents the reliability's lower limit (Eid et al., 2010). (2) The construct could still have predictive value concerning different external measures. For this reason, the external validity of the

Table 2
New Factors, Loadings, and Comparison to Previous English Solutions

Item	Stoffel et al. (2013) Germany Loading	Harland & Georgieff (2003) GB	Robinson et al. (1997) USA	Swartzman et al. (1994) Canada	Tuttle et al. (1991) USA	Rosenstiel & Keefe (1983) USA
Factor 1: Catastrophizing (CAT) ($\alpha = .879$)						
5. It is terrible and I feel it is never going to get any better.	.738	CAT	CAT	CAT	CAT	CAT
12. It is awful and I feel it overwhelms me.	.789	CAT	CAT	CAT	CAT	CAT
14. I feel my life isn't worth living.	.718	CAT	CAT	CAT	CAT	CAT
28. I worry all the time about whether it will end.	.681	CAT	CAT	CAT	CAT	CAT
38. I feel I can't stand it any more.	.771	CAT	CAT	CAT	CAT	CAT
42. I feel like I can't go on.	.715	CAT	CAT	CAT	CAT	CAT
Factor 2: Ignoring Pain (IP) ($\alpha = .802$)						
23. I tell myself I can't let the pain stand in the way of what I have to do.	.601	CC	CSS	IP	IP/CSS	CSS
24. I don't pay any attention to it.	.703		IP	IP	IP/CSS	IP
36. I see it as a challenge and don't let it bother me.	.511	CC		IP	IP/CSS	CSS
40. I ignore it.	.808		IP	IP	IP/CSS	IP
Factor 3: Diversion (DIV) ($\alpha = .839$)						
3. I try to think of something pleasant.	.621	DIV	DIS		DA	DA
30. I replay in my mind pleasant experiences in the past.	.671	DIV	DIS	DIS	DA	DA
31. I think of people I enjoy doing things with.	.607	DIV	DIS	DIS	DA	DA
43. I think of things I enjoy doing.	.720	DIV	DIS	DIS	DA	DA
45. I do something I enjoy, such as watching TV or listening to music.	.584	DIV	DIS	DIS		IAL
Factor 4: Reinterpreting Pain Sensations (RPS) ($\alpha = .852$)						
1. I try to feel distant from the pain, almost as if the pain was in somebody else's body.	.451	RPS	DP	RPS		RPS
11. I just think of it as some other sensation such as numbness.	.706			RPS	RPS	RPS
18. I try not to think of it as my body, but rather as something separate from me.	.821	RPS	DP	RPS	RPS	RPS
34. I imagine that the pain is outside of my body.	.861	RPS	DP	RPS	RPS	RPS
46. I pretend it's not a part of me.	.694	RPS	DP	RPS	RPS	RPS
Factor 5: Praying (PRAY) ($\alpha = .893$)						
17. I pray to God it won't last long.	.899		P	PH		PH
32. I pray for the pain to stop.	.894		P	PH		PH
41. I rely on my faith in God.	.718		P	PH		PH
Factor 6: Hoping (HOPE) ($\alpha = .603$)						
15. I know someday someone will be there to help me and it will go away for awhile.	.589		H	PH		PH
21. I try to think years ahead, of what everything will be like after I have gotten rid of the pain.	.635		H			
25. I have faith in doctors that someday there will be a cure for my pain.	.455		H			PH

Note. CAT = Catastrophizing; CC = Cognitive Coping; CSS = Coping Self-Statements; IP = Ignoring Pain; DIV = Diversion; DIS = Distraction; DA = Diverting Attention; IAL = Increasing Activity Level; RPS = Reinterpreting Pain Sensations; DP = Distancing from Pain; PH = Praying or Hoping; P = Praying; H = Hoping. The solution recently proposed by Utne et al. (2009) was excluded from the comparison due to the oncological sample.

factors was estimated. (3) The exclusion of rationally derived constructs leads inevitably to a reduction of the content validity of the whole measure, while scales with moderate reliabilities might have better validity than longer but redundant scales (Boyle, 1991). Table 2 shows the new factors, their internal consistencies, factor loadings, and a comparison with former factor solutions.

Descriptive Statistics of the New Scales

Descriptive statistics of the new scales were computed from the data of sample 1. As can be seen in Table 3, skewness of the first two scales CAT and IP is low, and the data are therefore symmetrically distributed. A more accurate analysis of the other scales showed that especially RPS and PRAY are problematic concerning

the responses to their items. As many of the subjects did not use these coping strategies at all, this produced highly positively skewed distributions.

Cross-validation in Sample 2

Testing a model on the basis of the data used to develop it often leads to an overestimation of its quality (Picard & Cook, 1984). For this reason, the factorial and external validity of the CSQ-DS was tested on the data of the independent paper-and-pencil sample of 162 participants with fibromyalgia-type symptoms. A confirmatory factor analysis was computed with Mplus 5.21 to estimate the model fit of the CSQ-DS compared to other relevant models

Table 3
CSQ-DS: Means, Standard Deviations, Skewness, and Kurtosis

	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
CAT	3.24	1.25	-0.35	-0.16
IP	2.74	1.28	-0.26	-0.48
DIV	3.30	1.08	-0.53	0.27
RPS	1.38	1.21	1.01	0.71
PRAY	1.49	1.69	0.86	-0.40
HOPE	1.80	1.25	0.62	0.26

Note. CAT = Catastrophizing; IP = Ignoring Pain; DIV = Diversion; RPS = Reinterpreting Pain Sensations; PRAY = Praying; HOPE = Hoping.

from past studies (Harland & Georgieff, 2003; Robinson et al., 1997; Swartzman et al., 1994; Tuttle et al., 1991).

As displayed in Table 4, the CSQ-DS is the only model that satisfactorily reproduces the empirical covariance matrix and therefore fulfils conventional fit criteria. The absolute fit indices meet the cut-off values of an acceptable model fit (CFI = .92; TLI = .90; RMSEA = .06; SRMR = .07). The χ^2/df ratio (434.57/284 = 1.53) meets common standards, although the test is significant ($p < .01$). The similarities between the CSQ-DS and the model of Robinson et al. (1997), which clearly fits the data second best, are worth mentioning. The overlaps between the two studies concerning the factors, number of items, and the similar sample sizes indicate that there is a stable factor structure within the CSQ-DS.

External Validity

The external validity was examined further through correlations of the new CSQ-DS scales with measures of depression and anxiety (HADS-D), pain (MPI-D), social support (MPI-D), and overall FM impact (FIQ-D) (see Table 5). CAT is highly positively related (correlations ranging from $r = .50^{**}$ to $r = .69^{**}$) to depression, anxiety, pain, and FM impact in both samples, demonstrating its special role among coping strategies. This is congruent with past research (Harland & Georgieff, 2003; Jensen et al., 1991; Robinson et al., 1997; Rosenstiel & Keefe, 1983). The relationship between social support and CAT is different; in sample 1 there is no significant correlation, and in sample 2 only the social support and the solicitous response scales are positively correlated ($r = .22^{**}/.21^{**}$). Negative significant relationships

between IP and depression ($r = -.24^{**}/-.39^{**}$) as well as IP and pain ($r = -.16^{**}/-.19^{**}$) are replicated across both samples. The same applies to DIV, which predicts lower ratings for depression ($r = -.41^{**}/-.20$). HOPE is associated with lower ratings for depression, significant for the first sample ($r = -.15^{**}$), and with a slight but clear direction in sample 2 (-.13). All three subscales of social support show a significant positive correlation with DIV and HOPE in both samples, as well as a partially significant correlation with RPS. Internal consistencies across the scales range from $\alpha = .70$ to $\alpha = .92$, except for HOPE ($\alpha = .60/.65$).

Discussion

The study focused on constructing a revised, reliable, and economical version of the CSQ-D in the first sample, and cross-validating it in the second, independent sample. Both samples consisted of patients with self-reported fibromyalgia-like symptoms. The study makes three important contributions. First, the results of both the exploratory and confirmatory factor analyses lead to a new factor structure with six dimensions (CAT, IP, DIV, RPS, PRAY, HOPE) and 26 items. Second, the analyses indicate that the factor solution acquired in the first sample fits the data in the second sample better than other empirically derived factor solutions of the CSQ. These findings indicate that revised factor structure might be generalizable to other, different samples. Third, we found evidence for the external validity of the new scales through correlations with measures of psychic distress, pain, and social support. The particular strength of the study is that it combines exploratory and confirmatory approaches in two independent samples, thus leading to a short version of the CSQ-D, which has not been proposed in German language to date. In the following, we will discuss the contributions of this study in more detail.

Factorial Validity of the CSQ-DS

The CSQ-DS displayed an acceptable model fit and better fit indices than previous factor analytic studies. All factors showed high internal consistencies (Cronbach's alpha ranging from .77 to .92), except for the factor HOPE (.60-.65). Our model is similar to Robinson's (1997) revised version of the CSQ based on a large sample of chronic pain patients, which is the model with the second-best fit indices (see Table 4).

The first four factors of the CSQ-DS (CAT, IP, DIV, RPS) were reproduced with small differences in all of the reviewed factor

Table 4
Model Fits; CSQ-DS vs. Previous Factor Solutions

Sample	Harland & Georgieff (2003) Chronic back pain <i>n</i> = 214	Robinson et al. (1997) Chronic pain <i>n</i> = 965	Swartzman et al. (1994) Whiplash <i>n</i> = 126	Tuttle et al. (1991) Chronic pain <i>n</i> = 181	Stoffel et al. (2013) Fibromyalgia <i>n</i> = 321
Items	24	27	32	35	26
Factors	4	6	5	5	6
χ^2/df	451.329/224	546.620/309	800.158/454	1086.358/516	434.571/284
CFI	0.839	0.872	0.821	0.736	0.920
TLI	0.819	0.855	0.805	0.713	0.908
RMSEA	0.087	0.075	0.076	0.093	0.057
SRMR	0.094	0.093	0.091	0.116	0.070

Note. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.

Table 5
Correlations Between Factors and Clinically Relevant Measures in Both samples; Internal Consistencies

	CAT (.88) ^a	IP (.80)	DIV (.84)	RP (.85)	PRAY (.89)	HOPE (.60)
Sample 1						
Depression (.87)	.69**	-.39**	-.41**	-.23**	.06	-.15**
Anxiety (.83)	.51**	-.16**	-.22**	-.11	.12*	-.16**
Pain (.79)	.48**	-.16**	.01	-.05	.02	.08
FM impact (.78)	.55**	-.25**	-.15**	-.09	-.05	-.09
Social support (.88)	.10	-.02	.18**	.10	.04	.16**
Solicitous responses (.82)	-.01	.07	.20**	.21**	.06	.17**
Distracting responses (.70)	-.08	.12*	.27**	.19**	.10	.18**
	CAT (.88)	IP (.77)	DIV (.78)	RP (.84)	PRAY (.92)	HOPE (.65)
Sample 2						
Depression (.81)	.64**	-.24**	-.20**	-.05	-.06	-.13
Anxiety (.82)	.58**	.00	.00	.09	-.03	-.01
Pain (.76)	.58**	-.19*	-.05	.01	-.06	.15
FM impact (.83)	.51**	-.05	-.06	.02	-.03	.05
Social support (.89)	.22**	.07	.17*	.11	-.10	.26**
Solicitous responses (.82)	.21**	.08	.23**	.09	-.16	.24**
Distracting responses (.71)	.15	.13	.38**	.22**	-.02	.30**

Note. a = α , in parentheses; FM = fibromyalgia.

* $p < 0.05$. ** $p < 0.01$.

analytic studies (Harland & Georgieff, 2003; Robinson et al., 1997; Rosenstiel & Keefe, 1983; Swartzman et al., 1994; Tuttle et al., 1991). In contrast to these stable factors, the behavioral coping strategies IAL and IPB were not found in any of the studies, although several items sometimes loaded on other dimensions such as DIV, which incorporates both cognitive and behavioral factors. However, the last two factors PRAY and HOPE remain controversial. The reviewed studies suggest that Praying and Hoping, originally considered as one factor (PH), should be considered as two independent dimensions. Indeed, the PFA, several abort criteria, and the construct validity of the scales clearly point toward two separate PRAY and HOPE dimensions in this study. Within the CSQ-DS, both factors are only represented by three items, giving rise to the question as to whether they adequately represent broad constructs such as praying and hoping. For future studies, we therefore suggest developing additional items to increase the validity of the subscales.

External Validity of the CSQ-DS

Correlations with measures of anxiety, depression, pain, overall FM impact, and other coping resources (i.e., social support) served as estimators of the external validity (see Table 5). As has often been shown, CAT represents the most important dimension of the CSQ. It shows strong positive associations with all included measures of distress, which is in line with other findings (Geisser et al., 1994; Jensen et al., 1991; Sullivan, Bishop, & Pivik, 1995; Turner et al., 2000). Catastrophizing is therefore well known as a clearly maladaptive “coping” style with regard to overall strain. This raises the question of whether the instrument that assesses a “failure to cope” as its most important dimension is labeled properly. However, CAT might have helpful aspects; in our second sample, patients reporting higher levels of catastrophizing seem to activate more social support. IP and DIV are both significantly negatively associated with several measures of psychological and

pain-related strain. Moreover, DIV is significantly positively related to all three measures of social support and is therefore considered to be an adaptive coping style. There has been little agreement on the question of whether DIV is a supportive (Jordan, Lumley, & Leisen, 1998; Snow-Turek et al., 1996) or maladaptive (Harland & Georgieff, 2003; Hastie, Riley, & Fillingim, 2004) coping strategy to date. These contradictory results make it necessary to consider and explore possible moderating variables. Similar to the relations reported by Robinson et al. (1997) and Harland and Georgieff (2003), RPS did not have stable associations with other measures, as the significant negative correlation with depression in sample 1 could not be replicated in the other sample. However, we found stable positive relationships with the measure of “distracting responses” as an indicator of social support in both samples, revealing the adaptive nature of this coping strategy. The PRAY factor, although measured very reliably (Cronbach’s alpha .89 and .92, respectively), was only slightly correlated with anxiety in sample 1 and uncorrelated with all other measures serving for external validity. However, relations of PRAY with other constructs than those examined at this point may exist. Religious coping strategies such as PRAY have to be differentiated between cultures and individuals, and effects may vary strongly (Chapman & Steger, 2010; Zwingmann, Wirtz, Müller, Körber, & Murken, 2006). The last factor, HOPE, was found to be an adaptive coping strategy with regard to mental health in our study (see Table 5). Significant correlations between HOPE and depression and anxiety were found in the first sample, only. In addition, we found stable positive relationships between HOPE and measures of social support in both samples. These findings contradict other studies that have shown that passive strategies such as HOPE used to be viewed as maladaptive and associated with psychological distress and depression (Rosenstiel & Keefe, 1983; Snow-Turek et al., 1996). It is possible to hypothesize that HOPE is not per se related to passivity, but could show positive

aspects of optimism. It thus needs to be somewhat differentiated with regard to control beliefs and self-responsibility in pain management.

Generalizability and Methodological Approach

The cross-validation procedure in the current study supports the assumption that the newly minted version of the CSQ might be adequate for different samples of patients. Despite the significant differences in demographic variables such as age and pain duration across the samples (see Table 1), we were able to replicate the factor structure with a good model fit. In addition, while the reliability of the diagnosis might be questionable due to the missing clinical judgment, our sample of patients with fibromyalgia-like symptoms and possibly a broader range of chronic pain symptoms can also be seen as a benefit, as it might allow for greater generalizability.

Furthermore, the factor solution in this study is similar to the solution proposed by Robinson and colleagues (1997). However, the sample in the study presented by Robinson et al. (1997) consisted of chronic pain patients ($N = 965$; particularly low back, neck, and head pain) with a different distribution of gender (49% female vs. 90% and 96% in our samples), a different age (43.9 ± 13.8 years vs. 48.1 ± 8.9 and 52.6 ± 9.7 years in our samples), and different pain duration (4.9 ± 13.8 years vs. 15.3 ± 10.4 and 17.5 ± 10.8 years in our samples). With the data of an independent and large sample of chronic pain patients ($N = 472$), Riley and Robinson (1997) demonstrated the superiority of Robinson's six-factor model over the five-factor structures proposed by Swartzman and colleagues (1994) and by Tuttle and colleagues (1991). On the basis of this comparison, we conclude that the revised factor structure might be applicable in different languages and for different patient samples, but further studies concerning measurement invariance issues should be conducted.

Although several studies have investigated the validity of the CSQ (Harland & Georgieff, 2003; Robinson et al., 1997; Swartzman et al., 1994; Tuttle et al., 1991) in different countries (Burckhardt, 1997; Irachabal, Koleck, Rascle, & Bruchon-Schweitzer, 2008; Spinhoven, Ter Kuile, Linssen, & Gazendam, 1989; Verra et al., 2006), different ethnic groups, and nonclinical samples (Hastie et al., 2004), there still remains the problem of comparability due to the differences in the way the data were statistically analyzed. Thus, the current results should be interpreted in the context of the following deliberations: (1) Previous research mostly used a PCA (Harland & Georgieff, 2003; Robinson et al., 1997; Swartzman et al., 1994; Tuttle et al., 1991) to determine the factor structure of the CSQ. This approach is open to criticism, as a PCA is based on the assumption that the observed variables are free of measurement errors. Most measures in psychological research, however, contain random errors. A PFA, as used in this study, reflects recognition of this fact and produces more realistic latent variables. (2) Items were selected when primary loadings exceeded .40 and possible secondary loadings were at least .20 less. This was an arbitrary decision intended to improve comparability with the reviewed studies, necessitating the removal of further items (4, 27, 35, 44) due to high multiple loadings. Although there are statistical differences between investigations of the CSQ, most studies are consistent in applying a varimax rotation to produce orthogonal

factors and a simple structure (Harland & Georgieff, 2003; Robinson et al., 1997; Swartzman et al., 1994; Tuttle et al., 1991). Our study followed this procedure to ensure comparability with the reviewed findings. Other studies argue that coping strategies are not used independently and therefore recommend an oblique solution (Utne et al., 2009).

Limitations

The limitations of the study are of both sample-specific and statistical nature. Patients were recruited mostly through self-help groups; therefore self-selection, rather than an objective diagnosis or independent observations from clinic staff, led to participation. Thus, one might conclude that our results can be generalized to persons with self-reported pain symptoms and that this sample is quite different from treatment-seeking clinic samples used in other studies (e.g., Verra et al., 2006). In fact, although the inclusion criterion, affirmation of a question concerning an existing FM diagnosis, was the same in both samples, the sociodemographic characteristics of participants differed (see Table 1). This might be due to the general heterogeneity of FM patients (Verra et al., 2009) or selection effects (online vs. paper and pencil). These differences, however, can be interpreted as an indication that the newly presented CSQ-DS could be applied in (patient) samples with varying demographic and illness-related characteristics. The fact that the external validity measures were collected at the same time as the CSQ also can be considered a limitation, as this approach ran the risk of creating excess method or response set variance, which may have led to an overestimation of our already weak external validity correlations. Future research therefore should focus on a broader, stepwise generalization. We recommend FM samples with a higher male proportion, clinical diagnoses along with other behavioral measures, and assessment at several time points. Furthermore, future research should include an evaluation of the extent to which the empirically derived coping strategies of the CSQ-DS are used by different pain patients and patients with diseases outside the spectrum of chronic pain.

Conclusions

All in all, the findings provide evidence for a stable factor structure and validity of the CSQ-DS in patients with self-reported chronic pain. To our knowledge, the resulting economical 26-item version is the first short version of the CSQ in the German language. The proposed short version might be useful as researchers can better integrate it within more extensive studies in which the assessment of coping strategies is necessary but only one of many interesting constructs. Nevertheless, for clinical application, we recommend future investigations to explore the external and predictive validity of the CSQ-DS further. Given the broad range of studies analyzing the CSQ, meta-analyses are needed to integrate existing knowledge and insights into the universality of the assessed coping strategies across different factor structures, chronic pain populations, and cultures.

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Received June 28, 2012

Revision received May 28, 2013

Accepted July 29, 2013 ■