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Abstract

Introduction. The most prominent outcome measurement in the field of neuromodulation is pain relief. Nevertheless, the number of studies that rely on composite outcomes, has increased. The aims of this study are two-fold 1) to evaluate which measures are important to include in a composite outcome and 2) to develop this new composite outcome to evaluate the degree of being a clinical holistic responder with a corresponding minimal clinical important difference (MCID).

Materials and Methods. Data from patients with Persistent Spinal Pain Syndrome Type 2, treated with High-Dose Spinal Cord Stimulation (HD-SCS) was used. Pain intensity for low back and leg pain, disability, health-related quality of life, medication use and patient satisfaction were measured at baseline and after 12 months of HD-SCS. Exploratory and Confirmatory Factor Analysis were used to evaluate which measures should be included in the composite outcome. Anchor-based and distribution-based methods were applied to determine the MCID of the newly developed outcome measurement.

Results. A three-factor model was the most appropriate for this dataset, whereby leg pain intensity, EQ5D VAS and disability had the largest loading on these factors. A clinical holistic outcome was created with a total score ranging from 0 (=better (no pain, no disability and perfect health status)) to 300 (=worse (maximal pain, maximal disability and worst health status)). The MCID value based on an absolute change score from baseline up to 12 months of HD-SCS was 87.97. When calculating with percentage changes, a MCID value of 48.4% was revealed.

Conclusions. This new composite outcome, to evaluate the degree of deviation from being a holistic responder, is the first step towards a meaningful, overall outcome assessment for patients who are treated with SCS. Further studies to evaluate the psychometric properties and the generalizability towards other patient populations still need to be performed.

Keywords: neuromodulation; factor analysis; Failed Back Surgery Syndrome; Persistent Spinal Pain Syndrome Type 2; composite endpoints.

Introduction

The main criteria to evaluate success in most studies with Spinal Cord Stimulation (SCS) is the percentage of pain relief resulting from a specific treatment paradigm [1]. Reimbursement of an SCS implant is often conditional upon a successful SCS trial period. The SCS trial period varies widely across and within countries, with differences observable in duration (ranging from minutes up to 28 days) and criteria of success (several percentages in pain reduction are available, sometimes in combination with medication reduction [2] and level of daily activities [3]) of SCS trials [4]. Overall, the cornerstone of a trial period is to test the efficacy of SCS, evaluated with (at least) a pain intensity reduction over a prespecified time period [4].

Evaluating success of a treatment with a pain intensity reporting on a verbal or written scale seems very straightforward and easy at first sight [5]. However, the reported number not only reflects the actual pain intensity, but also the interplay between and/or influence of this physical sensation on quality of life, work status and sleep quality, among other factors [6-12]. The International Association for the Study of Pain (IASP) revised the definition of pain in 2020, whereby pain is currently defined as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage"[13]. Within the accompanying key notes, it is clearly stipulated that pain is influenced to varying degrees by biological, psychological and social factors [13]. Additionally, it is stated that pain usually serves an adaptive role, with potential adverse effects on function and well-being (both social and psychological) [13]. Besides the IASP, the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) group and the Centers for Disease Control and Prevention (CDC) also stressed that functional improvements and emotional and/or psychosocial factors should be incorporated as well, in order to restore physical, mental, and social well-being within the context of pain management [13-15].

Therefore, evaluating success of SCS based solely on pain intensity reporting could be interpreted as a denial of the complexity of pain, pointing towards the use of a composite outcome when evaluating treatment effects [16]. Within a composite variable, multiple measurements are combined within a single (i.e. composite) variable using a predefined algorithm [17]. This approach is particularly useful to control the type I error rate, address multicollinearity or organise highly correlated variables in a meaningful way [18]. Pilitsis et al. created a composite score based on measures of pain intensity, pain catastrophizing, health-related quality of life and physical capability to assess the multidimensional aspects of chronic pain, which was in line with patient satisfaction [19]. Another composite approach that was proposed is to predict patient satisfaction with treatment by pain intensity in the evening and the interaction with walking tolerance time [20]. Additionally, our research group proposed a holistic

responder concept based on reaching minimal clinical important differences (MCIDs) post-SCS compared to baseline for pain intensity, disability, health-related quality of life and medication use [21]. Despite these initiatives, the concept of a holistic responder it not yet finetuned. The goal of this study is to further finetune the definition of a holistic responder by first exploring whether all measures are relevant to incorporate and secondly by constructing a composite outcome for a clinical holistic responder with a corresponding MCID, which is useful to detect meaningful changes for patients.

Methods

Study design

Data from the Discover study, a prospective multicenter registry-based cohort study to evaluate the effectiveness of HD-SCS, was used in this study. The protocol of Discover was prospectively registered at clinicaltrials.gov (NCT02787265) on June 1, 2016. The protocol of this study and the main results can be found elsewhere [21, 22]. All patients with Failed Back Surgery Syndrome (recently defined as Persistent Spinal Pain Syndrome Type 2 (PSPS-T2) after previous spinal surgery [23]), who suffered from leg and/or back pain with a numerical rating scale (NRS) score ≥5/10 were eligible. Before lead implantation, a baseline visit was scheduled. After a successful SCS trial period of 4 weeks (average pain reduction of 50% and a reduction in pain medication use of at least 50%), an internal pulse generator (IPG) was implanted. All patients were implanted with a RestoreSensor, Intellis or PrimeAdvanced IPG (Minneapolis, MN, USA) and received HD-SCS with a pulse density of 25% (500 Hz and 500 sec of pulse) in case of the RestoreSensor or Intellis and 11.7% (450 Hz and 130 sec of pulse width) in case of a PrimeAdvanced IPG. Three follow-up visits took place, namely after 1 month, 3 months and 12 months of HD-SCS. In the current study, only baseline data and data at the primary endpoint (12 months visit) was used.

The study was conducted according to the revised Declaration of Helsinki (1998). The study protocol was approved by the ethics committee of Universitair Ziekenhuis Brussel (B.U.N. 143201629180) and the ethics committees of each participating center. All patients provided written informed consent before enrolment in this study.

Outcome measurements

The NRS was used to evaluate current pain intensity for low back and leg pain separately, ranging from 0 (no pain) to 10 (maximal pain) [24]. Health-related quality of life was measured with the EQ5D-3L [25]. The EQ5D-3L consists of a descriptive system (containing 5 dimensions and 3 response levels) and a

visual analogue scale (VAS) to record an individual's rating for their current health-related quality of life state [26]. The responses to the EQ-5D-3L dimensions were converted into a single index value (utility score), generally ranging from less than zero (where zero is a health state equivalent to death and negative values indicate a health state worse than death) to 1 (perfect health) [27]. Functional disability was assessed with the Oswestry Disability Index [ODI][28], sleep quality with the Pittsburgh Sleep Quality Index [PSQI][29], and a numerical representation of the negative impact of pain medication was evaluated with the Medication Quantification Scale III [MQS][30]. Finally, at 12 months follow-up, patient satisfaction with HD-SCS was measured using a 5-point Likert scale (not at all satisfied, slightly satisfied, neutral, very satisfied, and extremely satisfied). Patients who rated themselves as 'extremely satisfied' or 'very satisfied' at follow-up were considered to have gained a clinically important outcome following SCS implantation ('better'), whereas other patients were considered to have not benefited from their treatment ('worse/neutral') [31].

Statistical analysis

All analyses were performed in R Studio version 1.2.5019 (R version 3.6). P-values of 0.05 or less were considered statistically significant. Data were used as observed, wherefore no imputation strategies for missing data were applied. Normality of data distribution was evaluated with the Shapiro Wilk test and QQ-plots and equality of variances by Levene's tests. Descriptive statistics are provided as mean ± standard deviation or as median (interquartile range).

The main objective was to create a composite outcome consisting of clinically relevant measures to present the clinical holistic outcome of a patient at 12 months follow-up after SCS (long-term outcome). Therefore, NRS for leg pain, NRS for low back pain, ODI, EQ5D (utility score and VAS) and MQS scores were taken into account. Sleep quality was not included as a separate measure since this component was already evaluated within the ODI. Percentages of pain intensity decrease, medication decrease, disability decrease and quality of life increase were calculated between baseline and 12 months data. Factor analyses were performed on standardized data to evaluate whether all variables should be included in the concept of a holistic responder. Exploratory factor analysis (EFA), followed by confirmatory factor analysis (CFA) were therefore used. All factor analyses were performed on the difference scores (baseline versus 12 months) of total scores for each questionnaire, indicating that analyses were not performed at the item-level. The number of components to be included in EFA was determined based on Principal Component Analysis (PCA) with visual inspection of the scree plot and Kaiser's eigenvalue-greater-than-one rule [32]. The Bartlett's test was used to assess the suitability for factor analysis. In EFA, the promax rotation was used to allow for correlations of factors. For each factor, questionnaires with a satisfactory loading (≥0.4) were included in the model [33]. Afterwards, a

CFA was conducted to assess the fit of the factors to represent the underlying constructs of the data, whereby goodness of fit was assessed with Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), the Comparative Fit Index [34] and Tucker-Lewis Index (TLI). Good fit is represented with values below 0.08 for the two first measures and above 0.95 for the latter.

Based on the results of the factor analyses, a new variable with only measures that were deemed important was constructed to denote whether a patient is a clinical holistic responder. Three different ways of expressing this new outcome variable in relation to the treatment were used: 1) the raw scores at baseline and 12 months follow-up; 2) the absolute change score (i.e., baseline score minus follow-up score); and 3) the percentage change score (i.e., the relative change score calculated as ((baseline score – follow-up score)/baseline score)*100). After creating this new variable, the MCID was constructed. Four different definitions of determining the MCID were employed. In the first method, MCID = 0.5*SD, whereby SD represents the standard deviation of the new score at baseline [35]. For the second method, the change in scores corresponding to the small effect size (0.2) is considered the MCID [36]. The MCID is calculated by multiplying the standard deviation of the baseline scores by 0.2 [37]. The third method is relying on within-patient change scores whereby the absolute and relative change in mean scores for patients categorized as 'better' are used as MCID values [38]. Finally, in the fourth method between-patient change scores were allocated as MCID, calculated as the difference in the absolute change scores of the patients classified as 'better' and the group classified as 'worse/neutral' [36].

Results

For 78 patients, complete data was observed at baseline and at 12 months of HD-SCS. Thirty-five (44.87%) males and 43 (55.13%) females were included in the current analysis with a mean age of 53.9±11.04 years. Regarding patient satisfaction with HD-SCS at 12 months, 15 patients (19.23%) were slightly satisfied, 8 patients (10.26%) neutral, 23 patients (29.49%) very satisfied and 32 patients (41.02%) were extremely satisfied. Results of questionnaires at baseline and 12 months can be found in Table 1.

A PCA was carried out to determine the number of factors in the following analyses using visual inspection of the scree plot and Kaiser's eigenvalue-greater-than-one rule. These clearly indicated that a 3-factor structure was the most appropriate for our dataset (with corresponding eigenvalues of 1.65,

1.06 and 1.03) (Figure 1). The Bartlett's test suggested that the data were suitable for PCA ($\chi^2(15)$ = 28.51, p = 0.02).

A three-factor EFA with promax rotation was calculated whereby loadings on the three factors are presented in Table 2. The first factor has a correlation of 0.945 with the difference score of NRS leg pain. The second factor has a correlation of 0.615 with the difference score of ODI and the third factor has a correlation with the difference score in EQ5D VAS (0.482). The common factors explain 31.8% of the total variance. A CFA was calculated whereby factors 1, 2 and 3 were represented by the difference scores for NRS leg pain, ODI and EQ5D VAS, respectively. The goodness-of-fit estimators were good: RMSEA=0, SRMR=0, CFI=1 and TLI=1 with an Akaike information criterion (AIC) of 2504.069. Covariances between the factors and variables were all positive and significant. Factor 1 had a loading of 121.871 on difference score of NRS leg pain (p<0.001), factor 2 a loading of 22.036 on difference score of ODI (p<0.001) and factor 3 a loading of 53.473 on difference score of EQ5D VAS (p<0.001). The correlation between factor 1 and 2 was statistically significant (r=0.451, p<0.001), as well as the correlation between factor 2 and factor 3 (r=0.228, p=0.006). The correlation between factor 1 and factor 3 was not statistically significant (r=0.136, p=0.22). Based on these analyses, the following variables were taken into account to define a clinical holistic responder: NRS leg pain intensity, ODI and EQ5D VAS.

Thus, a new variable was constructed to represent the degree of deviation of being a clinical holistic responder with a total score ranging from 0 (=better (no pain, no disability and perfect health status)) to 300 (=worse (maximal pain, maximal disability and worst health status)). To obtain this total score, the score of the EQ5D VAS was converted to be clinically useful, meaning that 0 represented a perfect health and 100 the worst imaginable health status. The score on the NRS for leg pain intensity was rescaled to a scale ranging from 0 to 100. Questionnaires that were incorporated in this new outcome variable were completely observed for 88 patients, wherefore the MCID was determined on this patient sample. Mean scores of 183±34.0 at baseline and 103±43.5 at 12 months were revealed for the new holistic responder composite variable. The mean absolute change score was 79.57±45.9 and mean relative change score was 42.9% (±24.51%). Correlation matrixes between the new variable and clinical questionnaires at baseline and 12 months are presented in Table 3. All questionnaires significantly correlated with the new composite outcome, both at baseline and 12 months.

The MCID was determined according to the four methods (two distribution-based and two anchor-based methods). For the first distribution-based method, the MCID is equal to 0.5 times the standard deviation at baseline, leading to a MCID of 16.99. In the second method, this standard deviation is multiplied by 0.2 to denote a small effect size, revealing a MCID of 6.80. The MCID based on the within-

patient change scores for patients who are classified in the “better” group resulted in an absolute MCID value of 87.97 and a MCID of 48.4% when calculating with percentage changes. In the fourth method, the difference in the absolute change score of the patients classified as “worse/neutral” and “better” was calculated, resulting in a MCID of 28.43. An overview of all calculated MCID values is presented in Table 4.

Discussion

One of the main criticisms on the use of composite outcomes is that they can be misleading [39], especially when treatment effects vary across components with very different clinical importance [40]. Additionally, unreasonably combined components with inconsistent definitions are frequently mentioned [41]. Nevertheless, composite endpoints are increasingly used in medicine with three main uses of composite indices namely as outcomes to evaluate the performance of health systems, to evaluate outcomes in clinical trials and as patient-reported outcome measure in daily clinical routine care [39]. Within the current study, the gradation of being a clinical holistic responder has implications for both clinical research as well as daily care.

The currently developed composite endpoint to measure the degree of deviation of being a clinical holistic responder was constructed based on input from factor analyses. The final variable included results from the ODI, NRS for leg pain and EQ5D VAS, whereby information about medication use, utility scores and NRS for low back pain was omitted from this variable. Presumably the most surprising finding is that low back pain intensity is not included in this composite variable. Despite the overwhelming influence of pain intensity reporting on determining whether a SCS trial is successful and despite the overall belief of healthcare providers in obtaining pain relief to evaluate success of a treatment, the low back pain component is not considered essential due to the low loading in the factor analysis, at least for a population of patients with PSPS-T2. Previously it was thought that SCS was more successful for chronic low back pain patients who present with pain predominantly in the legs (compared to the lower back pain component) [42, 43], which could serve as an explanation why factor analyses were suggestive for the removal of low back pain intensity and the integration of leg pain intensity in the composite variable. Nevertheless, this statement was not quantitatively confirmed in a meta-regression due to a lack of clear reporting of the dominant pain location in many studies, wherefore it was suggested that SCS is effective, irrespective of the dominant pain location (either leg or lower back pain) [44]. It might be suggested that SCS is effective for reducing both low back and leg pain, with more profound or higher reductions in leg pain intensity compared to back pain intensity (although not statistically compared to each other) [45-47], wherefore leg pain intensity is more suitable

to evaluate the effects of SCS. Furthermore, while the low back pain intensity component corresponded in a low loading in the current study using HD-SCS, it could be expected that it receives a higher load with techniques focusing on low back pain such as Peripheral Nerve Field Stimulation [48, 49]. The exclusion of medication use was in line with a machine learning study to predict the success of high-frequency SCS, in which only pain relief and the number of previous surgeries were denoted as important variables [50]. Similarly, recent work in which machine learning models were applied to develop robust screening tools to predict long-term SCS efficacy did not revealed a statistically significant effect of medication use (quantified with the MQS) in logistic regression [51].

Constructing a new composite outcome is only the first step in the process of creating a more patient-centered outcome. Data at 12 months of HD-SCS was used to construct the composite outcome to evaluate long-term effects. The ultimate goal is to induce a shift from evaluating success of neuromodulation with pain intensity towards evaluating success with a composite outcome, that could eventually serve as reimbursement rule if a composite endpoint with excellent psychometric performance can be constructed. Correlation analysis at 12 months revealed statistically significant associations between this new composite outcome and clinical measurements that are routinely used. Only for medication use, a rather low correlation coefficient of 0.41 was found, although statistically significant. Next steps that need to be performed on different datasets are evaluating the psychometric performance of this tool whereby it is essential to evaluate three criteria: reliability (the composite variable consistently yields the same results when administered on several occasions to the same stable patients), validity (measuring what it claims to measure) and sensitivity (responding to changes in the underlying status of the patient) [52]. However, in clinical practice, challenges exist in determining the clinical significance of a change in outcome measurements from a patient perspective [53]. One possible solution to handle this issue is by relying on MCID values, which can be considered as the smallest change or difference in an outcome measure that is perceived as beneficial and would lead to a change in the patient's medical management, assuming an absence of excessive side effects and costs [54]. To make our composite variable already valuable in clinical practice, the MCID of this measurement tool was determined with several methods. Different calculation strategies led to the proposal of several MCID values, however, to avoid baseline dependency of the sample when determining treatment effects [55] and to take an external standard (i.e. patient satisfaction) into account, the authors are in favor of using an anchor-based method with percentage changes, leading to a MCID of 48.4%. Another approach is to apply a Rasch model before determining individual MCID values, as proposed by Draak et al. [56].

Despite the strong call to further finetune and implement composite endpoints in the field of neuromodulation, this will also lead to statistical concerns when analyzing the data. In clinical trials

with chronic pain patients, patient dropout is common and typically estimated at around 20% to 50% of trial participants, depending on medication, dosage, pain condition, follow-up duration, and other factors [57, 58]. In case of missing values, the question arises whether values should be imputed at the item level, subscale level of composite level. Assuming that in most clinical trials the missing at random mechanisms is operating, simulations revealed that differences induced by imputations at the different levels are likely to be small [59]. In ideal settings, it is suggested to conduct imputations at the item or subscale level to provide more precise estimates of the treatment effect (due to better incorporating correlation amongst the different items) compared to imputations at the composite score or compared to complete case analysis [59]. Nevertheless, this approach is often unfeasible and prone to perfect prediction issues, which is not a preferred situation [59]. Therefore, the choice of imputation should be carefully evaluated, whereby sensitivity analysis to assess the impact of missing data should become a standard component of every trial in which incomplete data is observed.

The selection of measures to include in this composite outcome was data-driven, based on patients included in the Discover study, for whom a SCS trial period of 4 weeks was applied in which an average pain reduction of 50% and a reduction in pain medication use of at least 50% was necessary to have a successful SCS trial. It might be possible that different SCS trial criteria are indicative for the inclusion of other variables in the composite measure, wherefore further validation of the composite measure outside the currently used setting (with related SCS trial criteria) still needs to be performed. The current composite outcome is constructed to evaluate the long-term outcome at 12 months, however, a similar approach could be used to develop composite outcomes for short-term success. Additionally, the composite score should be further evaluated in a prospective study and also in other patient populations that may be candidates for other SCS modalities (e.g. patients with CRPS, virgin back). Furthermore, the perspectives of patients are included in this measure, since a previous European survey denoted the importance of achieving pain relief combined with improvements on the level of activities and participation [60]. Perspectives of clinicians are not yet implemented in this composite outcome [16], and should be evaluated first to evaluate whether their definition of success is in line with what patients aim to achieve.

Conclusions

This new composite outcome, to evaluate the degree of deviation from being a holistic responder, is the first step towards a meaningful, overall outcome assessment for patients who are treated with SCS. Instead of only relying on report of pain intensity, this outcome variable also takes into account

disability and health status, which is more in line with patient expectations and goals that patients aim to achieve with SCS.

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Tables

Variable	Baseline	12 months data
NRS back pain	8 (Q1-Q3: 7-9)	4 (Q1-Q3: 3-6)
NRS leg pain	8 (Q1-Q3: 8-9)	3 (Q1-Q3: 2-5)
EQ5D utility score	0.20 (Q1-Q3: 0.10-0.29)	0.59 (Q1-Q3: 0.55-0.76)
EQ5D VAS score	59 (Q1-Q3: 47.5-70)	70 (Q1-Q3: 52-75)
MQS score	12.1 (Q1-Q3: 6.8-17.9)	5.3 (Q1-Q3: 3.4-10.2)
ODI score	59 (SD: 12.5)	34 (SD: 16.3)

Table 1. Baseline and 12 months data of patients that are included in this study. Abbreviations. MQS: Medication Quantification Scale III, NRS: numeric rating scale, ODI: Oswestry Disability Index, VAS: visual analogue scale.

Variable	Factor 1	Factor 2	Factor 3
NRS back pain	0.078	-0.144	-0.106
NRS leg pain	**0.945**	0.071	0.013
EQ5D utility score	-0.127	0.306	-0.053
EQ5D VAS score	-0.025	0.107	**0.482**
MQS score	-0.086	0.019	0.246
ODI score	0.161	**0.615**	0.377

Table 2. Factor loadings (correlations) between difference scores for each variable and the three components of the Exploratory Factor Analysis. Components in bold were selected for each factor (loading ≥0.4) and used in the Confirmatory Factor Analysis.

Variables	Holistic variable	NRS back	NRS leg	EQ5D VAS	EQ5D	MQS	ODI
Holistic variable		**r = 0.22** p = 0.04	**r = 0.74** p < 0.001	**r = -0.61** p < 0.001	**r = -0.52** p < 0.001	**r = 0.26** p = 0.01	**r = 0.66** p < 0.001
NRS back	**r = 0.62** p < 0.001		**r = 0.26** p = 0.01	r = 0.05 p = 0.62	**r = -0.22** p = 0.04	r = 0.13 p = 0.23	**r = 0.25** p = 0.02
NRS leg	**r = 0.83** p < 0.001	**r = 0.48** p < 0.001		r = -0.07 p = 0.50	**r = -0.36** p < 0.001	r = 0.15 p = 0.16	**r = 0.33** p = 0.002
EQ5D VAS	**r = -0.73** p < 0.001	**r = -0.37** p < 0.001	**r = -0.33** p = 0.002		r = 0.13 p = 0.23	r = -0.10 p = 0.35	r = -0.13 p = 0.23
EQ5D	**r = -0.74** p < 0.001	**r = -0.57** p < 0.001	**r = -0.52** p < 0.001	**r = 0.56** p < 0.001		**r = -0.22** p = 0.04	**r = -0.62** p < 0.001
MQS	**r = 0.41** p < 0.001	**r = 0.25** p = 0.02	r = 0.15 p = 0.18	**r = -0.49** p < 0.001	**r = -0.45** p < 0.001		**r = 0.30** p = 0.006
ODI	**r = 0.85** p < 0.001	**r = 0.66** p < 0.001	**r = 0.51** p < 0.001	**r = -0.60** p < 0.001	**r = -0.75** p < 0.001	**r = 0.45** p < 0.001	

At baseline

At 12-month Follow-up

Table 3. Correlation matrixes between the new composite outcome and clinical questionnaires at baseline (upper blue triangle) and 12 months (lower orange triangle). In the calculation of correlations at baseline (12 months), the baseline (12 months) new outcome variable was correlated with baseline (12 months) clinical questionnaires. Significant correlations are presented in bold.

Method	MCID calculation	MCID value	Approach
Method 1: Standard deviation at baseline	0.5*SD_baseline	16.99	Distribution-based method
Method 2: Effect size	0.2*SD_baseline	6.80	Distribution-based method
Method 3: Within-patient change score	Absolute change score for "better" group Percentage change score for "better" group	87.97 48.4%	Anchor-based method
Method 4: Between-patient change score	Difference in absolute change score between both groups	28.43	Anchor-based method

Table 4. Distribution- and anchor-based methods to determine the minimal clinical important difference values for the new composite outcome variable in patients with Persistent Spinal Pain Syndrome Type 2. Abbreviations. MCID: minimal clinical important difference.

Figures

Figure 1. A. Screeplot indicating that the ideal number of factors is three for this dataset (eigenvalues larger than one). B. Results of the Principal Component Analysis with a presentation of all measures, plotted on the first two components. Abbreviations. MQS: medication quantification scale, NRS: numeric pain rating scale, ODI: Oswestry Disability Index, PC: principal component, VAS: visual analogue scale.