Measurement of clinically relevant functional health perceptions in patients with whiplash-associated disorders: the development of the whiplash specific activity and participation list (WAL)

Maarten A. Schmitt · Martijn S. Stenneberg ·
Patrick P. M. Schrama · Nico L. U. van Meeteren ·
Paul J. M. Helders · Carin D. Schröder

Received: 17 July 2012 / Revised: 25 April 2013 / Accepted: 8 May 2013 / Published online: 19 May 2013
© Springer-Verlag Berlin Heidelberg 2013

Abstract

Purpose The International Classification of Human Functioning Disability and Health (ICF) provides insight into functional health status in patients with whiplash-associated disorders (WAD). In the assessment of functional limitations in patients with WAD, there are several condition-specific questionnaires available. Estimation of the true relationship between the separate constructs of the ICF is only possible if the items of the salient questionnaires measure exactly the constructs of interest, while not simultaneously measuring other constructs of the model. This study aimed to develop a condition specific and clinically relevant and usable instrument for patients with

WAD that measures activity limitations and participation restrictions, as defined by the ICF framework.

Methods Item generation consisted of (1) a semi-structured interview which was conducted among 69 WAD patients; (2) a Delphi study involving 13 health professionals experienced in the assessment of patients with WAD; (3) a literature search for items from self-assessment questionnaires for neck pain.

Results A 35-item condition-specific self-assessment questionnaire for patients with WAD was developed. This new questionnaire measures purely activity limitations and participation restrictions according to the ICF and is based on patients' opinions and expert opinions.

Conclusion The whiplash activity and participation list tends to measure clinically relevant activity limitations and participation restrictions in WAD patients.

M. A. Schmitt (✉) · M. S. Stenneberg ·
P. P. M. Schrama · P. J. M. Helders · C. D. Schröder
SOMT, Institute for Master Education in Musculoskeletal
Therapy, Amersfoort, The Netherlands
e-mail: m.schmitt@somt.nl

N. L. U. van Meeteren
Innovation Area Healthy for Life, TNO, Delft, The Netherlands

N. L. U. van Meeteren
Center for Care Technology Research, Maastricht,
The Netherlands

P. J. M. Helders
Department of Pediatric Physical Therapy and Clinical Exercise
Physiology, Wilhelmina Children's Hospital, University Medical
Center Utrecht, Sub-Faculty of Health Sciences Utrecht
University, Utrecht, The Netherlands

P. J. M. Helders
Faculty of Medicine and University Medical Center,
Utrecht University, Utrecht, The Netherlands

C. D. Schröder
Rehabilitation Center De Hoogstraat, Utrecht, The Netherlands

Keywords Whiplash injury · Questionnaire ·
Development · Activity and participation · ICF

Introduction

A fair proportion of patients with whiplash-associated disorders (WAD) experience chronic complaints [1], which may interfere with patients' jobs, everyday activities, and leisure time pursuits [2]. WAD literature traditionally tends to focus on measurement of impairments, especially of pain, cervical muscle function, and cervical range of motion [3]. Evidence, however, shows that other factors, such as personal factors, activity limitations, and participation restrictions, are equally important [4].

The use of a theoretical framework for functioning and health can be helpful in the clinical decision making and provides insight into functional health status in patients

with WAD [5]. The International Classification of Human Functioning Disability and Health (ICF) seems to provide such a framework [5]. The ICF contains three main constructs (components) of health: body functions and structures, activity and participation and their respective opposites. Personal factors and environmental factors are additional components of the ICF [5].

Understanding of functioning and health in WAD requires an appreciation of the interrelationship between clinically relevant constructs and additional components [6]. Estimation of the true relationship between separate constructs is only possible if the items of the salient questionnaires measure the constructs purely, while not simultaneously measuring other constructs of the model [6]. A self-administrated questionnaire is favorable in both health assessment and outcome measurement [7]. A self-administrated, condition-specific instrument should meet the following criteria: (1) the instrument is developed within a conceptual framework, in this case the ICF; (2) the instrument measures exactly the constructs of interest; (3) the measure should have a good content and construct validity; (4) the instrument is clinically applicable and acceptable, both for patients and health professionals [8].

In the assessment of patients with WAD, there are several condition-specific questionnaires available [9–15]. While the clinometric properties of these questionnaires have been studied in patients with neck pain, their validity, specifically for assessing activity and participation in WAD, has not been established. Existing questionnaires do not meet the above-mentioned second and third criteria, as they measure multiple domains of the ICF and do not include a representative spectrum of restrictions deemed to be important by WAD patients [7]. The neck disability index (NDI), for instance, contains four items on impairments, and six items on activity/participation [16]. The whiplash disability questionnaire (WDQ) contains four functions, six items on activity/participation, and three items on personal factors. All existing questionnaires on WAD provide a sum score. The sum scores are based on the sub scores in several domains of the ICF. Estimation of the true relationship between separate constructs is only possible if the items of the salient questionnaires measure the constructs purely, while not simultaneously measuring other constructs of the model. It is, therefore, difficult to make inferences on the relationship between impairments, activity limitations/participation restrictions and personal factors.

As a consequence, there has, until now, been no condition-specific instrument available by which activity limitations and participation restrictions could be assessed in patients with WAD, without contamination of other ICF domains [2]. Until now, clinicians and researchers had to rely on generic disability measures, which are often not

sufficiently comprehensive and have less discriminative capacities [15]. Therefore, there is a need for a condition-specific questionnaire that measures solely the constructs of activity and participation.

When developing a condition-specific questionnaire, the development process should be based both on patients' perceptions, experiences, and opinions, as well as on experts' opinions and experiences [8].

This study aimed to develop a condition specific and clinically relevant and usable instrument for patients with WAD that measures activity limitations and participation restrictions, as defined by the ICF framework.

Methods

A new condition-specific self-assessment questionnaire for patients with WAD, measuring activity and participation (WAL), was developed. Item collection was established via three main separate yet interlinked procedures: (1) items were obtained via patients with WAD; (2) items were obtained via experts in the field of diagnosis and treatment of patients with WAD; and (3) selected items were compared with existing questionnaires aiming to measure perceptions of activity limitations and/or participation restrictions in patients with neck pain or WAD.

Items obtained from the patients were combined with the items obtained via the experts, and compared with items from the existing questionnaires. In order to assess the feasibility of the WAL, we performed a pilot study (Fig. 1).

Procedure 1: Item collection via patients with WAD

Patients with sub-acute or chronic WAD provided demographic data, and completed the NDI and the neck Bournemouth questionnaire (NBQ). NDI and NBQ scores were compared with existing databases.

For the development of the new questionnaire, items were selected based on replies to the adapted version of the McMaster Toronto arthritis patient preference disability questionnaire (MACTAR) [17]. The MACTAR is a semi-structured interview. It provides insight into problems of physical function that really matter to patients [18]. It was used in all patients as part of a routine assessment in clinical practice, in rehabilitation centres and in primary care settings. Each patient was asked to identify a maximum of ten of the most problematic activities or participation restrictions that he/she experienced due to WAD. Subsequently, the patients were asked to rate the activities according to their importance, and to score the level of limitation of each item on a numerical rating scale from 0 to 10. Inclusion of patients was continued until saturation

Fig. 1 Design of the study. WAD whiplash-associated disorders, MACTAR McMaster Toronto arthritis patient preference disability questionnaire, ICF International Classification of Functioning, Disability and Health, WAL the whiplash activity and participation list

of new items was established. All patients signed for informed consent.

After completion of item collection, all items obtained by the MACTAR that did not match with the definitions of activity limitations or participation restriction, were removed from the list. The remaining items were then linked to the ICF according to established linking rules of Cieza et al. [19], by three of the authors (MSch, MSt, PS) during a consensus meeting. A priori, the decision was made to include all items mentioned by 10 % or more of all participating patients.

The study was approved by the Medical Ethics Committee of the University Medical Center Utrecht.

Procedure 2: Item collection via experts

Using an electronic mail survey [20], a three-round Delphi study was conducted among physiotherapists, physiatrists, and occupational therapists. Prior to the first round of the Delphi study, seven physiotherapists and two occupational therapists who were not involved in the Delphi study, made a selection of all ICF activities and participation items that could be relevant for patients with WAD. These experts in the field of WAD were asked to rate all chosen items on a 5-point Likert scale. All items scored with a median Likert score of 3 or higher, were included and used in the first Delphi round (153 items).

Potential participants of the Delphi study were recruited via the professional networks of the authors. Inclusion criteria were (1) professional background as a physiatrist, physiotherapist, or occupational therapist; (2) more than 5 years of clinical experience in the diagnosis and treatment of WAD patients; (3) treatment of at least three new WAD patients a month; and (4) ability and willingness to respond to the electronic mail survey for each Delphi round within 4 weeks.

Round 1 of the Delphi study

In the first round, the aims of the Delphi study were explained and information on the experts was collected. The experts were asked to select items that were relevant for measuring activities and participation WAD patients. Selection was done by clicking on “yes, this item is relevant”, or clicking on “no, this item is not relevant”. The number of items to be selected was not a priori limited. Experts were given the opportunity to suggest additional items. The level of in- and exclusion for round 2 was a priori set at 80 % agreement among the experts, i.e., items were included in the list.

Round 2 of the Delphi study

In the second round, the experts were provided with their own scores and the group score. The scores were coded for the sake of anonymity. Experts were then asked to assess the importance of the selected items of round 1. A 7-point Likert scale (1, not important; 7, most important) was used. In addition, participants were given the opportunity to select a maximum of ten items out of the residual items which did not reach agreement in the first round (<80 %) to still add to the third round. Prior to round 2, it was decided that items were to be included when more than 80 % of the experts scored 5 or more on the Likert scale.

Round 3 of the Delphi study

The coded scores and the group scores (median and range) and the concept item list, were sent to the experts, who were asked to indicate, using “yes” or “no”, which of the items absolutely had to be included in the questionnaire. There was no restriction as to number of items that could be selected, but experts were asked to weight their

decisions based on the following criteria: (1) all questionnaire items must be relevant for measuring problem perceptions in activities and participation by WAD patients; (2) the questionnaire must be applicable in clinical practice, especially in respect to decision making; (3) the questionnaire must be clinically relevant and acceptable, for both patients and professionals. In addition, the experts were asked to indicate which scoring system would be the most appropriate for the items specifically and for the questionnaire as a whole.

Procedure 3: Literature search

Results of both item collections (via patients and experts) were compared with those of existing questionnaires that include items that assess activity limitations and/or participation restrictions. This comparison was done to examine whether there were items lacking in the concept questionnaire (WAL). A literature search was performed in MedLine, Cinahl, and EMBASE.

Pilot study

In a pilot study, patients were asked to complete the WAL and to appreciate the questionnaire. Patients rated the individual items in terms of relevance to their daily living and clarity using a 0–10 scale, and their appreciation on the whole questionnaire, with respect to wording, clarity, and layout.

Results

Procedure 1: 69 patients participated in the study, 53 women (77 %) and 16 men (23 %), median age 42 (range 21–68) (Table 1). Mean and range of the NDI scores of our sample were slightly higher than reference data [21–23]. Mean range of the NBQ scores were not different from reference data [24] (Table 1). In all collected MACTAR registration forms, 178 activity limitations or participation restrictions were mentioned. After grouping, rewording, and linking to the ICF, 132 items remained. Of these 132 items, all items suggested by 10 % or more of all participating patients were included in the concept list (Table 2). Items with nearly a 10 % score were only included if they scored high with the experts.

Procedure 2: twenty-five experts were invited to participate and 18 responded to the invitation, 13 of which met the inclusion criteria and agreed to participate (8 physical therapists, 3 occupational therapists, and 2 physiatrists). The characteristics of the experts are described in Table 3. All experts participated in all three rounds of the Delphi study.

Table 1 Demographic data patients with WAD, time since injury, and type of injury ($N = 69$)

	Women ($N = 53$) 76.8 %	Men ($N = 16$) 23.2 %
Age (years): median (range)	40 (22–64)	49.5 (21–68)
Time since collision (months) (median, range)	12 (2–120)	9 (3–42)
Type of injury (n)		
Rear end collision	42	12
Front collision	2	1
Side impact collision	2	
Sport injury	2	
Other injury	5	3
Total NDI score		
Mean (SD)	26.9 (7.9)	23.4 (8.9)
Range	10–47	8–39
Total NBQ score		
Mean (SD)	46.3 (13.8)	40.5 (14.3)
Range	12–69	20–61

WAD whiplash-associated disorders, NDI neck disability index, NBQ neck Bournemouth questionnaire, SD standard deviation

Based on the 80 % agreement level, 65 items were included during the first round of the Delphi study. No extra items were added to the list by the participants. As a result of round 2, 23 items were included. In round 3, one item was chosen by <20 % of the experts and was consequently removed, leaving 22 items.

Four suggestions for the questionnaire-scoring system were put forward. Five experts suggested a 5-point Likert scale, three experts suggested a 7-point Likert scale, and four suggested an 11-point Likert scale while one suggested a visual analogue scale (VAS).

Procedure 3: thirteen self-administered questionnaires that are used for the clinical assessment or evaluation of patients with neck pain, were found. Eight questionnaires [the extended Aberdeen spine pain scale (APS) [9], NBQ [10], cervical spine outcome questionnaire (CSOQ) [11], Copenhagen neck functional disability scale (CNFDS) [25], current perceived health 42 profile (CPH42) [12], NDI [13], sickness impact profile (SIP) [14], and the WDQ] [15], were selected by three authors (MSch, MSt, PS), based on full text articles, and after judging the original questionnaires. This selection was compared with the selection of self-assessment questionnaires by Nordin et al. [7]. Two questionnaires reported by Nordin et al. (problem elicitation technique, and VAS) were not included in this study, because they do not contain a fixed number of activity limitations and/or participation restrictions. In a consensus meeting with three of the authors (MSch, MSt, PS), questionnaire items which seem to measure activity

Table 2 Activity limitations (AL) and participation restrictions (PR) suggested by patients ($N = 69$) (after removing <10 % suggestions patients) and experts ($N = 13$); compared with questionnaires for the evaluation of function and disability in patients with cervical pain

Activity limitation/ participation restriction	ICF code	Number of patients (%) who suggested the AL/PR	Number of experts (%) who suggested the AL/PR	Questionnaires which contain suggested items by experts and patients
Learning and applying knowledge				
Focusing attention	d160		12 (92.3)	SIP
Reading	d166	22 (31.9)	10 (76.9)	CNFDS; NDI; NBQ; NPNPQ; EABPS
Solving complex problems	d1751		6 (46.2)	
General tasks and demands				
Undertaking multiple tasks	d220	10 (14.5)	10 (76.9)	CPH42
Handling stress and other psychological demands	d240		12 (92.3)	
Communication				
Conversation	d350	10 (14.5)		
Using writing machines	d3601	13 (18.8)		SIP
Mobility				
Bending	d4105	7 (10.1)	3 (23.1)	CPH42; SIP
Maintaining a sitting position	d4153	15 (21.7)		SIP
Transferring oneself, unspecified ^a	d4209		11 (84.6)	
Lifting and carrying objects	d430	36 (52.2)	9 (69.2)	CNFDS; NDI; NBQ; NPNPQ; SIP
Reaching	d4452	13 (18.8)		CPH42
Catching	d4455		1 (7.7)	
Walking and moving	d450	12 (17.4)		SIP
Moving around	d455		3 (23.1)	
Climbing	d4551	11 (16.0)		CPH42; SIP
Running	d4552	12 (17.4)	5 (38.5)	
Jumping	d4553		5 (38.5)	
Using transportation	d470	8 (11.6)		
Driving human-powered transportation	d4750	14 (20.3)		
Driving motorized vehicles	d4751	34 (49.3)	9 (69.2)	NDI; NPNPQ; WDQ; EABPS; NBQ
Self-care				
Washing oneself	d510			NDI; WDQ; SIP
Caring for body parts	d520		9 (69.2)	CNFDS
Dressing	d540	13 (18.8)		CNFDS; NDI; WDQ; SIP; NBQ
Domestic life				
Shopping	d6200	11 (16.0)	8 (61.5)	
Household tasks	d630	14 (20.3)	3 (23.1)	SIP
Doing housework	d640		11 (84.6)	SIP; NBQ
Cleaning living area	d6402	24 (34.8)		SIP
Using household appliances	d6403	28 (40.6)		
Disposing of garbage	d6405	8 (11.6)		
Interpersonal interactions and relationships				
Basic interpersonal interactions	d710	8 (11.6)		
Complex interpersonal interactions	d720	11 (16.0)		CNFDS; NPNPQ; WDQ; NBQ
Family relationships	d760	12 (17.4)		
Sexual relationships	d7702	11 (16.0)	7 (53.8)	EABPS; SIP

Table 2 continued

Activity limitation/ participation restriction	ICF code	Number of patients (%) who suggested the AL/PR	Number of experts (%) who suggested the AL/PR	Questionnaires which contain suggested items by experts and patients
Major life areas				
School education	d820		6 (46.2)	WDQ
Remunerative employment	d850	27 (39.1)	13 (100)	NDI; NPNPQ; WDQ; EABPS; NBQ
Community, social and civic life				
Recreation and leisure	d920		12 (92.3)	EABPS; SIP; NBQ
Community life	d910		6 (46.2)	
Sports	d9201	56 (81.2)	9 (69.2)	WDQ
Arts and culture	d9202	7 (10.1)		SIP
Socializing	d9205	7 (10.1)		CPH42; SIP; NBQ

MACTAR McMaster Toronto arthritis patient preference disability questionnaire, *CNFD* Copenhagen neck functional disability scale; *CPH42* current perceived health 42 profile, *EABPS* extended Aberdeen back pain scale, *NDI* neck disability index, *NBQ* neck Bournemouth questionnaire, *NPNPQ* Northwick Park neck pain questionnaire, *SIP* sickness impact profile, *WDQ* whiplash disability questionnaire, *ICF* The International Classification of Human Functioning Disability and Health

^a Suggested by the experts: rotating the head and the cervical spine while sitting in a car

Table 3 Characteristics of the experts ($N = 13$)

Mean age in years (range)	43.1 (29–54)
Profession	
Physical therapist	8
Occupational therapist	3
Physiatrist	2
Work setting (number)	
Rehabilitation center	8
Primary care setting	5
Mean of number of WAD patients per month (range)	5.2 (3–10)
WAD whiplash-associated disorders	

men). Median age was 42.5 (range 27–60). The questionnaire was found to be relevant and understandable to these patients. The mean score for relevance of the individual items was 7.3 out of 10 (range 5.1–9.2), and the mean score for comprehensibility of the separate items was 8.7 (range 7.7–9.2). The mean score of the general appreciation of the total questionnaire was 7.8 (range 6–10), and the score for the instruction of the questionnaire was 6.8 (range 4.0–8.0). The mean appreciation of the scoring method was 7.3 (range 2–10). In response to the results of the pilot study, some minor revisions were made in the wording of the items and the instruction.

limitations and/or participation restrictions, were selected, using the ICF linking rules [23].

Twenty-six activity limitations and/or participation restrictions were selected from literature and compared with the results of procedure 1 and procedure 2 (see Table 2). Compared to this list of activity limitations and participation restrictions suggested by experts and by patients, no new items were found in the screened eight questionnaires.

The items suggested by patients (28) and experts (22) were combined and reworded in the language that was applied by the patients. Double items (15) were removed. This resulted in a 35-item questionnaire. A scoring system for the WAL was chosen based on suggestions of the experts, and was also based on the ICF severity score (0, no problem; 1, mild problem; 2, moderate problem; 3, severe problem; 4, complete problem).

Pilot study: 13 patients with WAD were invited to participate. Ten (77 %) agreed to participate (8 women, 2

Discussion

The aim of this study was to develop a condition-specific questionnaire for WAD patients, which measures activity limitations and participation restrictions, in accordance with the ICF.

In literature, there is an on-going discussion concerning the use of diagnostic instruments that are based on a theoretical framework, i.e., the ICF. Existing questionnaires for WAD are not primarily based on the ICF. If a questionnaire is not primarily based on the ICF, it is difficult to compare components of functioning and health, like “impairments” versus “activity limitations”. This new questionnaire has a potential advantage over existing questionnaires because the instrument is developed within the conceptual framework, and measures the constructs of the framework purely.

The WAL was based on expert opinions, patients’ experiences, and on existing questionnaires, meaning that it

has face and content validity. The WAL is condition-specific, is framed within the ICF and is clinically applicable (brevity and simplicity). The ICF allows clinicians to comprehensively describe and categorize functioning and disability in a systematic and standardized way. An instrument that uses the ICF as conceptual framework allows clinicians to assess severity of the health problem and facilitates clinical reasoning [5].

Our study does have its limitations though. Firstly, all the patients who participated in this study followed regular treatment programs for physiotherapy, which might have been of influence on the suggested items they provided. And, it is unknown whether the sample in our study is representative for the population of patients with WAD, as we did not check clinical characteristics of patients who refused to participate in our study. There is possibly some selection bias. In addition, patients' suggestions were based on MACTAR data. Clinicians should be adequately trained on how to use the MACTAR correctly. In our study, we did not check the level of experience with the MACTAR. A different use of the MACTAR can lead to biased data. The MACTAR is normally used and validated for other types of conditions. A parallel study, however, showed the appropriateness of the methodology [22, 23]. Furthermore, we used a Delphi method to obtain expert opinions. The success of such a strategy rests on characteristics of the experts. We did not use sound criteria for the assessment of the participants' level of expertise. In the Delphi study, the cut-off point for including items was set at 10 %, which is arbitrary. To our knowledge no methodological criteria are available concerning decision making in item selection in relation to the development of a questionnaire. It is worthwhile to develop such criteria.

Prior to using the WAL in practice it has to be validated in a representative sample of the population. Therefore, the next steps in the development of this instrument are to evaluate its reproducibility and construct validity, both cross-sectional and longitudinal, and to estimate the minimally important change score.

In conclusion, the WAL measures activity limitations and participation restrictions in patients with WAD. The WAL is a first step in the development of a clinically applicable instrument. Further research must focus on the validation and generalizability of this questionnaire.

Conflict of interest All authors state no conflict of interest.

Appendix

See Table 4.

Table 4 Concept version of the whiplash activity and participation list (WAL)

Focusing attention
Reading
Solving complex problems
Undertaking multiple tasks
Handling stress
Conversing
Using a desktop computer or laptop
Bending over
Maintaining a sitting position
Looking over the shoulder
Lifting and carrying objects
Prolonged walking
Running
Overhead work
Using public transportation (bus, train or subway)
Cycling
Driving a motor vehicle (such as an automobile or motorcycle)
Wash or shower
Caring for body parts (such as face, teeth) or washing hair
To dress or undress
Shopping
Preparing meals (slicing, cooking, etc.)
Doing housework (cleaning, washing clothes, window cleaning, etc.)
Using household appliances (such as vacuum cleaners)
Gardening
Interacting with people (such as friends, co-workers, partner, and children)
Maintaining relationships
Sexuality
Following education or training
Work (maintaining a job, performing volunteer work)
Engaging in recreational activity (such as sightseeing or visiting an amusement park)
Engaging in social activities (such as organized religious ceremonies, political events or activities in a social club)
Sports
Going out (such as going to the theater, cinema or museum)
Visiting friends or relatives

References

1. Carroll LJ, Cassidy JD, Cote P (2006) Frequency, timing, and course of depressive symptomatology after whiplash. *Spine* 31(16):E551–E556
2. Pinfold M et al (2004) Validity and internal consistency of a whiplash-specific disability measure. *Spine (Phila Pa 1976)* 29(3):263–268
3. Lovell ME, Galasko CS (2002) Whiplash disorders—a review. *Injury* 33(2):97–101

4. Sterling M (2006) Identifying those at risk of developing persistent pain following a motor vehicle collision. *J Rheumatol* 33(5):838–839
5. Steiner WA et al (2002) Use of the ICF model as a clinical problem-solving tool in physical therapy and rehabilitation medicine. *Phys Ther* 82(11):1098–1107
6. Pollard B, Johnston M, Dixon D (2007) Theoretical framework and methodological development of common subjective health outcome measures in osteoarthritis: a critical review. *Health Qual Life Outcomes* 5:14
7. Nordin M et al (2008) Assessment of neck pain and its associated disorders: results of the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and its Associated Disorders. *Spine (Phila Pa 1976)* 33(4 Suppl):S101–S122
8. Pollard B et al (2009) Measuring the ICF components of impairment, activity limitation and participation restriction: an item analysis using classical test theory and item response theory. *Health Qual Life Outcomes* 7:41
9. Williams NH, Wilkinson C, Russell IT (2001) Extending the Aberdeen Back Pain Scale to include the whole spine: a set of outcome measures for the neck, upper and lower back. *Pain* 94(3):261–274
10. Bolton JE (2004) Sensitivity and specificity of outcome measures in patients with neck pain: detecting clinically significant improvement. *Spine* 29(21):2410–2417 (discussion 2418)
11. BenDebba M et al (2002) Cervical spine outcomes questionnaire: its development and psychometric properties. *Spine (Phila Pa 1976)* 27(19):2116–2123 (discussion 2124)
12. Fielding R, Li J (1997) A validation of the concept of current perceived health and the Current Perceived Health-42 (CPH-42) questionnaire. *Qual Life Res* 6(1):35–42
13. Vernon H, Mior S (1991) The Neck Disability Index: a study of reliability and validity. *J Manip Physiol Ther* 14(7):409–415
14. Gilson BS et al (1975) The sickness impact profile. Development of an outcome measure of health care. *Am J Public Health* 65(12):1304–1310
15. Willis C et al (2004) Reproducibility and responsiveness of the Whiplash Disability Questionnaire. *Pain* 110(3):681–688
16. Schmitt MA et al (2013) Content validity of the Dutch version of the Neck Bournemouth Questionnaire. *Man Ther* [Epub ahead of print]
17. Verhoef J et al (2007) Effectiveness of the introduction of an International Classification of Functioning, Disability and Health-based rehabilitation tool in multidisciplinary team care in patients with rheumatoid arthritis. *Arthritis Rheum* 57(2):240–248
18. Verhoeven AC, Boers M, van der Liden S (2000) Validity of the MACTAR questionnaire as a functional index in a rheumatoid arthritis clinical trial. The McMaster Toronto Arthritis. *J Rheumatol* 27(12):2801–2809
19. Cieza A et al (2002) Linking health-status measurements to the international classification of functioning, disability and health. *J Rehabil Med* 34(5):205–210
20. Elwyn G et al (2003) Developing a measure of patient access to primary care: the access response index (AROS). *J Eval Clin Pract* 9(1):33–37
21. Sterling M, Kenardy J (2008) Physical and psychological aspects of whiplash: important considerations for primary care assessment. *Man Ther* 13(2):93–102
22. Soderlund A, Lindberg P (1999) Long-term functional and psychological problems in whiplash associated disorders. *Int J Rehabil Res* 22(2):77–84
23. Kaale BR et al (2005) Whiplash-associated disorders impairment rating: neck disability index score according to severity of MRI findings of ligaments and membranes in the upper cervical spine. *J Neurotrauma* 22(4):466–475
24. Schmitt MA et al (2009) The Neck Bournemouth Questionnaire cross-cultural adaptation into Dutch and evaluation of its psychometric properties in a population with subacute and chronic whiplash associated disorders. *Spine (Phila Pa 1976)* 34(23):2551–2561
25. Jordan A et al (1998) The Copenhagen Neck Functional Disability Scale: a study of reliability and validity. *J Manip Physiol Ther* 21(8):520–527