

**Systematic Review**

## The Efficacy of Patient Education in Whiplash Associated Disorders: A Systematic Review

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**Background:** Until now, there is no firm evidence for conservative therapy in patients with chronic Whiplash Associated Disorders (WAD). While chronic WAD is a biopsychosocial problem, education may be an essential part in the treatment and the prevention of chronic WAD. However, it is still unclear which type of educative intervention has already been used in WAD patients and how effective such interventions are.

**Objective:** This systematic literature study aimed at providing an overview of the literature regarding the currently existing educative treatments for patients with whiplash or WAD and their evidence.

**Study Design:** Systematic review of the literature

**Methods:** A systematic literature search was conducted in the following databases: Pubmed, Springerlink, and Web of Science using different keyword combinations. We included randomized controlled clinical trials (RCT) that encompass the effectiveness of education for patients with WAD. The included articles were evaluated on their methodological quality.

**Results:** Ten RCT's of moderate to good quality remained after screening. Both oral and written advice, education integrated in exercise programs and behavioral programs appear effective interventions for reducing pain and disability and enhancing recovery and mobility in patients with WAD. In acute WAD, a simple oral education session will suffice. In subacute or chronic patients broader (multidisciplinary) programs including education which tend to modulate pain behavior and activate patients seems necessary.

**Limitations:** Because of limited studies and the broad range of different formats and contents of education and different outcome measures, further research is needed before solid conclusions can be drawn regarding the use and the modalities of these educational interventions in clinical practice.

**Conclusion:** Based on this systematic literature study it seems appropriate for the pain physician to provide education as part of a biopsychosocial approach of patients with whiplash. Such education should target removing therapy barriers, enhancing therapy compliance and preventing and treating chronicity. Still, more studies are required to provide firm evidence for the type, duration, format, and efficacy of education in the different types of whiplash patients.

**Key words:** Systematic review, whiplash, whiplash associated disorders, education, patient advice, information, chronic pain, biopsychosocial approach

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**W**hiplash-associated disorder (WAD) is a debilitating and costly condition of at least 6-month duration and is characterized by multiple symptoms such as chronic neck pain, fatigue,

dizziness, concentration difficulties, and headaches. WAD is diagnosed and categorized according to the Quebec Task Force on WAD (1). Although the majority of patients with whiplash show no physical signs, even

when sophisticated imaging techniques are used, up to 50% of the patients develop chronic pain (1-5)

Chronic WAD remains a challenging condition for clinicians. Based on the review of Scholten-Peeters et al (6), there is strong evidence that older age, female gender, angular deformity of the neck, and compensation are unrelated to an adverse prognosis. Catastrophic beliefs about pain, however, are associated with heightened pain and disability in people with chronic WAD, and they play an important role in the transition from (sub)acute to chronic WAD (7- 9). Besides catastrophizing, other psychological factors such as depression, anxiety, expectations for recovery, and high psychological distress have been identified as important prognostic factors for WAD patients (10-12). Coping strategies such as diverting attention and increasing activity are related with positive outcomes (8).

In order to achieve a positive rehabilitation outcome for patients with WAD, it seems plausible to use intervention programs that specifically target these cognitions and psychological factors, both for preventing and approaching chronicity. In patients with chronic low back pain (13,14) and patients with chronic fatigue syndrome suffering chronic widespread pain (15), there is evidence that pain education changes pain behavior and cognitions. Catastrophizing, especially decreased in response to pain education (15). Since catastrophizing is an important prognostic factor for WAD patients, educating these patients might be warranted. In WAD,

the use and the efficacy of education in general is not as clear as, for example, in chronic low back pain. The objective of this systematic literature search is to review the current knowledge concerning education in WAD. The following questions will be addressed:

1. What are the different kinds of education that are used in patients with WAD?
2. Is there a difference in the education provided to acute patients compared to chronic patients with WAD?
3. What is the efficacy of these educational formats in patients with WA

**METHODS**

This systematic review is reported following the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) guidelines, which is an updated statement addressing the conceptual and methodological issues of the original Quality of Reporting of Meta-analyses (QUOROM) Statement (16).

**Eligibility Criteria**

To be included in the present systematic review, articles had to report the results of clinical trial (S) evaluating education (I) for patients with WAD (P). The outcome measure (O) of the comparison (C) were not defined in order to obtain all available studies concerning the efficacy of education for patients with WAD.

**Information Sources and Search Strategy**

To identify relevant articles PubMed and Web of Science were searched in March 2012. The search strategy was based on a combination of the search terms related to “whiplash” and “education” as a therapy modality. It consisted of the following key words: Whiplash, whiplash injuries, whiplash associated disorders and patient education, patient information, behavioral therapy, behavioral treatment, cognitive therapy, cognitive treatment, cognitive behavioral therapy, conservative therapy, conservative treatment, information booklet, educational booklet, educational intervention, advice, coping strategies.

The construct of the search strategy is presented in Table 1. In addition reference lists of relevant published articles were searched to make the search as complete as possible.

**Study Selection**

Eligibility assessment of the search results was performed according to following eligibility criteria:

Table 1. Search strategy

Keywords		
Whiplash OR Whiplash injuries OR Whiplash associated disorders	AND	patient education
		patient information
		behavioral therapy
		behavioral treatment
		cognitive therapy
		cognitive treatment
		cognitive behavioral therapy
		conservative therapy
		conservative treatment
		information booklet
		educational booklet
		educational intervention
		advice
coping strategies		

- Study subjects were adult (> 18 years) whiplash patients (with a history of a whiplash / hyperextension injury to the neck).
- Study subjects could be in any stadium of cervical whiplash (acute, subacute and chronic).
- Studies could describe all kinds of education and they studied the efficacy of education.

The type of intervention was clearly described.

Only clinical trials published in full text in English, French, Dutch, or German were included.

First, all search results were screened based on title and abstract. The full-text article was retrieved if the citation was considered potentially eligible and relevant. In the second phase, each full text article was once again evaluated whether it met the inclusion criteria. If any of the 5 inclusions were not met, then the article was excluded from the literature review.

### **Qualification of Searchers / Raters**

Literature was searched and screened by VH, bachelor in the physiotherapy and rehabilitation sciences. She was trained by the first author (MM), who obtained the degree of PhD with a dissertation regarding chronic pain and central sensitization and has published 2 systematic review (17,18).

Methodological quality was separately assessed by 2 researchers (MM and VH), who were not acquainted with each other's evaluation of the search results before having a consensus meeting

### **Data Items and Collection**

Information was extracted from each included trial on: (1) characteristics of trial participants (acute, subacute, chronic) and the trial's inclusion and exclusion criteria; (2) type of intervention (format of education, solely or combined with other modalities, content of education, individually or in group, etc.); (3) type of control intervention; and (4) outcome measure and therapy effects. One review author (VH) extracted the data from included studies and the first author checked the extracted data.

### **Risk of Bias in Individual Studies**

Methodological quality was assessed by 2 independent, blinded researchers (MM and VH), i.e., they were not acquainted with each other's evaluation of the search results. After rating the selected articles, the results of both researchers were compared and differences were analysed in a consensus meeting. In case of

disagreement, the reviewers screened the manuscript a second time and the points of difference were discussed. Both reviewers got the opportunity to argue and to convince the other in order to obtain a consensus. When consensus could not be reached between the 2 raters, a third decisive opinion was provided by the last author (JVO).

Methodological quality of the different studies was assessed with a self-constructed checklist, because we anticipated that not many random controlled trials (RCTs) would be identified and because we felt that other relevant items are sometimes lacking in the existing checklists for RCTs. At the same time, we were able to specify our checklist in the direction of the specific content of studies reporting educational inventions. Our checklist was inspired by the available checklists for RCTs, like the PEDRO-scale (19), the Sign Check list ([www.sign.ac.uk/methodology/checklists.html](http://www.sign.ac.uk/methodology/checklists.html)), and the checklist of the Dutch Institute for Healthcare Improvement CBO ([www.cbo.nl/en/](http://www.cbo.nl/en/)).

The checklist consisted of 15 criteria and is presented in Table 2. Every positive answer is awarded by one point, giving a maximum score of 15, if all criteria were applicable, or less when only a certain amount of criteria were applicable. Scores were converted to percentages to ease comparing of studies.

Additionally, the studies were even so evaluated with the PEDRO-scale (19) by VH.

## **RESULTS**

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### **Study Selection**

As shown in Fig. 1, a total of 2,394 studies were identified. Of these, 2,089 were discarded because after reviewing the abstracts it appeared that these papers did not meet the criteria. After removing duplicates, 44 studies were withdrawn in the first screening phase. One study was discarded because the full text of the study was unavailable (20). The full text of the remaining 43 citations was examined in more detail. It appeared that 30 studies did not meet the inclusion criteria. Ten studies, all RCTs, met the inclusion criteria and were included in the systematic review.

### **Risk of Bias and Level of Evidence**

The risk of bias and the level of evidence of the different studies are reported in Table 2. All trials were evaluated with our 15-item checklist and the RCTs were even evaluated with the Pedro-scale.

In most cases (90.5 % or 136 of the 150 items)

Table 2. Risk of bias and level of evidence

STUDIES	Criteria															Score /100	Pedro /11	Level of evidence
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
Sholten-Peeters (2006) (27)	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	93	7	A
Stewart et al (2006) (28)	+	+	+	+	+	+	-	+	-	+	+	+	+	+	+	87	8	A
Kongsted et al (2007) (23)	+	+	+	+	+	+	-	+	-	+	+	+	+	+	+	87	8	A
Ferrari et al (2005) (25)	+	+	+	+	+	+	-	+	-	-	+	+	+	-	+	73	7	A
Rebbeck et al (2006) (32)	+	+	-	+	-	+	+	+	+	-	+	-	+	+	+	73	9	A
Wicksell et al (2008) (31)	+	+	+	+	-	+	-	+	-	+	+	-	+	-	+	67	8	A
Kongsted et al (2008) (24)	+	+	+	-	-	+	-	+	-	+	+	-	+	-	+	60	8	A
Oliveira et al (2006) (26)	+	-	+	+	+	-	-	+	-	-	+	+	+	-	+	60	7	A
McKinney et al (1989) (22)	+	+	+	+	-	+	-	+	-	+	-	-	+	-	-	53	7	A
Bonk et al (2000) (21)	+	+	-	+	-	-	-	+	+	-	+	-	-	-	-	40	5	B

1. In- and exclusion criteria are clearly defined.
2. Assignment of subjects to treatment groups is randomized.
3. Randomization procedure is described.
4. Groups were similar at baseline regarding the most important prognostic indicators.
5. Power calculation was performed.
6. There was blinding of all assessors who measured at least one key outcome.
7. There was blinding of all subjects.
8. Interventions were described in function of reproducibility.
9. Drop-out were described (amount and reason).
10. All relevant outcomes are measured in a standard, valid and reliable way
11. There was a follow-up period for at least 3 months after intervention.
12. Co-interventions were taken into account.
13. Statistical procedures are described.
14. Eventual negative effects were registered.
15. The content of the educational invention was standardized.

the 2 researchers agreed. After a second review and a comparison of the 14 differences, the reviewers reached a consensus for 2 items. The remaining 12 points of discussion were solved after a third opinion. The final score of each study is presented in Table 2, with the explanation for the loss of points.

Methodological quality varied between 40% and 93% on the self-constructed checklist and between 5 and 9/11 on the PEDro-scale, indicating similar results between the 2 lists. The self-constructed list was somewhat more stringent, because power analyses, account for co-intervention, and registration of negative effects was expected.

According to the PEDro-classification most of the studies showed good methodological quality. Only one study failed to get half of the points (21), resulting in a level of evidence B.

Most of the time studies lost points on blinding of assessors, power calculation and registering co-interventions and negative effects.

The criteria that we added in our checklist because of their relevance specific for the question of this review standardization of the education and objective outcome measures were positively scored for most of the studies.

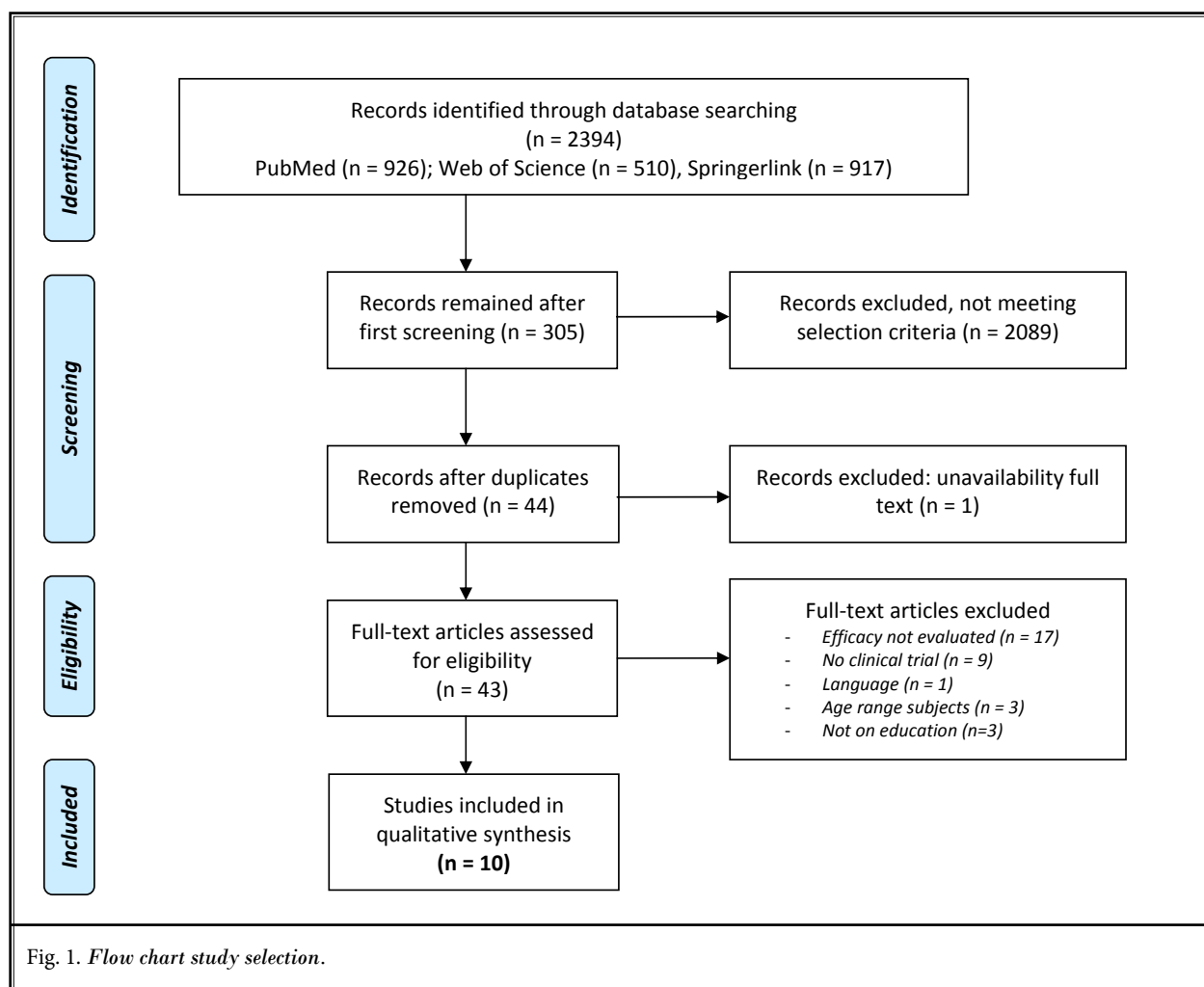
### Study Characteristics

For each study, the characteristics for which data were extracted (study size, PICO, follow-up period, and main results) are presented in Table 3.

### Types of Education in Patients with Whiplash

The first goal of the present review was to review all possible formats of education for whiplash patients. The third and the fourth columns of Table 3 present the different formats and contents of the education.

One of the first studies investigating this topic studied the effect of offering comprehensive advice for correct posture and home mobilization by a physiotherapist compared to a 4-week exercise program and



the wearing of an neck collar (22). After this first study, other studies on education appeared, varying between oral advice (sometimes with reinforcing written instruction) (22-24), information pamphlets (24,25), a psycho-educational video (26), exercise programs including education (21,27,28) or behavioral-oriented programs including education (29).

The content of the education was often based on The Whiplash Book, which provides advice and information on how to cope with whiplash injury, in order to avoid long-term pain and disability. (30). Analogously, most of the educational interventions provided information on the injury, symptomatology, physiology, prognosis, and possible therapies for WAD, and the relevance of physical activity, highlighting that activities provoking light complaints do not necessarily cause further damage. The most important goals of the in-

terventions were reassuring the patient, modulating maladaptive cognitions about WAD and activating the patient.

Sometimes advice was given towards mobilization, home exercise, and correct postures (21, 22). In 2 studies pain neurophysiology education was provided (27,31). In the study of Wicksel et al(31) different modalities were applied by a psychologist and a pain specialist experienced in cognitive behavioural therapy and acceptance and commitment therapy aiming at increasing psychological flexibility of the patient.

Most of the time education was provided by physiotherapists (21,22,27,28), followed by study nurses (23,24), a general practitioner (27), a psychologist and a pain physician (31).

There was also one study that evaluated whether education of the physiotherapists would influence the

Table 3: Evidence table

STUDIES	Patients	Format of Education	Education Intervention (EI)	Control Intervention (CI)	Outcome Measures	Follow-up	Main Results
<b>a) Acute patients</b>							
McKinney et al (1989) (22)	Acute (within 72 hours) n=247	Verbal (30) and reinforcing written instruction by physiotherapist	Mobilization advice: correct posture, mobilizing exercises and neck collar use	1: Rest & analgesics 2: Active physiotherapy	Cervical ROM (goniometer) Pain intensity (VAS)	2 months (LTFU =77)	EI = CI2 EI↔CI1: ↑ROM ↓ pain
Bonk et al (2000) (21)	Acute; grade 1 or 2; rear-end traffic accident; 16-60y; n=103	Verbal, integrated in 3 sessions of physiotherapy	Exercise therapy with integrated advice on neck posture	Neck collar	Cervical ROM (goniometer and distance chin-sternum) Neck pain, stiffness, headache, arm pain, shoulder pain	12 weeks LTFU=6)	EI = CI, but faster recovery in EI
Ferrari et al (2005) (25)	Acute (< 72 hours); grade 1 or 2; traffic accident; >18y; n=112	Written pamphlet	Advice based on The Whiplash Book	Usual care at emergency unit (incl. generic information pamphlet)	PO: recovery (interview) SO: symptom severity, ADL restrictions, employment, litigation status; and resource use	3 months (LTFU =10)	EI = CI
Oliveira et al (2006) (26)	Acute (grade 1 or 2); n=126	Psycho-educational video (12) at bedside	Defining whiplash + psychophysiological model of myofascial trigger points	Usual care at emergency unit	Musculoskeletal functioning Telephone interview: narcotics use, satisfaction of treatment, pain intensity, legal involvement, collar and medication use, etc.	6 months	EI ↔ CI: ↓ pain ↓ drugs, emergency visits, rest, etc.
Kongsted et al (2007) (23)	Acute (< 72 hours); rear-end or frontal car accident; 18-70y; n=458	Oral information (1h) by research nurse	Mechanism whiplash injuries, rationale for staying active in spite of symptoms (⇒ ↓ fear and ↑ activities)	1: Semirigid collar 2: Active mobilization	PO: Neck pain & headache (11point scale), disability, working ability SO: change in pain, medication, general health status (SF-36), cervical ROM	1 year (LTFU n=38)	EI=CI1=CI2
Kongsted et al (2008) (24)	Acute (< 72 hours); rear-end or frontal car accident; 18-70y; n=182	Oral (1h project nurse at home visit) vs. pamphlet (8-pages A5 booklet)	Whiplash mechanism, reduce fear and uncertainty and motivate to resume normal activities Oral vs. pamphlet		Neck pain and headache intensity (11point box scale) Disability	1 year (LTFU n=24)	Long term = Oral: tendency towards better outcome

(n = sample size; ROM = Range of motion; VAS = Visual analogue scale; LTFU = Loss to follow up; PO = Primary outcome; SO = Secondary outcome; ADL = Activities of daily living; SF-36 = Short form health survey-36; HADS = Hospital anxiety and depression scale; TSK = Tampa Scale for kinesiophobia; PCI = Pain coping inventory; QoL = Quality of life; PDI = Pain disability index.)

Table 3 (cont.): Evidence table

STUDIES	Patients	Format of Education	Education Intervention (EI)	Outcome Measures	Follow-up	Main Results
<b>b) Subacute patients</b>						
Scholten-Peeters et al (2006) (27)	Subacute (> 4 weeks); grade 1 or 2; traffic accident; 18-55y; n=80	Verbal, integrated in general practitioners (GP) care (10) vs. physiotherapy (PT) (30)	Emphasizing physical activity; discouraging neck collars, rest and medication; advice on graded activity; education on pain physiology, etc.  GP: education and advice PT: + exercise therapy	PO: neck pain, headache intensity, and ADL (VAS) SO: functional recovery (VAS), general health status (S F-36), cervical ROM, fear of movement (TSK), coping (PCI), disability	1 year	PO: GP = PT SO: Short term: PT ↑ ROM Long term: GP ↑ recovery ↑ coping ↑ functioning
Rebeck et al (2006) (32)	Physiotherapists (n=27)  (Sub)acute (<6 weeks); grade 1-3; traffic accident; >18y; n=103	Workshop for therapists (8h) and follow-up visit (2h) 6 months later vs. mail	Whiplash guidelines (reassure patient and advise to act as usual and use of functional outcome measures)	Therapists: guideline knowledge, satisfaction, and use of guidelines Patients: disability, Global Perceived Effect, satisfaction with care Cost of care	1 year (LTFU therapists n = 9; patients n = 4)	Workshop = mail
<b>c) Chronic patients</b>						
Stewart et al (2007) (28)	Chronic (3-12 months after accident); grade 1-3; n=134	Oral (1 consultation and 2 follow-up calls) by physiotherapist + written report	Prognosis, reassurance, encouragement to resume light activity, addressing beliefs. Advise and exercise (AE) vs advise alone (A)	PO: pain intensity, pain bothersomeness (0-10 box scale) and functional ability. SO: disability, global perceived effect, health-related QoL and work status	1 year (LTFU n=9)	AE↔A Short term: AE ↓ pain intensity ↓ bothersomeness ↓ disability Long term: =
Wicksell et al (2008) (31)	Chronic (>3 months pain); > 20y; n=22.	10 x 60 (8 weeks) individual sessions by psychologists and a physician specializing in pain	Psychological flexibility by pain education, shifting perspectives, acceptance and defusion, exposure, etc. (behavioral oriented) Control Intervention (CI) Waiting list	Pain intensity (VAS) Pain disability (PDI) Life satisfaction Fear of movement Depression (HADS) Psychological inflexibility	4 to 7 months (LTFU n=2)	EI↔CI ↓ pain disability ↓ fear of movement ↓ depression ↓ psych. inflexibility ↑ life satisfaction = pain intensity

(n = sample size; ROM = Range of motion; VAS = Visual analogue scale; LTFU = Loss to follow up; PO = Primary outcome; SO = Secondary outcome; ADL = Activities of daily living; SF-36 = Short form health survey-36; HADS = Hospital anxiety and depression scale; TSK = Tampa Scale for kinesiophobia; PCI = Pain coping inventory; QoL = Quality of life; PDI = Pain disability index.)

complaints of the treated acute whiplash patients indirectly (32). This study compared the efficacy of physiotherapy provided by therapists that underwent education by opinion leaders about whiplash guidelines and compared to therapists that received the guidelines by mail. Outcome measures were evaluated in the patients they treated.

### Is There a Difference in the Education Provided to Acute Patients Compared to Chronic Patients with WAD?

As presented in Table 3 most of the studies are performed in acute patients. Only 2 studies focused on subacute patients (27,32) and 2 on chronic patients (28,31).

In acute patients attention was paid to the prevention of chronicity; therefore, most of the time

short information sessions were provided in which the mechanism of whiplash and mobilization advice were emphasized. Only in the study by Bonk et al (21) was education integrated in 3 sessions of physiotherapy, including exercise therapy.

In subacute and chronic WAD patients, studies aimed at changing cognitions and behavior rather than directly modulating pain and disability. Therefore education was often integrated in exercise therapy programs (27,28) or behavioral programs (31).

## **What Is the Efficacy of These Education Formats in Patients with WAD?**

### **1. Oral education**

In acute patients, there is strong evidence for providing oral education. Oral education concerning the whiplash mechanisms and emphasizing physical activity and correct posture, has better effect on pain, cervical mobility, and recovery, compared to rest and neck collars (21,22). Furthermore oral education would be as effective as active physiotherapy and mobilization (22,23). Nevertheless, since Kongsted et al could not find a significant difference between a sole oral education session, written information or semi-rigid collars (23,24), it may be warranted to supplement oral education with a reinforcing written instruction (22) or exercise therapy (21).

In chronic WAD patients verbal education seems efficacious in reducing pain disability, fear of movement, and depression (31). In this study education was part of a global behavioral-oriented program. In subacute or chronic pain patients, the oral education is not a stand-alone therapy, but a component of exercise physiotherapy (27,28) or behavioral oriented programs (31). Regarding the therapist, education provided by physiotherapist has better effect on mobility in the short term, while education provided by the general practitioner has better effect towards recovery, coping, and physical functioning on the longer term (27).

### **2. Psycho-educational Video**

A brief psycho-educational video (12') [AUTHOR: WHAT DOES THE MARK AFTER 12 MEAN] at bedside seems to have a profound effect on subsequent pain and medical utilization in acute whiplash patients, compared to the usual care. These differences were still present 6 months later (26).

### **3. Written Education**

There were no significant differences in the percentage of recovered patients between those who received a written pamphlet based on The Whiplash Book and those who just received usual care at the emergency unit including a general information leaflet (25). Although, not significant, a systematic tendency toward better outcome with personally communicated information was observed in the study of Kongsted et al(24).

### **4. Oral Education Combined with Exercise Therapy**

As already mentioned, in chronic or subacute WAD patients, education is often integrated with exercise therapy. In chronic patients it seems that the combination of advice and exercise therapy (12 sessions in 6 weeks) is slightly more effective than advice alone in reducing pain intensity, but only in the short term. Exercise would particularly be more effective for subjects with higher baseline pain and disability (28).

Also in subacute patients education seems to be sufficient. An education session caused similar pain reductions compared to the combination therapy. Moreover, in a percentage of recovered patients, physical functioning and coping were in favor of the education alone (27).

### **5. Education of the Therapists**

Providing an educational workshop improved physiotherapists' knowledge regarding the guidelines for treating whiplash patients and their ability to identify risk factors for chronicity, compared to therapists who received the guidelines by mail. These results did not influence the patients' disability, or perceived effect or satisfaction with the treatment. Also cost of care was not affected (32).

## **DISCUSSION**

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The goal of the present systematic literature study was to review the existing knowledge on the efficacy of education for whiplash patients. Furthermore the different types of education and the differences for chronic and acute patients were studied.

From the systematic literature study we can conclude that there is strong evidence for most forms of verbal education for whiplash patients in order to reduce pain, enhance neck mobility, and improve outcome (21,22). It may be useful to supplement the oral education with a written pamphlet. Neither written information or the education of the therapists were



superior over usual care or mailing information to the therapists, etc. (25,32).

In acute patients oral information is equally efficacious as an active exercise program (22, 23). Even a simple psycho-educational video at bedside seems beneficial in reducing pain and medical needs in acute patients (26). However the results of the latter study need to be confirmed by further and stronger studies including more standardized and objective outcome measures (instead of telephone interviews) (26).

Also in subacute patients, a short verbal education session by a general practitioner seems sufficient to improve recovery, coping strategies, and physical functioning on longer term. Only in the short term, does the combination with exercise therapy seem better for cervical mobility (27).

In chronic patients, education integrated in broader therapy approaches seems warranted, especially for effects in the shorter term (28,31).

Thus there is evidence for providing oral education to acute, subacute, and chronic whiplash patients, regardless of the exact format or content. The fact that these information sessions are more efficacious than written information, highlights the importance of the personal component of the education. Providing education allows the therapist to talk to and listen to the patient and to individualize the provided information. Although this may be more time-consuming, it seems that for acute whiplash patients a short intervention is already beneficial. Since not all whiplash patients are at risk for developing chronicity, multidisciplinary and broader approaches can be preserved for those who are at risk of becoming chronic.

This implies that early screening for risk factors for chronicity is important. Therefore more study into these possible risk factors and how to influence these in whiplash patients is warranted. Following the meta-analysis of Walton et al (33), there are 9 significant predictors: no postsecondary education, female gender, history of previous neck pain, baseline neck pain intensity greater than 55/100, presence of neck pain at baseline, presence of headache at baseline, catastrophizing, WAD grade 2 or 3, and no seat belt in use at time of collision. Subsequently, by providing a brief oral education session to acute patients, one of the compliant risk factors (no postsecondary education) can be modulated in the earliest phase. The single other compliant risk factor is catastrophizing. Since catastrophizing is so highly predictive of the degree of pain in various other chronic pain populations (34,35) and in acute WAD (36),

influencing the degree of catastrophizing may reduce pain complaints and modulate 4 of the 9 risk factor for chronicity in acute WAD patients.

As it is known that catastrophizing could be the expression or the consequence of ignorance or incorrect illness perceptions (37), reassuring and giving appropriate information might be helpful, because information is determining for the eventual threatening appraisal of pain {author what is meant here?} (38). Education on pain neurophysiology has been shown to reduce catastrophic thinking in patients with chronic fatigue syndrome (15) and in patients with chronic low back pain (14). As shown in the evidence table pain education was part of the information in only 2 studies, but not isolated in acute patients.

Since previous studies in different chronic pain populations showed that short education session(s) are sufficient to alter pain cognitions (15,39), this short therapy modality could also be applied in acute patients. In contrast to robust behavioral programs, a short session of pain education could be used for acute patients presenting inappropriate pain cognitions or behavior in order to reduce pain and prevent chronicity.

In a pilot study of Van Oosterwijck et al. (40) in 6 chronic WAD patients, it was shown that a short pain education session led to increased pain thresholds and improvements of pain behavior and pain-free movement performance, but up to now, pain education has only been evaluated in subacute or chronic WAD patients, and it is not yet known whether pain education could prevent chronicity by reducing catastrophic thinking.

The methodological quality of the included RCT's was overall moderate to good. The self-constructed checklist was however more stringent compared to the PEDro-scale. Based on the self-constructed checklist, it can be concluded that most studies failed on the items power calculation, accounting for co-interventions, registering side-effects and blinding of the subjects. Standardization of the intervention and the use of objective outcome measures were often positively appreciated. The use of this self-constructed checklist allowed us to evaluate criteria that were specifically relevant for the present research question and to identify potential pitfalls for further similar studies.

Comparing and pooling the results of the different studies was hard because of the heterogeneity of outcome measures, content and formats of the education, patients etc. Regarding the outcome measure disability for example, different questionnaires were used, in-

cluding the Neck Disability Index (28) and the Pain Disability Index (31), while others interviewed the patients (25). The same goes for pain and recovery, varying from standardized scales to telephone interviews.

## CONCLUSION

Based on the present systematic literature study, we found strong evidence for the use of education in patients with WAD. In acute whiplash patients a short oral education session is effective in reducing pain and enhancing mobility and recovery. In subacute and

chronic patients broader (multidisciplinary) approaches seem warranted, but further study is necessary. Educating the therapists did not influence the treatment effects. Although more research is necessary to elucidate the optimal content and format of the education, it should be advised to provide education to all whiplash patients regarding the mechanisms of whiplash, pain physiology, and the relevance of physical activity by a pain physician. More complex therapy modalities may be added for those who are at risk of becoming chronic.

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