

Expectations for Recovery Important in the Prognosis of Whiplash Injuries

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Abbreviations: HADS, Hospital Anxiety and Depression Scale; IES, Impact of Event Scale; NRS, numerical rating scale; OR, odds ratio; PDI, Pain Disability Index; WAD, whiplash-associated disorders

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ABSTRACT

Background

Individuals' expectations on returning to work after an injury have been shown to predict the duration of time that a person with work-related low back pain will remain on benefits; individuals with lower recovery expectations received benefits for a longer time than those with higher expectations. The role of expectations in recovery from traumatic neck pain, in particular whiplash-associated disorders (WAD), has not been assessed to date to our knowledge. The aim of this study was to investigate if expectations for recovery are a prognostic factor after experiencing a WAD.

Methods and Findings

We used a prospective cohort study composed of insurance claimants in Sweden. The participants were car occupants who filed a neck injury claim (i.e., for WAD) to one of two insurance companies between 15 January 2004 and 12 January 2005 ($n = 1,032$). Postal questionnaires were completed shortly (average 23 d) after the collision and then again 6 mo later. Expectations for recovery were measured with a numerical rating scale (NRS) at baseline, where 0 corresponds to "unlikely to make a full recovery" and 10 to "very likely to make a full recovery." The scale was reverse coded and trichotomised into NRS 0, 1–4, and 5–10. The main outcome measure was self-perceived disability at 6 mo postinjury, measured with the Pain Disability Index, and categorised into no/low, moderate, and high disability. Multivariable polytomous logistic regression was used for the analysis. There was a dose response relationship between recovery expectations and disability. After controlling for severity of physical and mental symptoms, individuals who stated that they were less likely to make a full recovery (NRS 5–10), were more likely to have a high disability compared to individuals who stated that they were very likely to make a full recovery (odds ratio [OR] 4.2 [95% confidence interval (CI) 2.1 to 8.5]). For the intermediate category (NRS 1–4), the OR was 2.1 (95% CI 1.2 to 3.2). Associations between expectations and disability were also found among individuals with moderate disability.

Conclusions

Individuals' expectations for recovery are important in prognosis, even after controlling for symptom severity. Interventions designed to increase patients' expectations may be beneficial and should be examined further in controlled studies.

The Editors' Summary of this article follows the references.

Introduction

Whiplash is an acceleration-deceleration mechanism resulting from an energy transfer to the neck that may lead to a variety of clinical manifestations (whiplash-associated disorders [WAD]) [1]. Despite substantial research over many years, understanding prognostic factors for WAD recovery is sparse [1,2]. High pain intensity in the neck and head, radicular signs/symptoms, older age, female gender, and tort insurance systems are associated with delayed recovery [2]. Psychological and psychosocial factors such as general psychological distress [3], early depressive symptoms [4], passive coping strategies [5], perceived helplessness [6], and higher levels of somatisation [7] are also associated with poor prognosis in WAD. Several studies also indicate a substantial difference in recovery between countries [2,8]. Such variation might reflect differences across study populations, different inclusion criteria, or different health-care seeking behaviour, but might also reflect societal and individual differences in the perception or expectations of the injury and for recovery. Thus expectations might in turn influence prognosis. Results from studies of uninjured individuals' perceptions of the symptoms that may arise from WAD and those from mild traumatic head injuries suggest that there are differences between countries in the perceptions of presence and duration of symptoms. For example in Lithuania and Greece, symptoms are expected to be fewer and to be present for a shorter duration than is the case in Canada [9,10].

The concept of expectations for recovery is complex. Janzen et al. have suggested a conceptual model for health expectations, which can also be applied to recovery expectations [11]. Such expectations are, apart from the symptoms/signs of the disease or injury, influenced by prior health and prior knowledge of the condition, as well as by psychological characteristics such as anxiety, self efficacy, and the patient's beliefs. Systematic reviews of research on various clinical conditions and outcomes have concluded that expectations contribute to the patients' outcome, including recovery duration and return to work [12,13].

Over the past 10–15 y, considerable attention has been given to WAD in the Swedish media. WAD are often considered to have severe consequences. Such “prior knowledge” might have an impact on expectations of the prognosis for individuals experiencing WAD. To our knowledge, the role of recovery expectations in individuals with traumatic pain has not been studied. Therefore, the objective of this study was to assess the prognostic value of individuals' expectations for recovery after WAD.

Methods

Study Population

A cohort was formed from incident cases of injury claimants to two Swedish traffic insurers: Trygg-Hansa and Aktsam. The inception period was between January 15, 2004 and January 12, 2005. A weekly computer-based search of new claims was performed at the insurer's information technology department. The following criteria were used for the search: claimant age 18–74 y; car occupants who filed an injury claim within 30 d of a collision; and no fatal injury to another occupant in the same car. Identifying information on each injured person was transferred to Karolinska Institutet (KI)

on a weekly basis. The following day, questionnaires were sent from our research centre at KI. The questionnaire included questions concerning the collision, socioeconomic and pre-injury health status, and pain and other symptoms experienced since the collision. We included questions assessing mental health and questions that could capture information about the injured person's expectations for a complete recovery. Because of a risk of low or delayed response during the summer holiday of 2004, claims made during 16 June and 3 August 2004 were excluded. At 6 mo postinjury, a follow-up questionnaire was administered to those who responded to the baseline questionnaire. Here we asked about the disability and signs and symptoms that the participants attributed to the injury 6 mo earlier. At 6 mo after the last inception into the study, we also retrieved information from the insurers on all claimants about whether they had completed their claim, and whether the claim was settled or not.

We included claimants who met the criteria outlined above, and who (i) reported WAD (defined below), (ii) were not hospitalized for more than 2 d, and (iii) did not have other injury claims reported during the inception period. We excluded those who were not Swedish residents, those with complete recovery at baseline, those who had missing data on expectations for recovery, and those who, at follow up, reported that they had experienced any new injury during the past 6 mo. The study was approved by the Regional Committee on Ethics at Karolinska Institutet, Stockholm.

Definition of WAD

WAD was defined as having answered “yes” to any of the following questions in the questionnaire: “Do you have or have you had pain/ache in the neck due to the accident?” or “Do you have or have you had reduced neck movement that you relate to the accident?” Cervical fractures were excluded.

Outcome

Disability was assessed with the seven-item Pain Disability Index (PDI) questionnaire, which ranges from 0 to 70, where 0 is no disability due to pain [14]. PDI was trichotomised with cut-off scores at the median and at the 75th percentile.

Exposure

Expectations for recovery were measured with a numerical rating scale (NRS 0–10) where the respondents were asked to rate how likely it was that he/she would have a complete recovery. The anchors were labeled “not likely” (0) and “very likely” (10). For the analysis, we reversed the scale and arbitrarily trichotomised it into those who stated that they were less likely to make a full recovery (NRS 5–10), an intermediate category (NRS 1–4), and those who stated that they were very likely to make a full recovery (NRS 0).

Potential Confounders

We used the baseline information when choosing potential confounders. The choice was guided by knowledge of prognostic factors for neck pain and WAD (Box 1). Postcollision symptoms were (i) pain referring to three specified anatomic regions and one option for “other” region, all assessed with numerical rating scales (NRS 0–10); (ii) number of pain areas from pain drawings [15]; and (iii) mental health, using the Hospital Anxiety and Depression Scale (HADS) [16,17]. We assessed psychological stress after the collision with the Impact of Event Scale (IES) [18,19].

Box 1. Factors Considered as Potential Confounders in the Relation between Expectations of Recovery and Subsequent Disability

Number of days between injury and completion of the baseline questionnaire
 Gender
 Age
 Education
 Family status
 General health prior to injury including prior neck pain and headache
 Prior injuries
 Memory loss after the injury
 Number of pain areas
 Severity of eight pain-associated symptoms
 Pain intensity in the neck, head, low back and other body parts
 Anxiety and depression
 Posttraumatic stress symptoms
 Passive coping strategies

In the analysis of potential confounders, HADS subscales and IES were all treated both as categorical variables according to suggested cut-off scores [16,20] and as continuous variables.

Moreover, we used a subscale of the Pain Management Inventory to assess passive coping [21,22]. The presence and severity of eight pain-associated symptoms were assessed with a checklist, with a five-grade verbal scale ranging from “no symptoms” to “unbearable symptoms.”

Statistical Analysis

We used multivariable polytomous logistic regression [23]. We first assessed the crude associations between the exposure and pain disability. The exposure was treated both as a continuous and categorical variable, thus we built two different regression models. We determined the role of confounders by considering each potential confounder in turn in the models [24]. If any single variable changed any of the crude estimates by more than 10%, they were entered in the final model [24]. We also evaluated the final full model by removing one confounder at a time. We tested for the presence of interaction by stratifying for gender, educational level, and level of pain intensity. Results are presented as crude and adjusted odds ratios (ORs) with 95% confidence intervals (CIs).

Responders were compared with nonresponders, to determine potential bias as a result of selective participation. We had information on all claimants regarding age, gender, and whether they had completed the injury claim or not. We also compared those with WAD who responded to the baseline questionnaire with those who were successfully followed for 6 mo.

All statistical analyses were performed with the use of SPSS software package version 14.0 [25].

Results

Between January 15, 2004 and January 12, 2005, there were 4,603 eligible claimants fulfilling the search criteria at the insurance companies. Of these, 676 were filed during the

summer of 2004, and were excluded. Another 52 had an unknown address, were not car occupants, or were not Swedish residents. Of the remaining claimants 3,875 were successfully approached with questionnaires. Figure 1 illustrates the inclusion and exclusions of study participants, as well as the attrition from the study.

Attrition Analysis

Compared to the responders, the nonresponders were younger (mean age 37.2 y versus 39.3 y), had a lower proportion of females (43.9% versus 56.1%), and a higher proportion of uncompleted claims (40.7% versus 17.7%). There were no essential differences between the WAD claimants who completed both questionnaires compared to those who completed only the baseline questionnaire with respect to sociodemographic characteristics, recovery expectations, physical and mental symptoms at baseline, and proportion of settled claims.

Study Population

The baseline questionnaire was completed on average 23 d (median 20 d) postinjury, with 4% responding within 7 d and 81% within 30 d of the collision. Table 1 presents a description of the 1,032 persons in the study population. Table 2 shows the proportion of the three categories of expectations stratified by baseline neck pain intensity and disability. In all 278 persons (27%) in both pain strata rated themselves to be very likely to make a full recovery. As expected, those with mild pain intensity were more likely to expect complete recovery compared to persons with intense pain, but 123 (17%) of those in the mild pain strata were pessimistic about their recovery. On the contrary, only 22 (7%) in the moderate/severe pain group had rated it very likely to have complete recovery, and 160 (50%) fell into the lower group of expectations.

Recovery Expectations and Disability

The crude ORs of the associations between expectations for recovery and pain disability are presented in Table 3. It also shows the crude OR for demographic and prior health factors, and for the confounding factors. After adjustment for confounders, the odds of high disability in individuals who stated they were less likely to make a full recovery were 4.2 times the odds in individuals who stated they were very likely to make a full recovery (Table 3). There was a dose response relationship, in that the intermediate category (NRS 1–4) was also associated with severity of disability, but the ORs were smaller. These estimates were independent of whether we modelled the confounders; anxiety, depression, and post-traumatic stress as category variables or as continuous variables. When stratifying the data by mild (NRS 0–4) versus moderate/severe (NRS 5–10) baseline neck pain, we found a stronger effect in the mild neck pain strata. However, there were only 22 individuals in the joint category of “moderate/high neck pain intensity” and stating “very likely to recover,” which precluded a formal interaction analysis (Table 2).

Discussion

Expectations for recovery were an important factor in the prognosis of WAD, for both moderate and high disability, with a clear dose response relationship. To our knowledge this is the first study to assess these associations in WAD. The significance of the findings is that in addition to an understanding of the injury and its clinical symptoms, the patient’s perception of

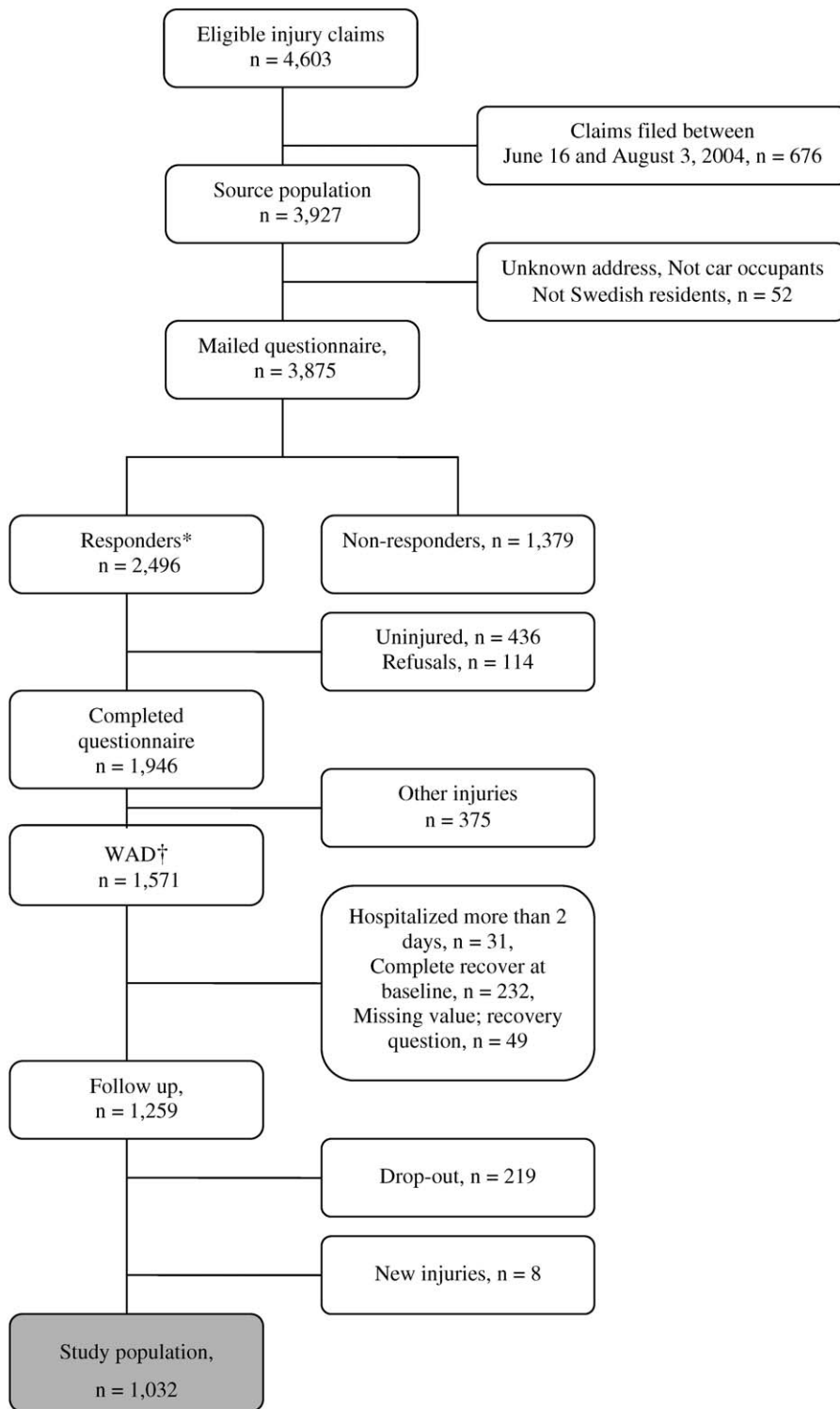


Figure 1. Flowchart of the Inclusion Process for the Study

*Returned questionnaires; † WAD, whiplash-associated disorders.

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recovery is necessary information for a proper understanding of WAD. Only 27% of the study participants reported that they were very likely to make a complete recovery. Interventions with the goal of changing expectations and beliefs may therefore benefit a large proportion of individuals with WAD.

The study's strengths include the prospective design with a

well-defined study population and assessment of recovery expectations early after the injury. Moreover the study is based on a well-defined population of injured persons, in which a variety of potential confounders were evaluated. We tested the robustness of the regression models both in single

Table 1. Baseline Characteristics of the Study Population ($n = 1,032$)

Factors	Variables	Category	Very Likely to Make Full Recovery NRS 0% ($n = 280$)	Intermediate Category NRS 1%–4% ($n = 465$)	Less Likely to Make Full Recovery NRS 5%–10% ($n = 287$)	Total n^a ($n = 1,032$)
Demographic and socioeconomic factors	Sex	Male	27.7	47.6	26.7	420
		Female	28.1	43.3	28.6	612
	Age (y)	40 and over	27.6	42.9	29.5	471
		30–39	27.5	45.9	26.6	316
		18–29	25.7	48.2	26.1	245
	Education	University	32.0	45.8	22.2	356
High school		24.8	46.6	28.6	521	
Less than high school		24.0	38.0	38.0	150	
Prior health factors	General health the month before MVC	Excellent, very good or good	28.3	45.5	26.2	965
		Fair or poor	10.6	37.9	51.5	66
	Neck pain the month before MVC	Never/sometimes	27.8	46.0	26.3	990
Collision Factors	Impact direction	Very often or every day	11.9	23.8	64.3	42
		Rear-end	25.8	45.8	28.3	561
		Frontal	31.4	45.6	23.0	261
	Head position	Side	25.9	43.2	30.9	139
		Roll-over	25.4	38.8	35.8	67
		Straight forward	29.5	45.9	24.6	601
Signs and symptoms after MVC	Neck pain	Turned to the side	24.6	44.8	30.6	268
		Do not know	22.2	42.6	35.2	162
	NRS median	NRS median	2.0	3.0	5.0	1,027
		NRS mean (SD)	2.2 (1.7)	3.6 (2.1)	4.9 (2.4)	
	Headache	Yes	18.6	47.9	33.5	580
		No	38.3	41.34	20.4	447
	Low back pain	Yes	17.8	46.5	35.7	361
		No	32.3	44.5	23.3	665
	Other pain	Yes	23.5	44.0	32.5	400
		No	29.7	46.7	23.7	613
Posttraumatic stress IES	No (IES < 26)	30.6	46.4	23.0	832	
	Yes (IES \geq 26)	11.9	39.4	48.7	193	
Depression HADS	0–6	30.9	46.7	22.4	841	
	7–10	12.2	40.5	47.3	131	
	>10	7.7	30.8	61.5	52	
Anxiety HADS	0–6	33.8	45.3	20.9	702	
	7–10	14.2	48.2	37.6	218	
	>10	10.7	37.5	51.8	112	

^aSum of the numbers in the cells differs because of missing values.

MVC, motor vehicle collision; SD, standard deviation.

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Table 2. Recovery Expectations Stratified by Baseline Neck Pain and the Outcome PDI

Baseline Neck Pain	Recovery Expectations	No/Low Disability PDI 0–4 (Median = 0) n (%)	Moderate Disability PDI 5–21 (Median = 16) n (%)	High Disability PDI \geq 22 (Median = 35) n (%)	Total n
Mild (NRS 0–4)	Very likely to make full recovery (NRS 10)	205 (80.1)	43 (16.8)	8 (3.1)	256
	Intermediate category (NRS 6–9)	198 (61.1)	90 (27.8)	36 (11.1)	324
	Less likely to make full recovery (NRS 0–5)	52 (42.3)	36 (29.3)	35 (28.5)	123
Moderate/severe (NRS 5–10)	Very likely to make full recovery (NRS 10)	4 (18.2)	7 (31.8)	11 (50.0)	22
	Intermediate category (NRS 6–9)	29 (21.0)	44 (31.9)	65 (47.1)	138
	Less likely to make full recovery (NRS 0–5)	21 (13.1)	36 (22.5)	103 (64.4)	160
Total n		509	256	258	1,023

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Table 3. Results of Polytomous Regression

Factors	Variable	Category	Crude OR (95% CI)		Adjusted OR (95% CI)	
			Moderate Disability PDI 5–21	High Disability PDI ≥ 22	Moderate Disability PDI 5–21	High Disability PDI ≥ 22
Main exposure	Expectations for recovery as categorical variable	Very likely to make full recovery (NRS 0)	Reference	Reference	Reference	Reference
		Intermediate category (NRS 1–4)	2.5 (1.7–3.6)	4.1 (2.6–6.4)	1.5 (1.0–2.3)	2.0 (1.2–3.2)
		Less likely to make full recovery (NRS 5–10)	4.9 (2.9–8.3)	20.8 (12.0–36.0)	2.0 (1.0–3.8)	4.2 (2.1–8.5)
Sociodemographics and health prior to MVC	Expectations for recovery as continuous variable (NRS 0–10)	—	1.2 (1.1–1.3)	1.5 (1.4–1.6)	1.1 (1.0–1.2)	1.2 (1.1–1.3)
		Female gender	1.2 (0.9–1.6)	1.3 (1.0–1.8)	—	—
Age	40 and over	Reference	Reference	Reference	Reference	Reference
		30–39	0.9 (0.7–1.3)	0.9 (0.7–1.3)	—	—
		18–29	0.7 (0.5–1.1)	0.7 (0.5–1.1)	—	—
Education	University	Reference	Reference	Reference	Reference	Reference
		High school	1.1 (0.8–1.6)	1.1 (0.8–1.6)	—	—
		Less than high school	2.5 (1.6–3.8)	2.5 (1.6–3.8)	—	—
Neck pain during the month prior to MVC	Never or sometimes	Reference	Reference	Reference	Reference	Reference
		Very often or every day	2.3 (0.9–6.0)	6.7 (3.0–15.0)	—	—
Headache during the month prior to MVC	Never or sometimes	Reference	Reference	Reference	Reference	Reference
		Very often or every day	1.0 (0.2–4.0)	4.1 (1.3–11.0)	—	—
Symptoms after MVC	Neck pain intensity (NRS 0–10)	Reference	Reference	Reference	Reference	Reference
		Very often or every day	1.5 (1.3–1.6)	2.1 (1.9–2.4)	—	—
Headache intensity (NRS 0–10)	Low back pain intensity (NRS 0–10)	Reference	Reference	Reference	Reference	Reference
		Very often or every day	1.3 (1.2–1.4)	1.7 (1.6–1.8)	—	—
Number of pain areas (0–45)	Number of pain associated symptoms ^a (0–8)	Reference	Reference	Reference	Reference	Reference
		Very often or every day	1.2 (1.1–1.3)	1.6 (1.5–1.7)	—	—
Posttraumatic stress symptoms (IES > 25)	Severity of reduced cervical range of motion	Reference	Reference	Reference	Reference	Reference
		Very often or every day	2.2 (1.5–3.5)	6.2 (4.2–9.2)	—	—
HADS Anxiety > 6	Severity of numbness in arms	Reference	Reference	Reference	Reference	Reference
		Very often or every day	1.8 (1.3–2.6)	4.7 (3.4–6.5)	—	—
HADS Depression > 6	Severity of ringing in the ears	Reference	Reference	Reference	Reference	Reference
		Very often or every day	2.9 (1.8–4.7)	9.5 (6.2–14.6)	—	—
Severity of reduced cervical range of motion	Severity of ringing in the ears	Reference	Reference	Reference	Reference	Reference
		Very often or every day	2.1 (1.7–2.5)	4.3 (3.5–5.4)	—	—
Severity of numbness in arms	Severity of ringing in the ears	Reference	Reference	Reference	Reference	Reference
		Very often or every day	2.1 (1.7–2.7)	3.5 (2.8–4.4)	—	—
Severity of ringing in the ears	Severity of ringing in the ears	Reference	Reference	Reference	Reference	Reference
		Very often or every day	1.5 (1.1–2.1)	2.7 (2.0–3.6)	—	—

Associations between baseline factors and disability due to pain at 6 mo following the injury. PDI score of 0–4 (no/low disability) serves as the reference category.

^aReduced cervical range of motion, numbness in arms and/or legs, ringing in the ears, memory difficulties, concentration difficulties, dizziness, and nausea.

CI, confidence interval; MVC, motor vehicle collision.

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and combined ways, and the findings were broadly similar regardless of which statistical modelling strategy was used.

Our study has some limitations. Nonparticipants were more likely to be younger and male. However, this would have an impact on the results only if these factors were confounders in the relation between expectations of recovery and disability. The nonparticipants were also less likely to have completed their claim. Since all persons, irrespective of whether or not they are responsible for the collision, are entitled to insurance compensation in Sweden, we assume that nonparticipants were less likely to have sustained an injury or only a transient injury. Although residual confounding is possible because of misclassified or unmeasured confounders, the strength of the associations observed for high disability make it unlikely that the findings can be fully explained by residual confounding. However, it is possible that passive coping strategies, anxiety, depressive symptomatology, and other similar psychological characteristics influence the perception of disability in other ways than by being confounders. Some factors might act as mediators, or for some factors the causal change might be reversed. For instance recovery expectations might effect how individuals report intensity of pain, instead of pain intensity effecting expectations for recovery. Thus, we cannot be confident that there is a causal relationship between recovery expectations and actual recovery. Nevertheless, other studies have found that early positive information about the injury, which is one way of modifying recovery expectations, has a favourable impact on the prognosis [26,27]. In a recent intervention study in which the authors investigated the efficacy of informational group sessions for high risk patients with mild injuries after traffic collisions (including WAD), the intervention group had a 20% greater recovery rate compared to the group who received “general care” [28]. In that study expectations for recovery were not measured, but one possible explanation for the positive effect in the intervention group, may be that the expectations for recovery were modified by the group sessions. Previous findings from studies on conditions similar to WAD also suggest that individuals’ expectations are important factors in recovery and return to work [12,29,30]. The fact that we found a dose response relationship between level of expectations and the level of reported disability is a further indication of a causal relationship. If future interventional studies show that modifying expectations of recovery reduced or removed this association, it would be a further step towards demonstrating causality.

The substantial influence of initial expectations on subsequent disability, even after considering the impact of baseline pain intensity and other symptoms, might be a partial explanation for anecdotal reports of long term dysfunction in persons with initially mild WAD symptoms.

In conclusion, we suggest early assessment of expectations for recovery to be made, in order to identify people at risk for poor prognosis after WAD. Furthermore, controlled studies on interventions aimed at modifying expectations are warranted. Such studies could be conducted on the population level, similar to the successful media campaign on back pain beliefs, which decreased disability claims, both in terms of incidence and time on benefits [31,32]. Alternatively interventions targeting persons in the acute phase of an injury should be evaluated. Finally, it is not inconceivable that our findings can be extended to persons with pain conditions other than WAD.

Supporting Information

Alternative Language Abstract S1. Translation of Abstract into Swedish by LH

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Editors' Summary

Background The disability associated with injury is a major source of distress for patients, and can be costly to the health care system and employers when persons fail to recover quickly and are unable to return to work. Finding ways to help people recover quickly and get back to optimal health is important. Some of the most common injuries causing disability and time off work result from whiplash—the sudden hyper-extension or “whipping” of the neck, which can occur from a motor vehicle crash. It has long been recognized that psychological factors (such as the ability to cope, how “in control” one feels about one's life) are as important as physical symptoms in how disabling an injury can be. There is now growing evidence that a person's feelings about their ability to recover from injury plays a part in actual recovery. Studies from Europe and North America have shown with conditions like low back pain and minor head injury that a patient's feelings about the possibility of getting better are related to how well they do. Less is known about how important these psychological factors are in recovery from disorders due to whiplash associated disorders.

Why Was This Study Done? The authors wanted to find out whether there was a relationship between people's expectations for their recovery from whiplash associated disorders and their actual recovery six months later. So, for example, they wondered if a person with whiplash who felt they were very unlikely to recover from their injury, actually did not recover (and vice versa).

What Did the Researchers Do and Find? The authors had access to an unusual set of health information—insurance claims by people who had been involved in car collisions to two insurance companies in Sweden. They identified about 1,000 adult insurance claimants over one year and mailed them a questionnaire that asked for details about the collision as well as information about the claimant: their demographic profile, health history, and the types of pain and symptoms experienced since the crash. The questionnaire also asked the claimant how likely they thought they were to make a full recovery from their injuries.

For those who said they had whiplash associated disorders, the authors followed up with another questionnaire six months later, which asked for information about any disability, pain, or other symptoms that the claimant was still experiencing because of the injury. Of those who had completed the first questionnaire, 82% were followed up.

Only about a quarter of claimants with whiplash associated disorders said they expected to make a full recovery. Perhaps not surprisingly, those with only mild pain, compared to those with intense pain, were more likely to think so. Persons who said they were less likely to make a full recovery were four times more likely to report high levels of disability six months later. Even for persons (or individuals) people with moderate levels of disability six months after injury, their expectations for recovery were similarly linked to how well they did: the lower the expectations for recovery, the higher the disability. These findings were true even after taking into account how severe signs and symptoms the person had, and how well the person was coping psychologically.

What Do These Findings Mean? The findings indicate that those with the lowest expectations for recovery after their whiplash injury will have the poorest recovery, and those with the highest expectations will have the best recovery. They also suggest that a patient's expectations about getting better are as important as his or her physical symptoms. The authors say that the more we can influence patients to believe they will make a full recovery, the better chance they will have to recover completely. This means that it may be beneficial for healthcare providers to give support and/or education to patients with whiplash associated disorders that increases their positive feelings toward recovery. The authors call for more studies into whether these types of targeted interventions would be of benefit.

Additional Information Please access these Web sites via the online version of this summary at <http://dx.doi.org/10.1371/journal.pmed.0050105>.

- Information about research on injuries and rehabilitation can be found at the Web sites of organisations devoted to studying the health of workers, such as the Institute for Work and Health in Canada, the Finnish Institute of Occupational Health, and the US National Institute for Occupational Safety and Health
- The Wikipedia entry for medical aspects of whiplash describes the four grades of whiplash disorder, but does not cover the debate about the credibility of whiplash disorder (please note that Wikipedia is an online encyclopedia that anyone can edit)
- The Sjukvårdsradgivningen Web site provides information about whiplash-related disorders, common signs and symptoms, recovery and prognosis, and treatments (in Swedish)