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Work-related outcome assessment instruments

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Abstract Prevention of work disability is a primary goal within treatment of spinal disorders. Work-related outcome measures therefore are essential indices within evidence-based medicine. So far many measures suffer, however, from standardized measurement, standardized terminology, and a lack of theoretical background. This review addresses traditional indicators like work status and sickness absence, and discusses more theory-bound concepts, i.e. work ability, occupational risk factors for recurrence of symptoms and re-injury, work-re-

lated attitudes that may become obstacles to recovery, and individual reactions to occupational stressors that increase the risk of maintenance and recurrence of symptoms. The review includes methodological and theoretical considerations and recommendations for the use of work-related outcome measures in future outcome research.

Keywords Occupational low back pain · Work status · Sickness absence · Work ability · Obstacles to recovery

Introduction

Spinal disorders, especially nonspecific low back pain (LBP), differs from other diseases in causing enormous costs to society. The relation of direct and indirect costs in spinal disorders is unique [52]. One-quarter of patients produce about three quarter of costs. Only 15% of costs are based on treatment, but 85% are indirect costs from loss of labour and early retirement. This relation is rather different in most other diseases (mean average is 60% direct costs and 40% indirect costs) [52]. Work-related outcome of treatment therefore becomes increasingly a matter of clinicians who should early screen for patients at risk for work loss. All issues that address return to work (RTW) should not be seen anymore as a separate, second stage after “treatment” is complete: rehabilitation principles should be integral to clinical and occupational management. Early diagnosis therefore must address obstacles to recovery and barriers to (return to) work [61]. Recently, Waddell and Burton [108] supposed that it should be possible to reduce sickness absence and

long-term incapacity due to LBP by at least 30–50%, but this would require a fundamental shift in management culture.

On this issue, the measurement of work-related outcome is one important topic that is in focus of this contribution. But research on work-related outcome includes research on outcome specific risk factors that help to screen for patients at risk [110, 112]. Reliable and valid assessment of work-related risk factors and outcome is a predisposition for “RTW rules” that supports clinical decision-making [24]. This contribution reviews work-related outcome measures and discusses the validity of measures where data are available.

Work-related burden of spinal disorders

Musculoskeletal complaints account for about 10–20% of primary care visits by being the second most common reason for consulting a doctor [78]. They are second after respiratory disorders as a cause of short-term sick

leave [100], while musculoskeletal complaints are the leading cause of long-term absence from work (>2 weeks) in many countries [11]. For instance, in Germany only among nurses musculoskeletal complaints (ICD XIII) caused 2,245,135 days of work absence in 2003, thus accounting for 24.6% of total absence days among nurses [92]. The mean number of absence days per spell was among the highest (19.2 days); only psychiatric disorders caused longer spells (26.4 days) [92]. Furthermore, musculoskeletal complaints are among the leading causes of long-term disability. Disability at work and in one's private life includes restrictions in the individual's major roles and limitations in social and recreational activities. Individual functional losses include subcategories of functional capacity, such as mobility (part of the activities of daily living, transportation, leisure activities, sexual activities, and other social role handicaps—occupational and household). Non-specific back pain therefore is often accompanied by psychological distress (depression or anxiety), impaired cognition, and dysfunctional pain behaviour.

Work-related outcome measures

In 1980, the WHO added to the Classification of Diseases the International Classification of Impairments, Disabilities, and Handicaps.

In 2001, the WHO introduced the International Classification of Functioning, Disability, and Health (ICF) [114]. ICF has moved away from being a “consequences of disease” classification to becoming a “components of health” classification. “Components of health” classification identifies the constituents of health, whereas “consequences” focuses on the impact of diseases or other health conditions that may follow as a result. The three domains (body, individual, and society) are now ordered into three basic lists: (1a) body functions and (1b) structures, (2) activities and participation (that asks for a coding of work status “Work and employment, d840–d859”), and (3) personal and environmental factors. Each of these lists contains a domain where a disease can manifest its presence. Pathologies express their manifestations in all four ICF dimensions but (depending on the individuality of the patient) the values of the four dimensions are expressed individually. The values of each of the four dimensions are correlated (low or high correlation) but there is no causality between them. Recently, Grotle et al. in their review gave an overview of the WHO classification system and how current back-specific outcome questionnaires fit the proposed dimensions [36].

Dimensions of work-related outcome that were in focus so far are work status, work incapacity, sick leave or absenteeism, and functional disability. Noteworthy, these indicators are part of recommendations for measurement of the outcome task force [23], and recom-

mendations on the outcome measurement in rehabilitation [49].

This review will discuss these traditional measures (occupational status and sickness absence), but also includes work-related outcome measures that up to now are less common but should become central in the evaluation of treatment of spinal disorders and work capacity. These concepts are work ability, occupational risk factors for recurrence of symptoms and re-injury, work-related attitudes that may become obstacles to recovery, and individual reactions to occupational stressors that increase the risk of development, maintenance, and recurrence of symptoms. Comparably few considerations address work-related costs because monetary outcome measures are the topic of another contribution within this special issue on outcome measures.

Occupational status

Regain or maintenance of full work status is the most important treatment goal [43, 71]. Occupational status is recommended as a minimum work outcome variable [2] because it is easy to collect and of great societal relevance. It should be measured at the first visit and after the final care visit. Work outcomes are a socially and economically important set of endpoints for both practitioners and researchers. The often recommended type of work status information to be collected includes: “is employed at usual job, does light duty or some other restricted work assignment (e.g. reduced work hours, modified work duties), receives paid leave or sick leave, receives unpaid leave, is unemployed because of health problem, is unemployed for some other reason, is a student, is a homemaker, is retired, or is on disability” [2]. Furthermore, the expected work status at the beginning of therapy may be of concern and the history of work-related change of work status, i.e. a powerful predictor of future work status [110]. Moreover, it may be important to measure both recommended work status and actual work status after care. Apparently, RTW means most often RTW to a pre-sick employer which is quite different with respect to RTW to a new employer as Høgelund and Holm showed recently [44].

Another important goal must be to maintain work status after RTW that requires follow-up measures, at least 1-year follow-ups after RTW to assess intervention sustainability and recurrence of sickness absence due to spinal disorders. One of the most impressive indicators of work-related outcome is whether disability claim could be prevented by treatment. Zimmermann [116] reported prevention of claims for at least 30% of participants of an intensive rehabilitation programme (“Göttinger Rücken-Intensiv Programm” [42]).

Occupational status, however, also may be of transient character; for instance when a disability claim has

been filed and patients wait for decisions, or engage a lawyer to aid in doing so. It was shown that those patients with ongoing claims do engage less in active rehabilitation efforts [5].

Measurement problems and recommendations

- (1) *Reliability*. Self-reported work status is sufficient [45].
- (2) *Validity*. Now it is becoming more and more clear that work status is only in part attributable to treatment success. Moreover, the influence of age, gender and cultural factors [50], economic and health policy factors do influence work status. Work status therefore must be analysed using multivariate methods that control the known confounders [110].
- (3) *Specificity and sensitivity*. Dionne et al. [25] showed that pain and disability are only moderately related with work status. However the relation and predictive power increased when work status was asked before treatment and at follow-up as per se related to the disorder: “Has your back problem kept you from obtaining or keeping full-time work?” [25]. Dionne et al. [25] suggested that sensitivity should be best in using an even more focused measure “currently unable to work because of my back pain.” The problem in more or less specific measures of work status is a trait-off between comparability of work status measure with more general indices from any administration or the use of administrative data and the better sensitivity and predictability of work status as a treatment-related outcome. While admitting that no measure of work status is ideal, the authors recommend a specific measure to be preferred that “focuses on the inability to accomplish job tasks due to back pain to define absence from work” [25]. However, these definitions require a view on work status as a more active process, and active managing that leads to changing and maintaining a position at work.

Sickness absence

One might expect fewer problems with the measurement of sickness absence because it is even recorded in files. However, the problems are much alike with work status. Many factors may contribute to absence from work and file records include questionable information on the reasons for work absence. Sickness absence is a complex phenomenon, an aspect of disability that includes illness behaviour as well as illness. It is a shortcoming to view absence to be on par with ill health. It has been shown that sickness absence can be explained by employees’

satisfaction with jobs [83], psychosocial job factors, i.e. low psychological control over the work situation [1], and factors that are not related to work at all. Last but not least, economic constraints and global competition lead to increased job insecurity in employees, and greater monitoring and management efforts of absence in employers. Both factors reduce sickness absence that is currently on low levels in many countries [6, 115]. Indeed, the phenomenon of sickness presenteeism, i.e. to go to work although individuals feel sick becomes relevant in outcome research [4, 16]. For instance in Japan, studies on sickness absence also collect data on employees who took entitled holidays to treat illness [91].

On the other side, economic pressures cause employers to distribute work on less number of shoulders that increases occupational health and safety problems. The complexity of various factors contributing to sickness absence may explain why short spells of sickness absences may decrease while long-spell absences increase continuously [100].

While sickness absence is a complex phenomenon, however, its measurement in meaningful units appears not that difficult. Again, this expectation is wrong. Sickness absence may be measured in very different units that refer to sick-leave spell, time, and person [40]. The following list includes examples of how sickness absence can be quantified according to these units. Sick-leave spell may be characterized with respect to appearance (new/ongoing/concluded, recurrent), course (continuous vs. interrupted spells), duration, different levels (full-time or part-time), and different types (sick listing, rehabilitation benefit, disability pension). Even mere duration of sickness absence can be measured differently, e.g. in calendar days or working days, full or partial absent days, or mere compensated days that might differ from absent days. To account for the costs of absenteeism, sickness absence is often also expressed in hours (number of hours absent during work hours or percentage of total work hours absent). Sickness absence may be also expressed as the number of sick listed individuals, percentage of staff sick listed, both total and stratified into full-time or part-time. The diversity of indicators increases as units can be combined in several different ways. Sick-leave days/(sick-listed) person is often expressed as some type of mean value. Sick-leave spells/person is also common in literature on spinal disorders; measures that use persons as the unit in the numerator have been less common [40]. All relative indices, however, must include denominators that make sense, i.e. the population at work and not the general population, etc. As Hensing et al. strongly recommend, the research field would gain from better standardization in the measures used [41], and the contributions of this Scandinavian research group are seminal.

The scientific jargon in this area still includes a number of terms and concepts that are often poorly

defined [40]. Borg [10] offers some basic definitions that could serve to reduce ambiguity (Table 1).

Occupational status and sickness absence are often easily accessible from central registries (e.g. US Occupational Safety and Health Administration, 200 and 300 logs [30, 81]) and have economic relevance; however, even if clearly defined, they are not sufficient measures of work outcomes. RTW and work status do not account for residual pain and disability, or resulting loss in performance. Work status and RTW therefore underestimate the impact of spinal disorders on work absence and the ability to work [30]. They only roughly estimate the work pattern when there is no information about what type of work the employee returns to, a full- or part-time work, and whether it is the old or a new work. It is not clear how long the working period after RTW lasts until a new spell follows. It is important to bear in mind that work status and RTW are not automatically measures of lasting effects. Belonging to the work force is, however, a primary goal of secondary prevention and therefore it is a must to measure work status and RTW, but also to add additional measures of work-related outcome like work ability.

Measurement problems and recommendations

(1) *Reliability*. Results in numerous studies have shown that memory problems can lead to workers making errors in estimating disability duration [102]. Recommendations here limit the time period under question to 2 months [89]. Often chronic pain patients do report deficits in attention and memory that might further be of relevance in data assessment. There is a lack of studies that tested cognitive ability

in chronic pain patients in detail. Recent evidence, however, showed no significant difference in chronic lumbar sciatica patients compared to controls [54]. Differences were linked to differences in depressivity and disappeared when depressivity was controlled.

- (2) *Validity*. Dasinger et al. [22] observed a sevenfold difference between administrative and self-report data (higher disability duration with self-reports) among California workers with low back injuries. The validity of administrative data has been assumed, yet little research has been conducted to explore whether there is systematic bias, such as underreporting by insurers or over-reporting by patients. Pole et al. [76] found a similar pattern: their study showed that the number of self-reported days absent was greater than the number of compensated days that were filed in registries. The differences between measures were smaller among workers who had filed a previous lost-time claim, were unionized, and were better educated. Control for these confounders may be an option. The authors recommend that ideally both the information should be collected, i.e. self-report data and administrative records [76]. Calculating an average value from both measures may be an additional option to compensate for systematic tendencies [85].
- (3) *Recommended measures*. Hensing et al. [41] recommended five measures for sick leave that have become a bit of a reference standard in clinical and epidemiological literature on spinal disorders. Not all measures make sense in every outcome study; however, they make more sense in studies that include follow-ups and a control group, or representative reference dates of the population under study. Table 2 shows the five measures, their definitions, and interpretations.

Table 1 Sick-leave terms suggested by Borg [10]

Concept	Suggested definition
Sickness absence and sick leave	Used as synonyms to indicate temporary absence from work due to reduced work capacity caused by disease or injury and registered at social insurance offices
Sick-leave day	A day when a person is on sick leave
Sick-leave period	The continuous period of sick-leave days a sickness certificate is valid for. When a physician certifies such a period the diagnosis, the degree (e.g. half time), and type of sick leave (e.g. work injury compensation) are constant. Short sick-leave periods can be self-certified
Sick-leave spell	Consists of one or more connected sick-leave periods, without any interruption
Sickness certification	Issuing of a medical certificate by a physician to confirm that a person has a reduced work capacity due to disease or injury
Return to work (RTW)	When sickness absence is the outcome studied after a recent illness episode or injury followed by intervention, i.e. medical treatment, and/or rehabilitation, and evaluation of the treatment/intervention success is in focus, the time of work absence is often labelled RTW
Disability pension	Temporary or permanent pension granted due to disability (in the literature, sometimes called early retirement on medical grounds); can be granted before the age of retirement to a person whose work capacity has been reduced for a longer period of time or permanently due to disease or injury. Disability pension should be clearly differentiated from age-related retirement pension

Work ability

Back pain and functional limitations should be considered as different outcomes [107]. Although the incidence and prevalence of LBP remains steady on a high level, the numbers of LBP disability/incapacity are on the increase in many countries [104]. Functional limitations can be related to work disability; however, they do not have to because work disability also depends on task demands, which is a very critical issue in estimating work ability in decisions on compensation claims and early retirement files. Most questionnaires that measure disability ask for the ability in performing simple daily tasks; however, most items do not refer explicitly to work tasks. Many of these scales were derived from items of the Sickness Impact Profile (SIP) [8], a health status measure that was developed in the 1980s to meet the disability measurement requirement of the WHO. Consequently, the items do not specifically refer to spinal disorders. A more specific questionnaire that was derived from the SIP was the Roland and Morris Disability Questionnaire [80] (RMDQ) that comprised 24 items and is consistently validated in several language adaptations, and was recently recommended by Müller [68] who studied several forms of bias in different pain and disability specific outcome measures. A disadvantage of the RMDQ is that no question directly refers to occupational work. The 16-item version reported by Dionne et al. [25] has overcome this shortcoming and may be more adequately related as a work-related work outcome. The modified 16-item version of the RMDQ included two items from the SIP that refer to disability at work: “In the past two weeks, because of past or present back pain have you...

Accomplished less than usual at work?” “Taken frequent rest when you work?” Because in most measures of disability—with only rare exceptions [53]—few items relate to work tasks [36, 68], a separate analysis of these items is recommended when these instruments are the only work-related outcome measures.

Benefits adjudicators, employers, insurers, and physicians often rely upon functional capacity evaluations (FCEs) to determine musculoskeletal capacity to perform physical work, often with legal or occupational consequences [77]. However, FCEs raise a number of scientific, legal, and practical concerns. FCEs are based upon a theoretical model of comparing job demands to worker capabilities. Validity of FCE results is best with accurate simulation of work tasks. When test criteria are unrelated to job performance or subjective evaluation criteria are employed, the validity of results is questionable. Repeated measurements to prove progress in worker rehabilitation are more valid than evaluation of sincerity of effort, ability to perform complex or variable jobs, and prediction of injury based upon FCE data [77]. Further studies should link FCE results to occupational outcomes. For instance, modified duty and other accommodations by employers should be shown to be helpful in managing workplace disability associated with injuries and illnesses. FCE should be proved to serve employers who have adopted proactive RTW policies to plan temporary work modifications.

In the 1980s of the last century, the work ability index was developed in Finland by Ilmarinen [48]. The short multidimensional instrument comprises 11 items measuring seven dimensions, including recovery expectations, functional capacity and self-estimated work capability to

Table 2 Sick-leave measures suggested by Hensing et al. [41]

Measure	Definition	Comments
1. Frequency of sick-leave	Current or new sick-leave spells during the study period/number of persons in the study-group (including currently sick-listed)	Frequency of sick-leave can be seen as a basic measure. It is based on the whole population and is simple to assess as well as understand for those interested in the area but without deeper knowledge of epidemiology. It is a measure possible to use also in smaller samples
2. Length of absence	Sick-leave days in current and new spells during study period/number of sick-listed persons in current and new spells during study period	Length of absence is based on sick-leave days. It is a measure of the gathered individual illness burden during the study period. It is based on sick-listed individuals only, in order to increase the usefulness of this measure for medical purposes
3. Incidence rate	New sick-leave spells during the study period/number of persons at risk \times number of days in study period minus all sick-leave days in new and current spells during study period	Incidence rate is a measure that includes both frequency and length. It is of great importance in studies of risk factors to assess the incidence in relation to the time at risk. This measure reflects the density of absence during a specified time period
4. Cumulative incidence	Persons with at least one new sick-leave spell, irrespective of duration during study period/number of persons at risk at the beginning of study period	Cumulative incidence measures the risk of getting sick-listed during a specified time-period and in a specific population. This measure is less useful in small populations due to the small differences found between different subgroups
5. Duration of absence	Sick-leave days in new spells during study period/number of new sick-leave spells during study period	This measure is based on sick-leave spells in the denominator instead of persons. It is complementary to length and reflects the severity of sick-leave spells

meet the specific demands of the job, self-perceived health, recovery resources, self-evaluation of performance, and previous sick-related absenteeism. The instrument is translated and validated into several languages and its use is increasing worldwide. It should be considered more often also as a standardized tool in outcome research.

Performance loss may be a rather sensible marker of work-related function also in individuals who currently work. Working with spinal disorders presumably produces additional loss as recently shown by Hagberg et al. [37] in VDU workers. Participants in this study rated their loss in productivity due to musculoskeletal problems in the last month compared with the previous month. Among those with no sick leave in the last month, 6.1% of women and 8.3% men reported a loss of productivity as a result of musculoskeletal disorders (MSD). The Canadian Occupational Role Questionnaire [53] is a short, eight-item instrument consisting of two scales, a productivity scale and a satisfaction with work scale. The scales were shown to correlate as expected with the Roland and Morris Disability Scale, and should be adapted to other languages for future work-related outcome studies.

Occupational risk factors for recurrence of symptoms and re-injury

Musculoskeletal disorders such as neck, shoulder, and back pain problems, are among the most frequently reported health problems in industrialized countries (e.g. in Switzerland [82]). Recent etiological models of MSD are multifactorial and contain ergonomic and environmental factors, health behaviour as well as demographic factors, and psychosocial variables that influence vulnerability, maintenance, and recovery [47, 107]. MSD are closely connected with occupational health psychology, not only via biomechanical and environmental strains, but also through occupational variables like task related and social stressors, control at work, job satisfaction, and support from supervisors and co-workers. Prospective analyses including 3–10 years of follow-up have shown that work perceptions and psychosocial factors at work were predictive of future MSD even when physical work load and demographic risk factors were controlled [56]. For further evidence concerning the unique predictive potential of biomechanical and work-related psychosocial factors refer [57, 58], for psychosocial risk factors for back pain [9, 46], for neck pain [3, 69]. Occupational health psychology views employees as active players at work and also in rehabilitation process. Patients follow their individual goals, and one important goal in many cases is to have less pain and better quality of life, including RTW and regain of full work capacity. Many occupational characteristics before, during, and after treatment may be viewed as regulation requirements

(decision necessities) and regulation possibilities (decision possibilities) and regulation obstacles (stressors), which disturb the action process and “endanger the fulfilment of task-related goals” that is doing it right at work [34, 88], and RTW after treatment to further doing it right. Often, the regulation possibilities or resources are the changeable factors in many occupational settings. From this point of view, the occupational psychosocial risk factors for delayed or no RTW at the same time are relevant work-related outcome measures in secondary prevention. For instance low social support from supervisors and colleagues is a risk factor for delayed RTW, and therefore during rehabilitation individual case management that includes the employer should try to increase social support in order to facilitate RTW and to prevent recurrence of disability episodes. In this broader understanding of work-related outcome measurement, the occupational blue flags are also seen as work-related outcome measures. Blue flags are individually perceived occupational regulation requirements, regulation possibilities, and regulation stressors that prevent individuals to reach their work-related goals and therefore impede early RTW [21, 75, 109]. Work-related blue flags that are in most instruments that measure work stressors and resources [86, 88] include:

- High level of regulation obstacles. High job demands (time pressure, uncertainty, frequent interruptions, etc.) [88].
- Low level of regulation resources. Low job control (influence on methods and time, e.g. the ability to independently plan and organize one’s own work, and influence on work pace and schedule, autonomy, decision latitude, participation in planning, etc.) [28], Low or inadequate social support from supervisors and colleagues [29]. Low appreciation of efforts by income, social recognition, non-monetary rewards, or career prospects [79].

Work-related expectations and evaluations that may become obstacles to recovery

Many studies in occupational psychology show that not objective environmental circumstances but subjective estimates are relevant to estimate motivation. To predict work behaviour, two parameters are of special importance: the subjective expectancy of an event and its value to a person. Assessing both parameters and multiplication of both parameters for a complete set of alternative behaviours predicts motivational choices and behaviour rather well [87]. In a patient who likes his job and has the expectation that he will recover well, early RTW is more likely than in patients showing low job satisfaction, unfavourable recovery expectations, or both. Obstacles to recovery and RTW (the so called yellow flags) merely address individual expectations and value [15, 61]. A

system for the identification and management of obstacles to recovery, or yellow flags, has been integrated into a systems approach for the management of acute and subacute LBP [51] that recognises the importance of both clinical and occupational perspectives in the management of LBP at work clients. Assessment of yellow flags should contribute to (a) better screening of individuals at risk for chronic disability, (b) better interventions to increase RTW, and (c) prevention of recurrent episodes of disability. Flags are therefore included in occupational policy guidelines for the management of non-specific spinal disorders, particularly occupational LBP.

Work-related yellow flags are individual cognitive, emotional, and behavioural risk factors for developing chronic LBP, including individual attitudes and beliefs towards their own LBP and management [24, 51]. Some important yellow flags are work-related and can be assessed with validated instruments. They comprise:

- Expectations from patients that strongly depend on what they have experienced before. Therefore, pre-existing history of work absenteeism, either because of spinal disorders or other diseases, is a strong predictor of future work-related outcome. Past episodes of back pain are among the strongest predictors of future episodes [96].
- The measurement of job satisfaction [83] and work-related resignation, i.e. working in the current position only because of a lack of alternatives [83]. A scale that contains three items plus a Kunin Faces-item can assess job satisfaction. It has been shown to be a good predictor of outcome [83]. Resignation that indicates a resigned attitude towards one's job is based on Bruggemann's concept of "resigned job satisfaction" [12]. For an English description, see Büssing [17]. Items ask how often one has thoughts like "my job is not ideal, but it could be worse," aiming at a defensive, or resentful, adaptation to working conditions that are unfavourable [84].
- The belief that work has caused the spinal disorder. The belief that work is a risk factor turns it into negative value; there is no approach motivation towards work but avoidance motivation. Work-related fear-avoidance beliefs can be assessed reliably with validated instruments [35, 74, 99, 111].
- Items that address poor individual belief that treatment will lead to (early) RTW were strongly linked to outcome (poor work prognosis) [20]. There is consistent evidence that expectation of outcome is crucial to the success of rehabilitation and is linked to levels of postoperative pain and recovery [66]. On the basis of such evidence, most clinicians would probably agree that what patients think will happen (their recovery expectations) could influence what actually happens (their health outcomes) [20].
- Expectation and evaluation of compensation or early retirement may indicate comparably poor work-related recovery expectations and low value of previous work status. Early retirement is a goal that conflicts with RTW. Research shows that patients with ongoing disability claims are less involved in rehabilitation efforts [5].
- Self-efficacy with regard to work capacity, which was shown to be significantly correlated with dynamometer performances as an objective measure of capacity [24].
- Pain tolerance that is the individual expectancy how much pain would be bearable to work with. Recently this expectancy was shown to predict work disability [70].
- Self-estimation of skills to cope with future pain at work ("pain management efficacy") [32].
- Being sceptical about the further management of work tasks. Patients' expectations of how they could change work characteristics towards their new needs after RTW. Some individuals may fear loss of their autonomy and participation possibilities at work. Other individuals may expect that they can adapt their work to their changed needs. Clearly, the estimation of individual resource to contribute to successful RTW contributes to work-related outcome expectations. Cardol et al. [18] developed the "Impact on Participation and Autonomy Questionnaire" (IPAQ). Rather than focusing on ability or capacity, the IPAQ focuses on autonomy and participation of people with chronic disorders. The scale was developed for use as a profile for disease severity assessment, needs assessment, and outcome assessment (evaluation). It is self-administered and presently consists of five domains: social relations, autonomy in self-care, mobility and leisure, family role, and work and educational opportunities. The work-related items are "In the context of illness or disability... My chances of doing the paid work I want to do are, My chances of doing my job the way I want to are, My chances of maintaining or changing my working role as I would wish are."
- In cases of occupational spinal injury, fear of re-injury should be addressed. Ciccone and Just [19] developed instruments measuring pain expectancies and injury expectancies. In their study, both measures were even strongly related with work disability than fear-avoidance beliefs.
- Expectation and valuation of employer and especially supervisor engagement and interest in RTW and work redesign. Many patients feel alienated or ignored during a time when an outpouring of employer support was expected [73]. Recognition versus shame-inducing encounters are among the most salient topics absentees report when asked in interviews about factors that

facilitate or impede RTW [103, 113]. There is evidence that supervisors may view workers returning from an injury or illness in a negative way because of reduced productivity or the need for special attention and support [55, 101]. In particular, supportive communication from supervisors that validates pain complaints, expresses concern, solicits employee input, and is responsive to employee concerns is likely to result in improved disability outcomes for work-related injuries and illnesses [90]. Having a positive self-image and being positively regarded by others is among the most basic goals we have. The expectation of not being valued after RTW by significant others can therefore be an important obstacle for RTW.

- Mein et al. [63] showed that among predictors of early retirement, self-perceived health, employment grade, and job satisfaction have unique value. Low self-perceived health therefore may be an important obstacle for RTW and should be addressed. Note that self-perceived health cognitively differs from measures of comorbidity because self-perceived health includes a self-evaluation of health, while measures of comorbidity are reports of different symptoms that are also related to outcome [72].
- Noteworthy, it is a strong point that not only expectations and values of patients and supervisors and colleagues are important, but also those of physicians and others. As Linton et al. showed in their paper [59] and also Buchbinder showed in her study on media campaign, to change fear-avoidance beliefs was rather effective [14], also in the long term [13].

Change of problematic yellow flags so far is neglected as work-related outcome variable. In the last decade, much progress has been made in the development of instruments that assess recovery expectations and avoidance beliefs. However there is a lack of validated short instruments in this area that are carefully adapted to different cultural contexts [7]. The challenge is to derive shorter but valid instruments that are adequate for routine screening for patients at risk [110], and monitoring of work-related outcome. Thereby, assessment should address both individual expectations and evaluations of work-related outcome alternatives.

Unfavourable individual reactions to occupational stressors

There is considerable evidence that the way individuals cope with stressors including work stressors is differently related to health outcomes. Catastrophizing and behavioural and cognitive avoidance are risky ways to cope with stressors [103]. Those moderating individual factors again are both risk factors and outcome factors when they are subject matter in cognitive therapy.

However in recent years, more specific behavioural factors were presumed that should explain the link between biomechanical, mental, and psychosocial factors at work and the development of pain and disability. So far, two concepts appear rather promising and should be discussed as important work-related outcome measures and could be addressed in interventions. The first concept is “spillover” [67] and the second one is the so called “workstyle” [31].

Among models on occupational stress and MSD [47], the biopsychosocial model of stress as developed by Frankenhaeuser is the one that is most concise about mechanisms [33]. Psychological stress is present to the degree that individuals perceive psychosocial and mental demands exceed their perceived resources to meet these demands [33]. Note that stress responses may persist also off the job when employees are unable to detach from work problems but keep involved cognitively, e.g. by worrying, and emotionally, e.g. by experiencing high irritability. Work stressors still have an effect after work has ended, which is called “spillover.” The importance of unwinding, i.e. to deactivate after work and to recover on day offs was strongly associated to psychological well-being and health indicators [33, 64, 94, 95, 98]. Psychologically stressful jobs may elevate the risk for MSD by increased muscular tension. In particular, low threshold motor units are being kept active even in the absence of physical load [38]. Muscle tension was shown to increase in response to mental stressors and was even more pronounced when combined with a physical load [62, 93]. Chronically elevated muscle tension is associated with muscular pain [105]. Lundberg [60] postulates that in the modern society, it is possible that lack of rest and recovery is an even more important health problem than the absolute intensity of mental and physical stress during work. Slow unwinding as one assumed cause of work-related health problems reflects a spillover of neuroendocrine reactivity that occurs when recovery after exertion is often incomplete. Increasing evidence shows that spillover from work to private life impedes recovery [94], and may be assessed with the validated eight-item instrument from Mohr [67]. Sample items are, “it is hard for me to switch off my mind after work,” and “when I come home from work, I tend to be rather nervous.” Spillover that results in an inability to switch off after work and impedes recovery is a promising concept in etiological models of work-related disorders and therefore should be considered as an important work-related outcome variable. The same is with “workstyle”, an even newer concept that focuses on the individual’s responses to work stressors at work [31]. An adverse workstyle may comprise the tendency to continue working despite pain to ensure work quality, perceived inability to discuss work loads with supervisors that can lead to sustained forceful movements, awkward postures, work without rest breaks, and/or

heightened levels of muscle activity. Future studies should address workstyle as an individual risk factor that should also be a topic within cognitive-behavioural treatment. However, there is also a potential pitfall with these measures. It must be said that workstyle and spillover should not be misused to blame the individual for the consequences of work stressors and function as an excuse to avoid work redesign.

Conclusions

Empirical research on work-related outcome measures has been conducted within many different disciplines. For a long time, progress has been slow and weak, but within the last decade there were fruitful efforts to standardize measures and terminology.

It sounds trivial but it is important to note again that work-related outcome is multidimensional and only in part due to the condition of spinal disorder that is under consideration. In other words, the most common measures of work-related outcome, i.e. global work status and RTW measures, lack specificity. Parallel with consistent findings of pain history as the most powerful predictor for future pain episodes [28], evidence suggests that prior inability to work despite relatively small health problems is a major risk factor for unfavourable work-related outcome after lumbar disk surgery. It follows from here that RTW after treatment for spinal disorder is no specific process and that work-related outcome should be adjusted against prior sick-leave history [97]. A second important consequence is that minor comorbidity factors in some patients might be responsible for delayed RTW that is attributed to recovery from spinal disorder. Future outcome research should try to disentangle these associations.

There is considerable evidence that the time of intervention is critical. Early intervention in subacute

phase [27] is a must to avoid adverse long-term work-related outcome. Therefore research on work-related outcome also concerns screening for patients at risk [26, 39]. An important point on the current research agenda is to develop and evaluate decision rules for clinicians to estimate the risk of no RTW [24]. These efforts need theoretical background and therefore this contribution also concerned many work-related variables like work-related attitudes and behaviours that are relevant within RTW process rather than indicating the end. Concerning this RTW process, it was argued that industrial and work psychology with concepts like action theory may help to understand RTW process.

Another conclusion from this review is that traditional indicators including work status and RTW should be used in an improved manner, that is, disjunctive classes of categories, clear relatedness to MSD, and adequate time frame. Wherever possible, multiple data sources should be used. Furthermore, biomechanical and psychosocial work factors that are risk factors at the same time should function as work-related outcome variables because they can be expected to predict recurrent episodes or maintenance of disability that are major outcome variables. Work-related attitudes (job satisfaction, FABQ-W, work-related expectations to treatment, plans to apply for compensation, etc.) are risk factors for chronic disability and should also be treated in cognitive behavioural treatment. Therefore, during and after treatment, work-related attitudes are important work-related outcome measures. Evidence increases that social recognition of patients by their work colleagues and supervisors regarding their status of sickness absence and RTW expectations are potentially underestimated as important factors for early RTW. Not only that, research on case management efforts should emphasize aspects of recognition and occupational self-esteem.

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