



# Mustard Fellowship 2006-2008

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## Subgroups in low back pain disability cases



## Background

A uniform treatment for all low back pain patients does not seem to work

Different treatments for different people: What works for whom? (And why?)



# How do you identify different groups of patients?

Two options

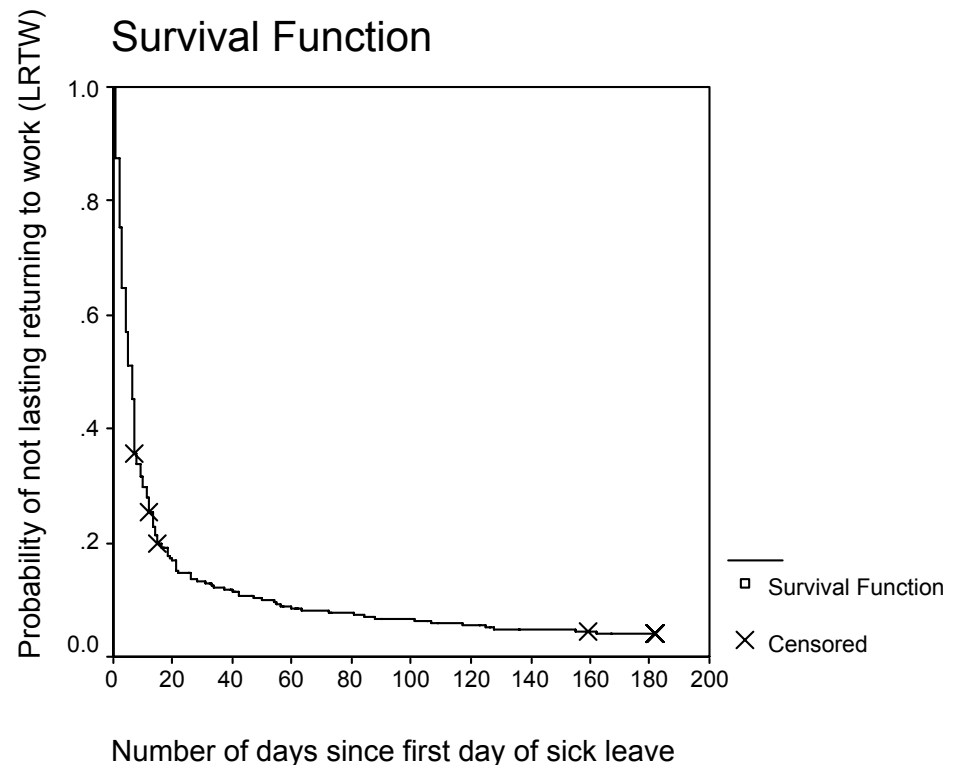
- Based on duration of the episode/ time to event
- Based on patients' clinical, demographic, workplace characteristics



## Based on duration

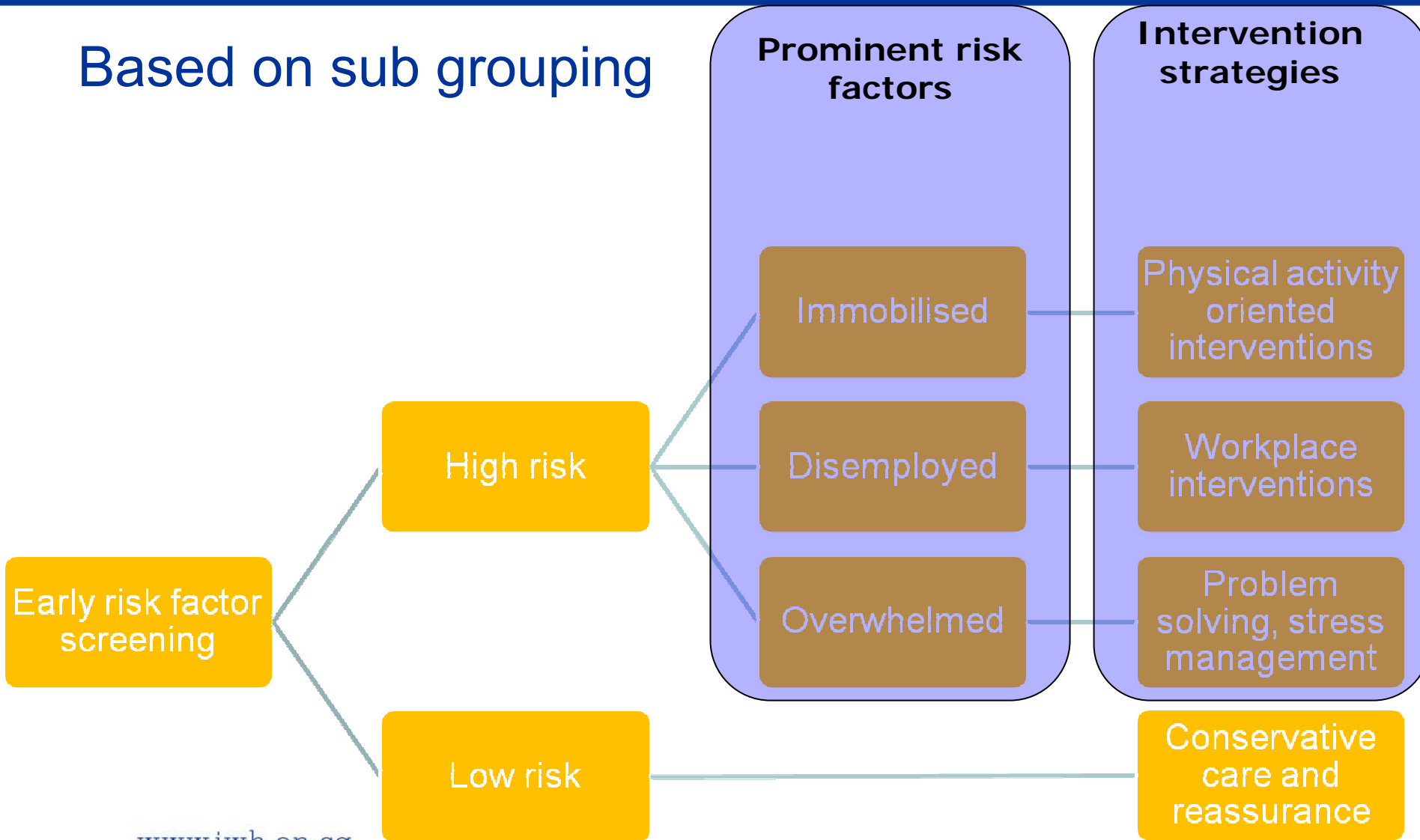
### “Classic” categorisation

- Acute (< 6 weeks)
- Subacute (6-12 weeks)
- Chronic (>12 weeks)





# Based on sub grouping





## Validating the literature based sub- grouping model

- 442 cases claiming disability benefits due to low back pain for the Readiness for Return to Work (R-RTW) cohort
- Interviews at approx. 4 weeks after “accident date”
- First step:
  - Low risk: Returned To Work (RTW) at time of interview (n=259=59%)
  - High risk is not at work at time of interview (n=183=41%)



# Using the available data

In subgrouping model	In R-RTW data
<b>Immobilized</b>	
Fear avoidant Pain catastrophising Physical dysfunction Poor expectation for resuming activity	Pain (10 point VAS) Functional disability (Roland Morris Disability Questionnaire) Fear avoidance beliefs (FAB)
<b>Disemployed</b>	
High physical demands Poor employer response No modified duties Short job tenure	High physical demands (self report) Low people oriented culture Limited disability Management
<b>Overwhelmed</b>	
Mood symptoms Life adversity Work stress Fears and worries	Depression (CES-D)





## Methods of analysis

Logistic regression to examine indicators for being off work at baseline interview

Latent class analysis

- Most stable method for identifying classes

- Not reliant on normal distribution or equal variances

- Choosing classes by combining model fit and meaningfulness

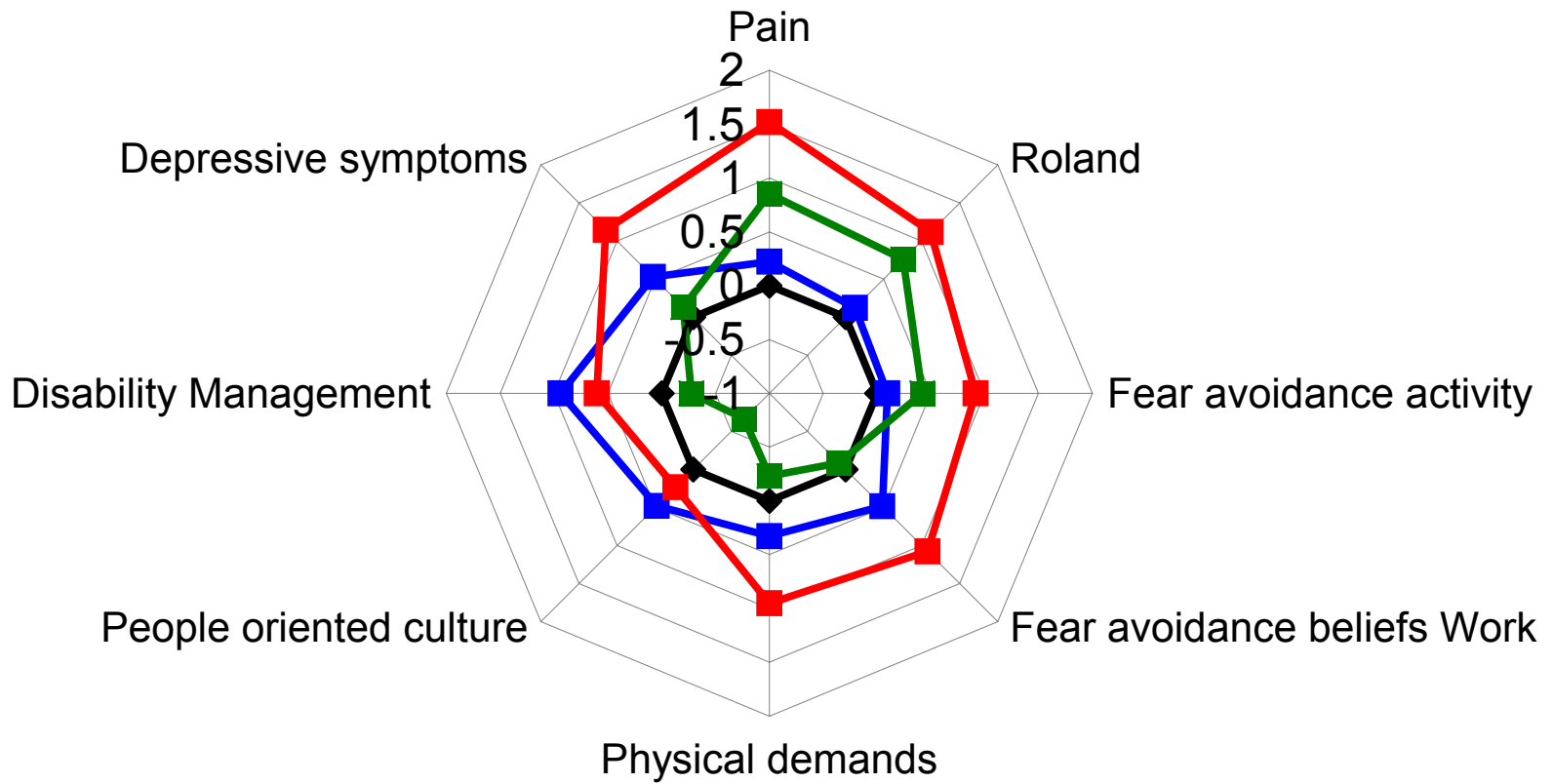
Cox regression analysis to explore predictive validity of classes



## What seem to be the main drivers for being off work at 4 weeks?

	<b>Sig</b>	<b>OR</b>	<b>[95% CI]</b>
Pain	0.00	1.28	[1.15, 1.43]
Functional disability	0.00	1.02	[1.01, 1.03]
Physical demands	0.03	1.04	[1.00, 1.07]
People oriented culture	0.01	1.50	[1.13, 1.99]
Disability management	0.00	0.49	[0.34, 0.70]
Sex	0.71	0.92	[0.59, 1.44]
Age	0.45	1.01	[0.99, 1.03]

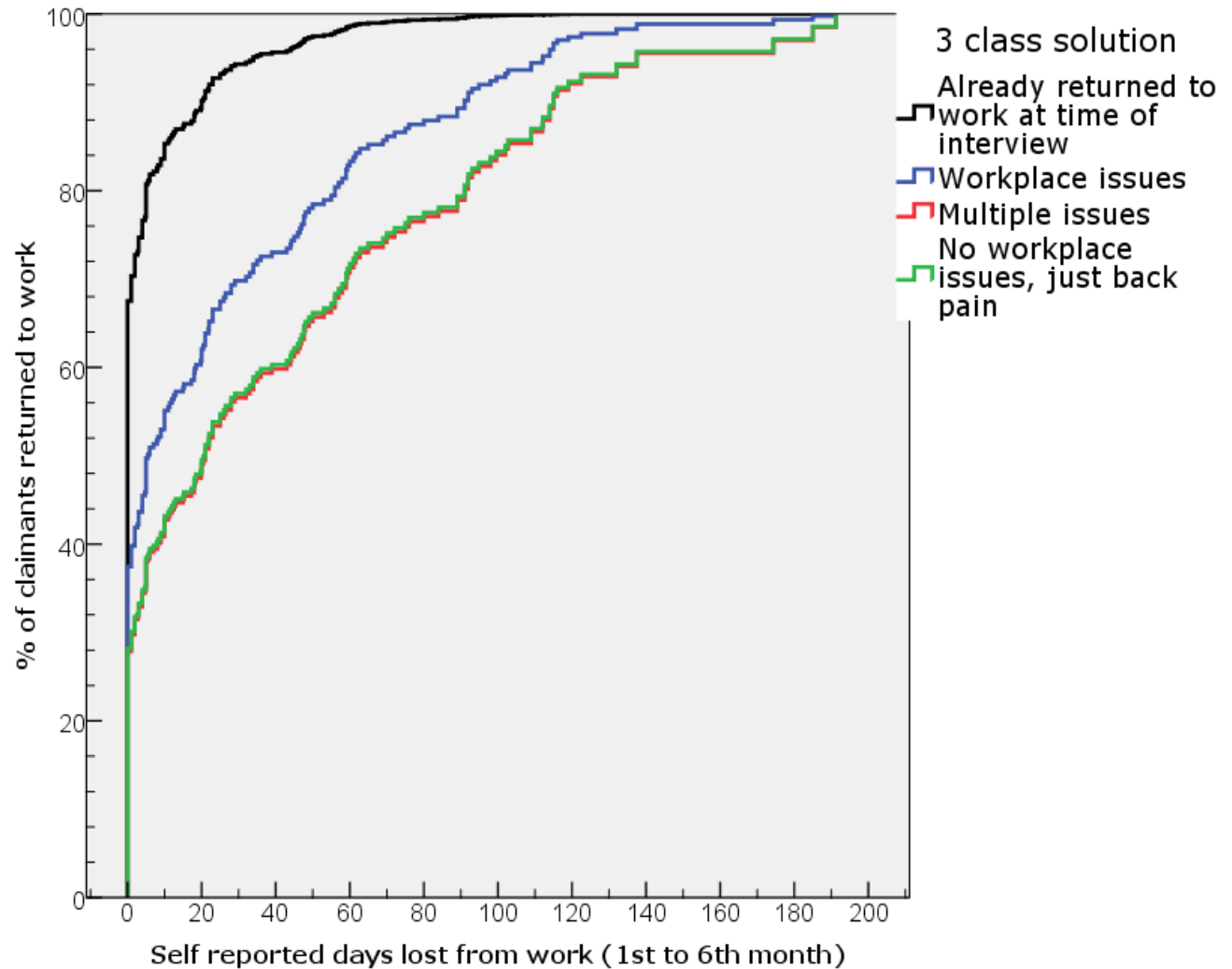
Associations between all constructs from model and work status (multivariate, cross sectional)



- ◆ Group returned to work (n=259)
- Class 1 'workplace issues' (n=55)
- Class 2: "Multiple issues" (n=64)
- Class 3: "Great workplace, just backpain" (n=64)



# Number of days lost by subgroups





## The sub group model and our findings

- Immobilised group= “Back pain” group
- *Pain, function and fear avoidance are important, but workplace factors are also different from the other groups*
- Disemployed group= “Workplace issues” group
- *Poor employer response as measured with disability management practices seems to be the most important characteristic. (Perceived) physical demands seem less important*
- Overwhelmed group: “Multiple issues” group
- *Not only high scores on depression but “overwhelmed” in all characteristics*



## Implications for future work

- Sub group model was partially confirmed, but more complex than expected from theory – need more work
- Issues with early classification
  - Can we screen?
  - Is it feasible?
  - What about sensitivity and specificity?
  - What are the consequences of misclassification?
- Developing and/or testing interventions



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# Subgroup analysis in a RCT on the effectiveness of a workplace intervention in LBP patients on sick leave

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## 1. What works for whom?

- 1998: Second International Forum for Primary Care Research on Low Back Pain : identification of LBP subgroups to apply tailor-made interventions identified as a research priority<sup>7</sup>
- Cochrane Back Review Group 2003<sup>8</sup>
- RCTs gold standard for treatment efficacy; yet only report results on groups' averages
- Heterogeneity of effects in a RCT population; information on effectiveness in subgroups<sup>9</sup>



## 2. Background

- Randomised controlled trial (RCT) on cost-effectiveness of the Sherbrooke model<sup>4</sup> in the Netherlands
- Workplace intervention was effective on RTW: HR = 1.7; 95% CI [1.2-2.3]<sup>5</sup> at reasonable costs<sup>6</sup>
- Graded activity delayed RTW<sup>5,7</sup> and the combination of interventions showed no effect<sup>5</sup>



### 3. Possible subgroups

- Focus on workplace intervention
- Prior to analysis, all authors choose possibly relevant modifiers from measured baseline variables, based on authors opinions and literature, variables had to be reliably and easily measured<sup>10</sup>
  - Age<sup>11</sup>
  - Gender<sup>11</sup>
  - Pain; 10 cm visual analogue scale<sup>11,12</sup>
  - Functional status; Roland Morris Disability.<sup>11, 13</sup>
  - Heavy work; Dutch Musculoskeletal Questionnaire<sup>11,14,15</sup>
  - Sick leave in the previous year, self report and dichotomized to yes/no<sup>16</sup>
- Not chosen, because intervention was not linked to these factors:
  - Fear avoidance beliefs
  - Coping
  - Kinesiophobia



## 4. Primary outcome

Successful return to work:

Lasting return to own or equal work: duration of work absenteeism due to LBP in calendar days from the first day of sick leave to full return to work in own or other work with equal earnings, for at least 4 weeks without (partial or full) drop-out



## 5. Analysis

- Interaction tests are regarded as the most efficient tests to identify modifying factors for the effectiveness of treatment<sup>17,18</sup>
- Time dependent co-variates were used to adjust for the time until randomization for the interventions in the Cox regression model
- Confounders added in case of a >10% change in the Beta of the workplace intervention<sup>19</sup>
- Non linearity; dividing into four groups of equal size (at 25th, 50th , and 75th percentile).
- Moderators; factor and an interaction term between the factor and the intervention in the model ( $p < 0.10$ )<sup>20</sup>
- Cox regression survival analysis was performed on all subgroups.



## 6. Results

- Effects of age, pain score and perceived heavy work not linearly related to RTW.
  - Age: dichotomized at median (44 yrs)
  - Pain and heavy work scores: quartiles
- Modifying effects from gender, pain, functional status and heavy work were statistically not significant ( $p=0.14$ ,  $p=0.88$ ,  $p=0.75$  and  $p=0.29$ , respectively)



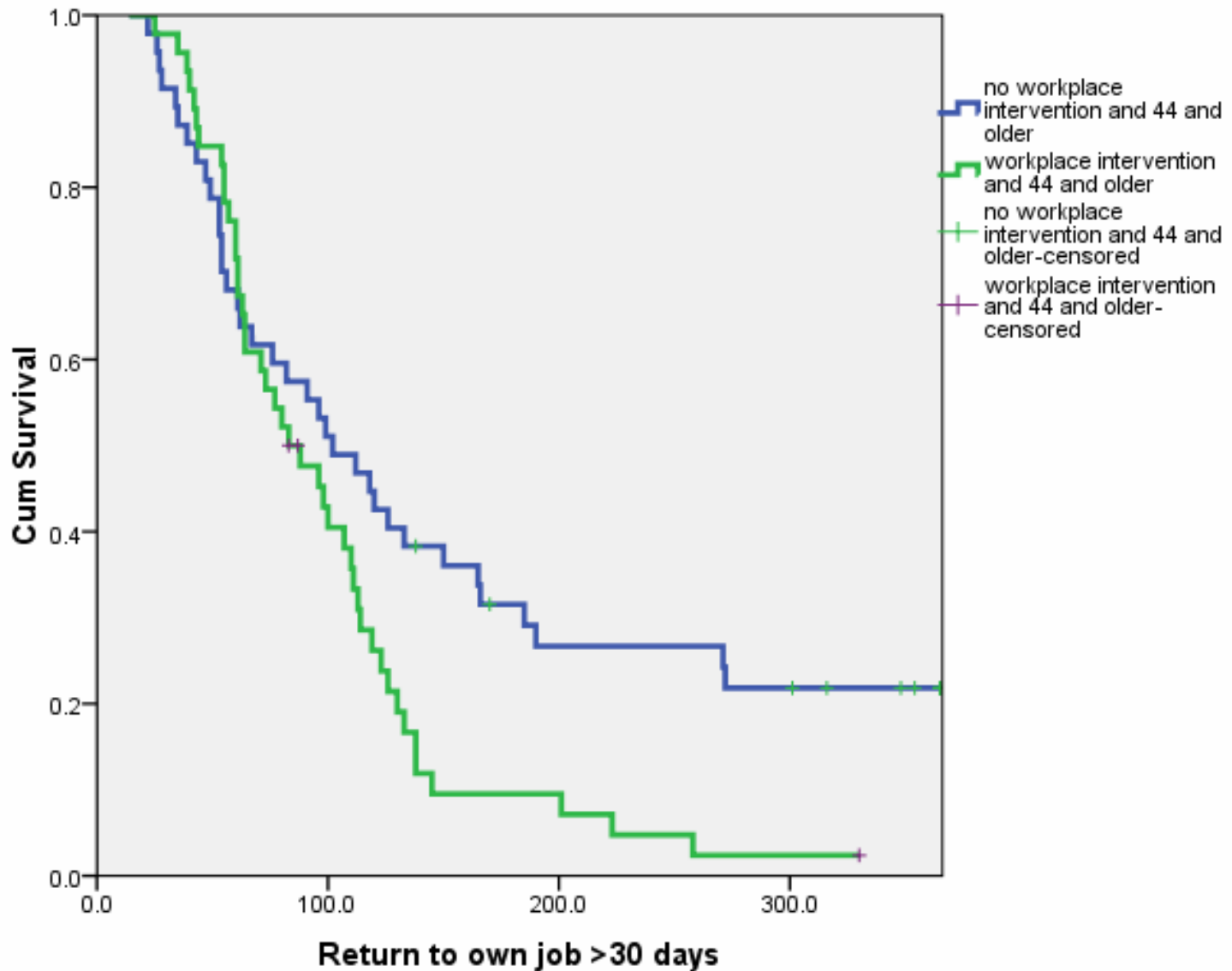
## 7. Results

Moderator (n=192)	Effect workplace intervention vs. usual care (HR, [95% CI])	**p-value interaction
No moderator in the model*	1.7, [1.2, 2.3]	
Age < 44 (=median) (n=100)	1.2, [0.8, 1.8]	0.02**
Age ≥44 (n=91)	2.5, [1.6, 4.1]	
No sick leave in previous year (n=123)	1.3, [0.9, 2.0]	0.04**
Sick leave in previous year (n=68)	2.8, [1.7, 4.9]	

Table 2 Hazard ratios for moderators of the workplace intervention, \*adjusted for the effect of a possible graded activity intervention and functional status.

\*\* Adjusted for the effect of the other significant modifier

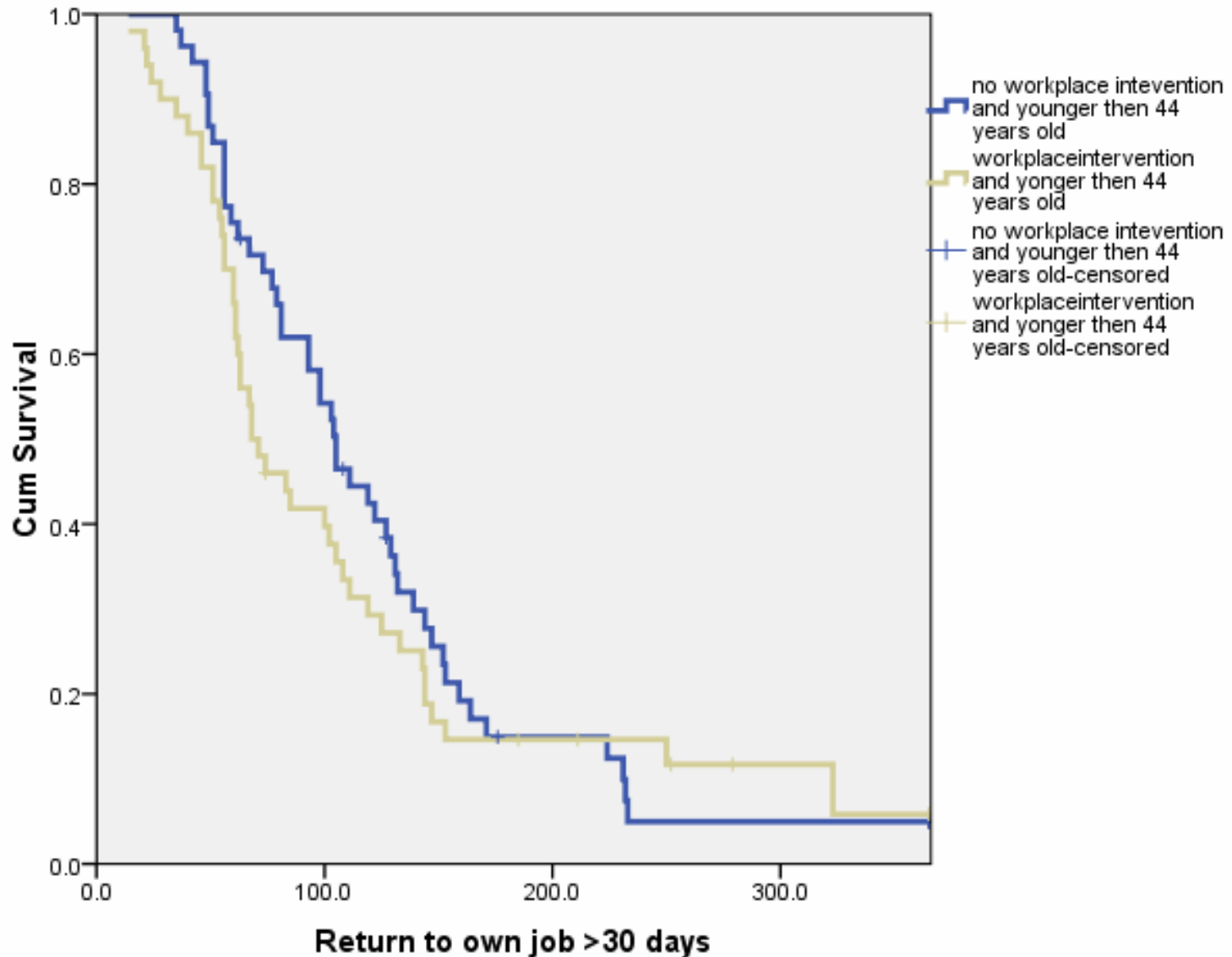
# 8. Results: younger vs. 44 and older





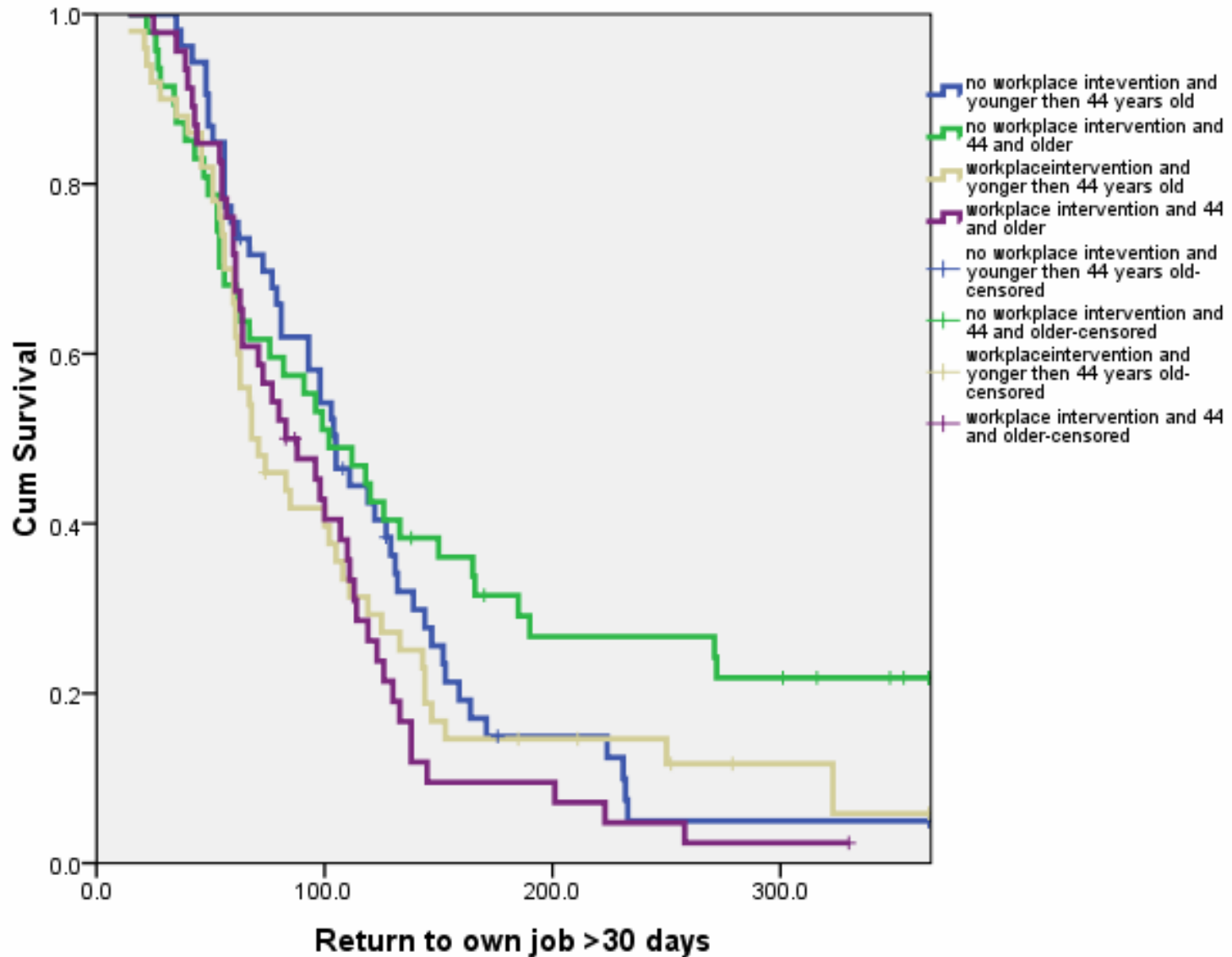


## 8. Results: younger vs. 44 and older

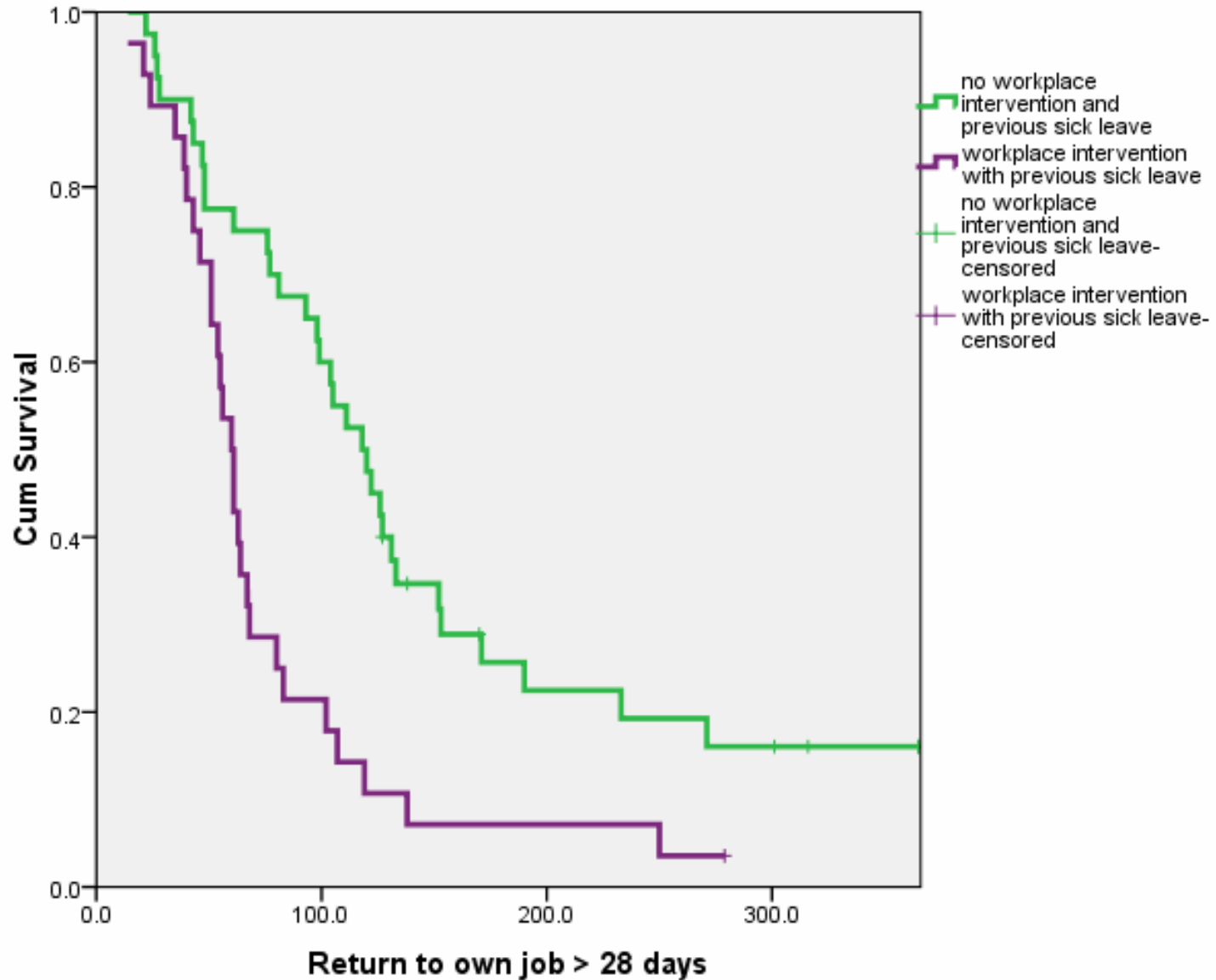




# 8. Results: younger vs. 44 and older

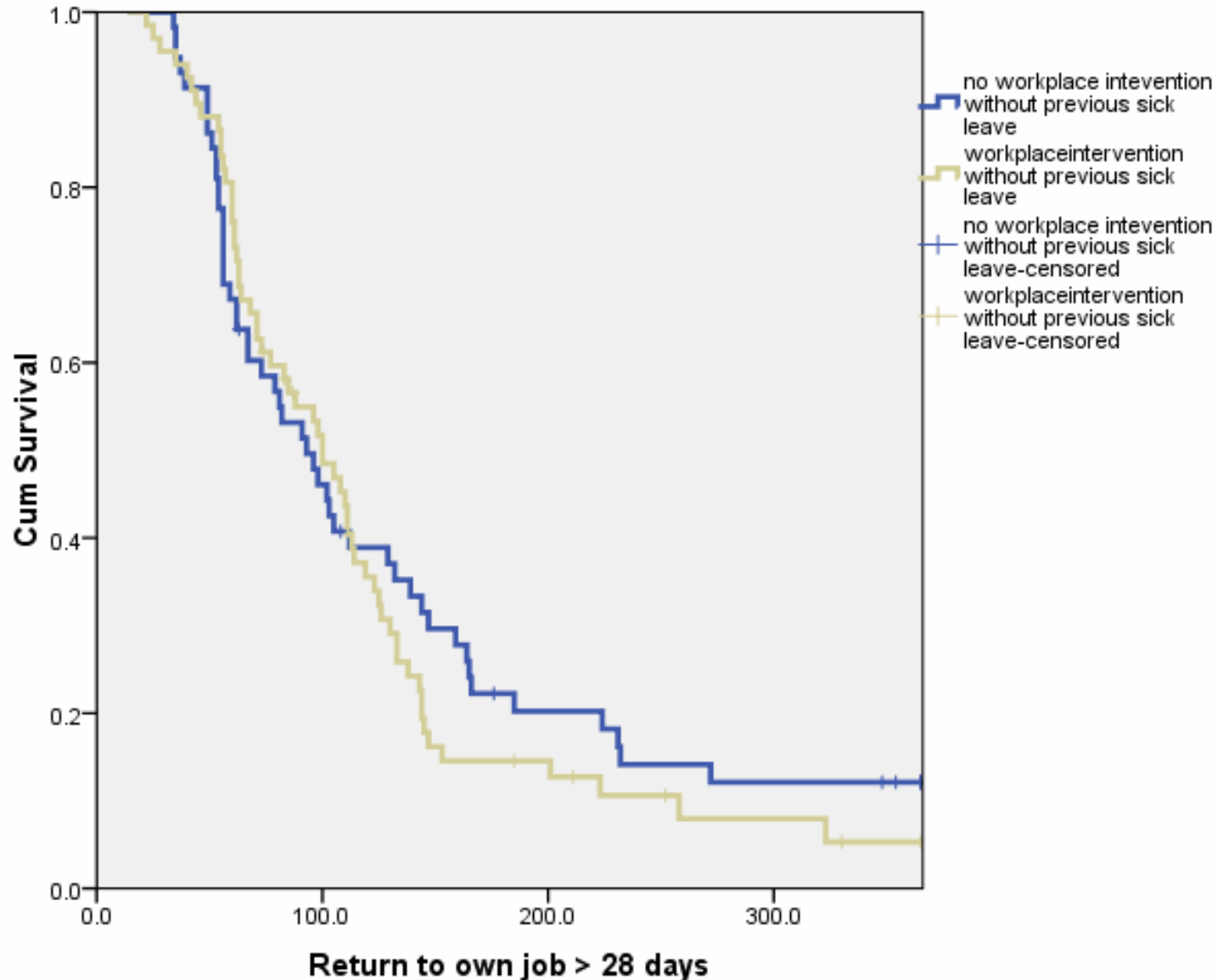


# 9. Results: no previous sick leave



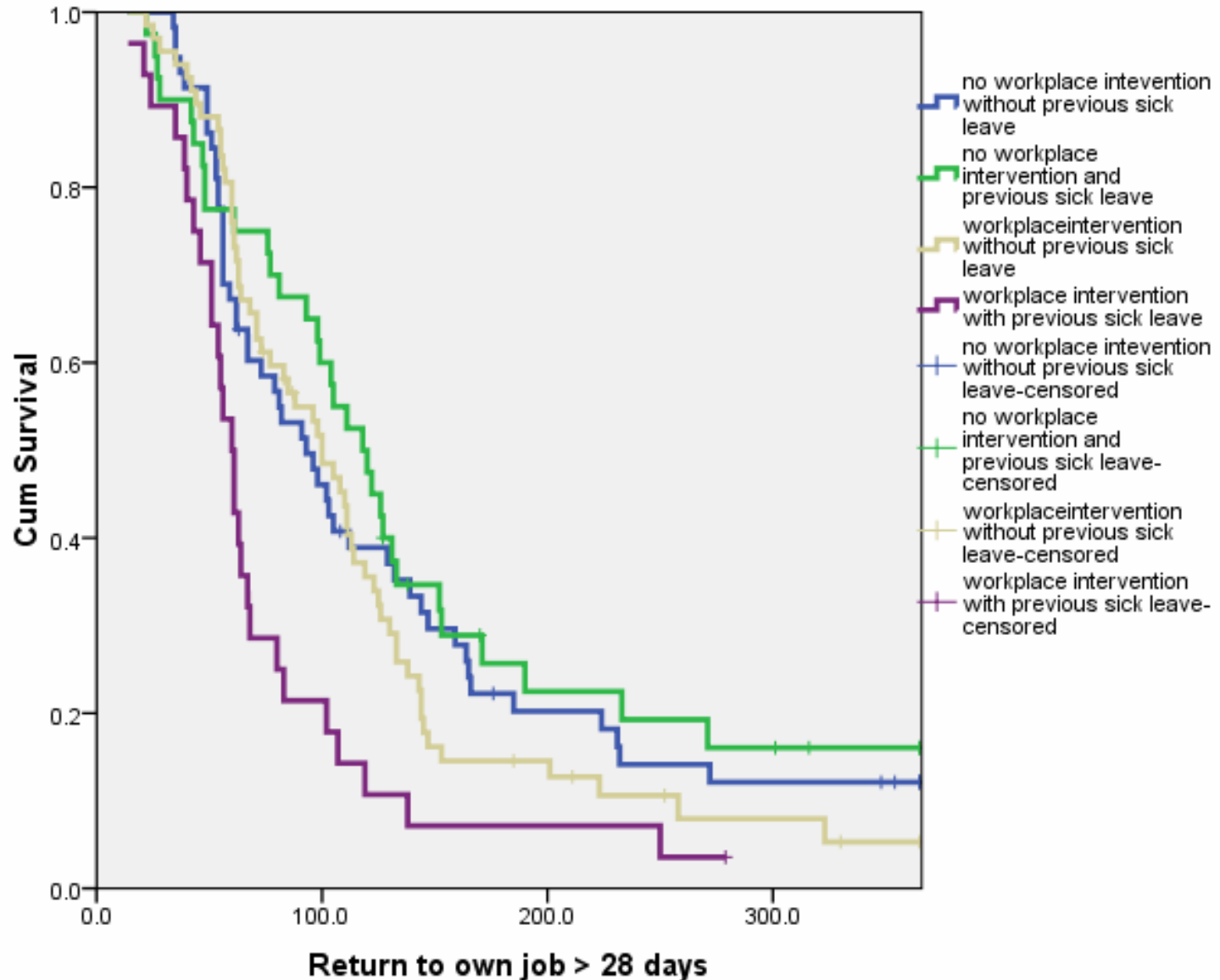


## 9. Results: no previous sick leave





## 9. Results: previous sick leave





## 10. Concluding

- Workplace intervention more effective in older workers and those with earlier sick leave in previous year
- Analysis is exploratory: results should be confirmed in new RCTs
- Modifiers (and mediators) for treatment should be considered in design of (randomized controlled) trials



## 11. Why?

- More effective in older workers: compared to usual care?
- Earlier sick leave: coping?
- Not more effective in heavier work: perception of heaviness of work?
- Does this mean that we need different intervention for younger workers/ for workers without previous sick leave?



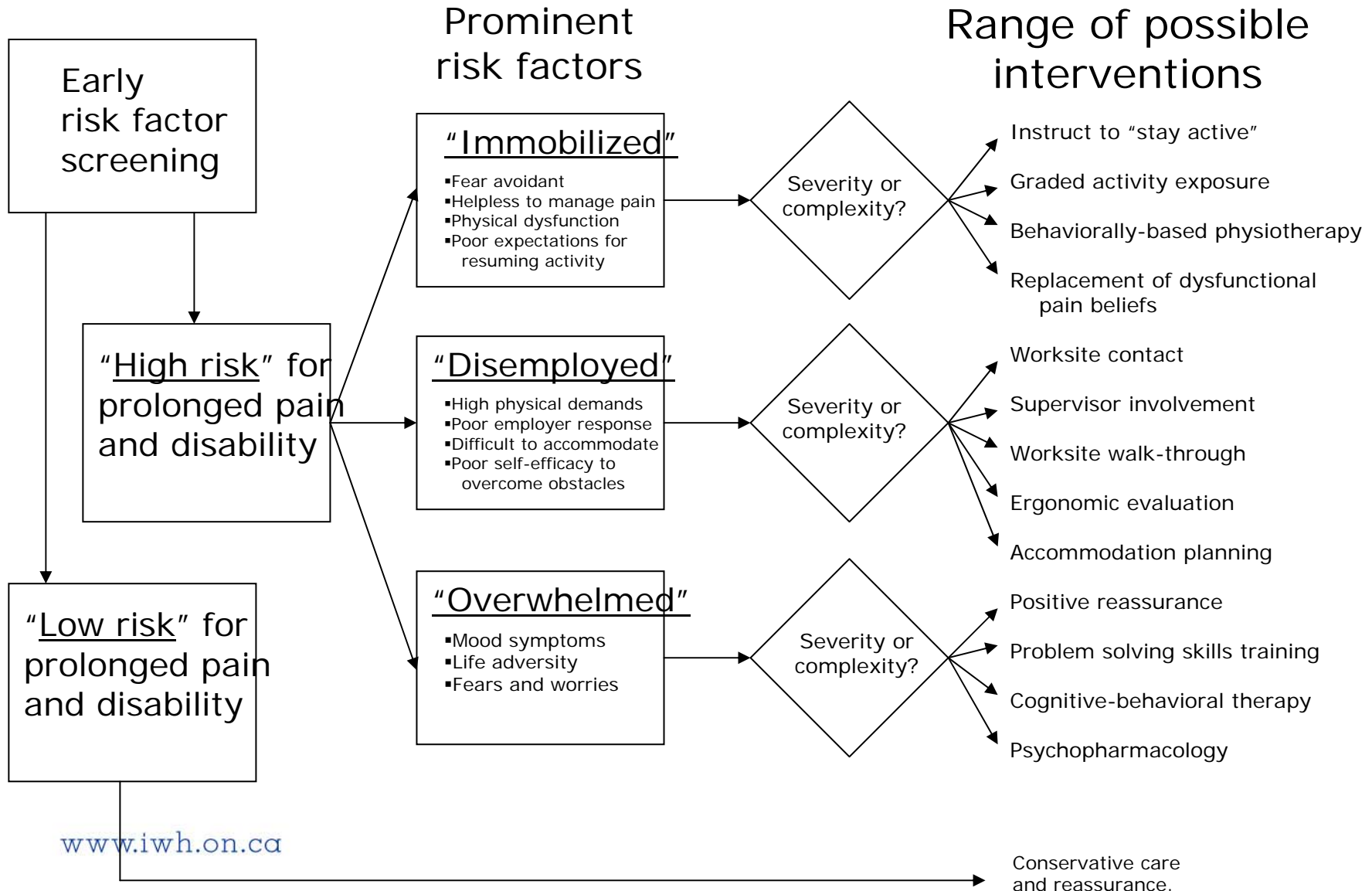
# Development of Patient Screening Inventory Impact of Pain, Recovery Expectations, and Concerns (IPREC)

William Shaw, Steven Linton,  
Ivan Steenstra, Glenn Pransky





Figure 1. Conceptual basis for defining 3 patient subgroups in the first 2 weeks after onset of (adapted from Shaw, Linton, & Pransky, J Occup Rehab, 2006).



# IPREC Scoring Sheet: 0-4 days post-onset of LBP

Patient name: \_\_\_\_\_ Birth date: \_\_\_\_\_ Gender: \_\_\_\_\_

Date and description of injury/onset: \_\_\_\_\_

Current work status: \_\_\_\_\_



Assessment date: \_\_\_\_\_

Pain rating (0-10): \_\_\_\_\_

Bothersome rating (0-10): \_\_\_\_\_

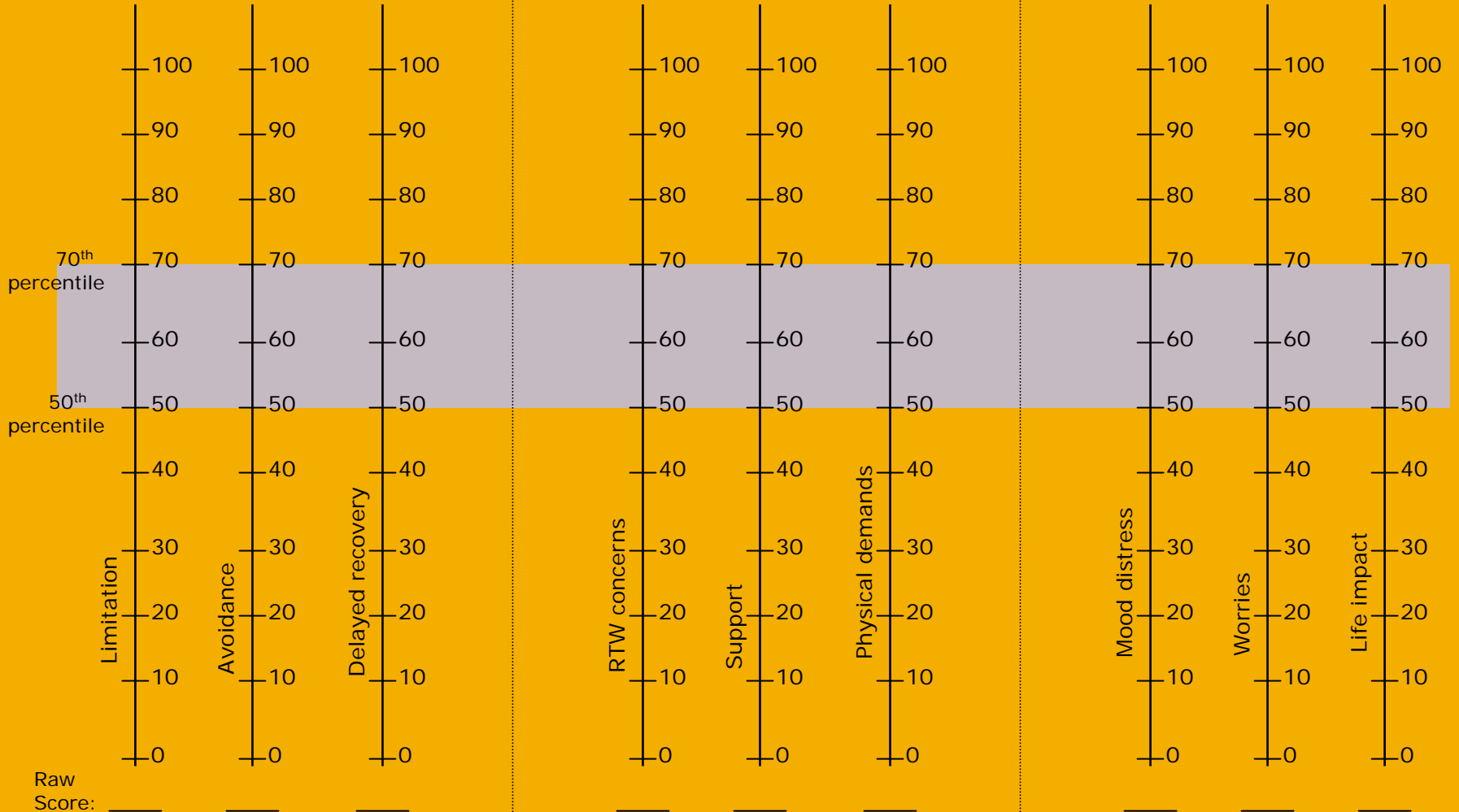
Distress rating (0-10): \_\_\_\_\_

Current treatment plan: \_\_\_\_\_

## Functional concerns:

## Workplace concerns:

## Emotional concerns:



Raw Score: \_\_\_\_\_

# IPREC Scoring Sheet: 2 weeks post-onset of LBP

Patient name: \_\_\_\_\_ Birth date: \_\_\_\_\_ Gender: \_\_\_\_\_

Date and description of injury/onset: \_\_\_\_\_

Current work status: \_\_\_\_\_



Assessment date: \_\_\_\_\_

Pain rating (0-10): \_\_\_\_\_

Bothersome rating (0-10): \_\_\_\_\_

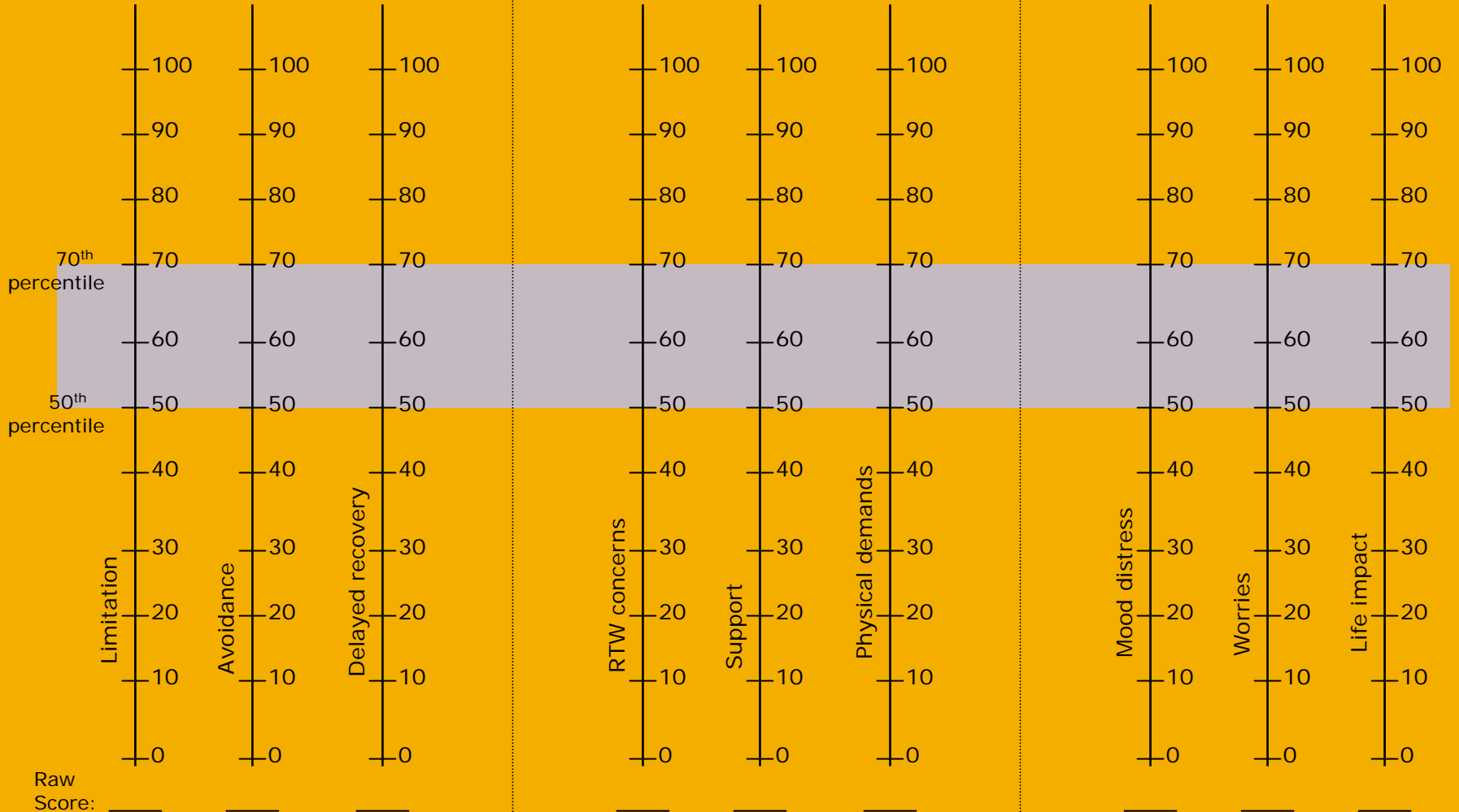
Distress rating (0-10): \_\_\_\_\_

Current treatment plan: \_\_\_\_\_

## Functional concerns:

## Workplace concerns:

## Emotional concerns:



Raw Score: \_\_\_\_\_



## Outcomes

- Time on disability benefits
- Depression
- Pain
- Functioning
- Costs



# Prediction rules to determine duration on disability benefits

**Ivan A Steenstra, Sheilah Hogg-Johnson,  
Selahadin Ibrahim, David Toluso, Ben  
Amick**



# WSIB RAC Research Priority

## Return-to-Work, Disability Management, and Rehabilitation

- This priority includes: identification of factors that determine sustained return to work,



## Identifying high risk patients

Two options

- Based on duration of the back pain episode
- Based on patient characteristics (Done in 2008)



## **A prediction rule for duration of disability benefits in workers with non specific low back pain**

Target group for using the prediction rule developed in this study will be WSIB case managers

The final products will be a (computerised) prediction score card, the sum of the scores on the chart will be the estimated number of days on disability benefits

<http://www.nspoh-on-line.nl/pva/rtw/>

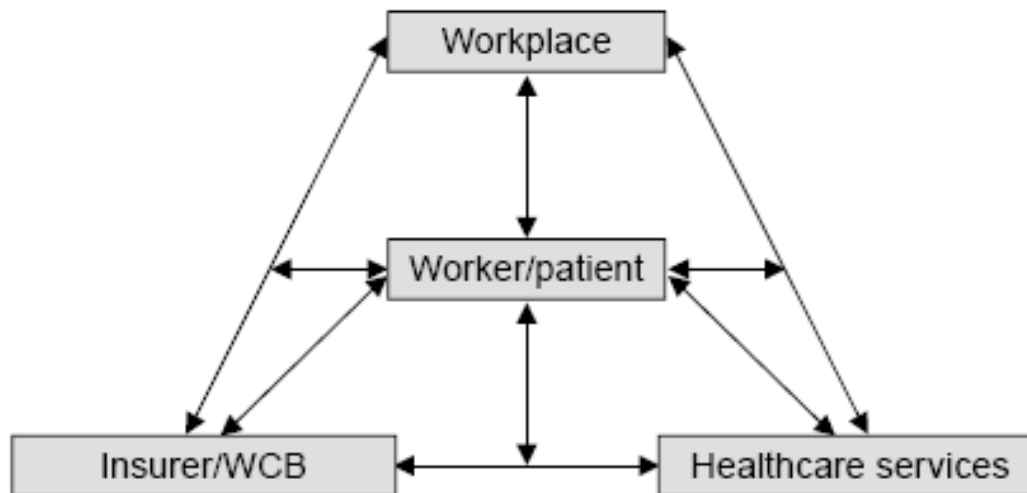




## Methods

- We will be using a Bayesian sequence of accumulating information as described by Hemmingway (7)
- The prediction rule will be built in blocks.
  - First block : administrative data
  - Second block: data collected in IWH datasets (R-RTW , ECC)
  - (Third block: clinical information from programs of care or Forms)

## Theoretical framework



**Fig. 1.** Interactions between stakeholders in the disability problem. Workers' disability is influenced by the stakeholders' actions and attitudes and by interactions occurring between the stakeholders. **WCB** = workers' compensation boards.



iwv