

Flexible work hours and accident risk

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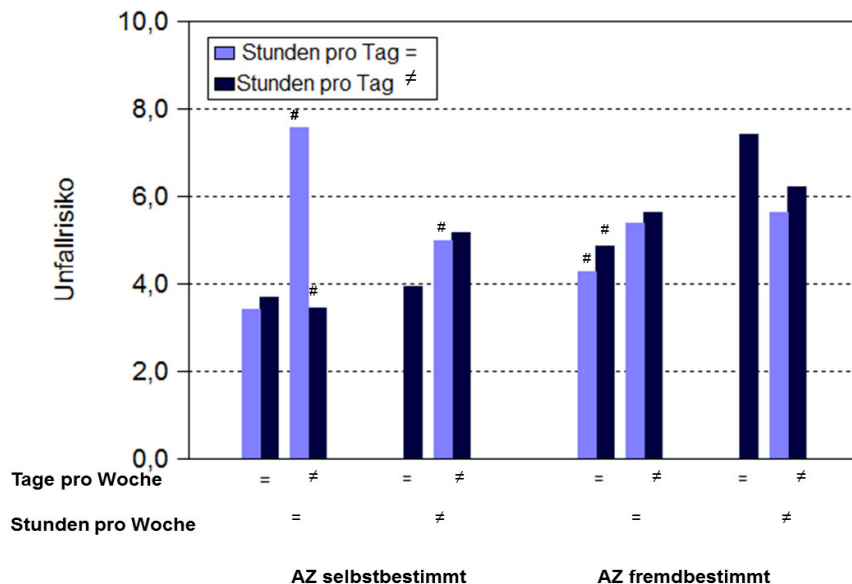
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- ✓ Flexible work hours are by definition (see e.g. the definition of the SALTSA group, 2003) and intention associated with some (at least potential) variability of work hours
- ✓ Variability of work hours does not only change the temporal structure of working time but also those of other activities, e.g. recuperation, social participation
- ✓ Variability of work hours can thus lead to a desynchronisation of biological and social rhythms

- ✓ For shift work the effects of this desynchronisation are well known and documented
 - among others as impairments to safety, health, and social participation
- ✓ Recently also evidence for an increased accident risk for work at "unusual times" has been presented
 - i.e. work hours that deviate from "normal" or "standard" work hours
 - among others e.g. by Wirtz & Nachreiner, Arlinghaus et al., or Greubel et al.

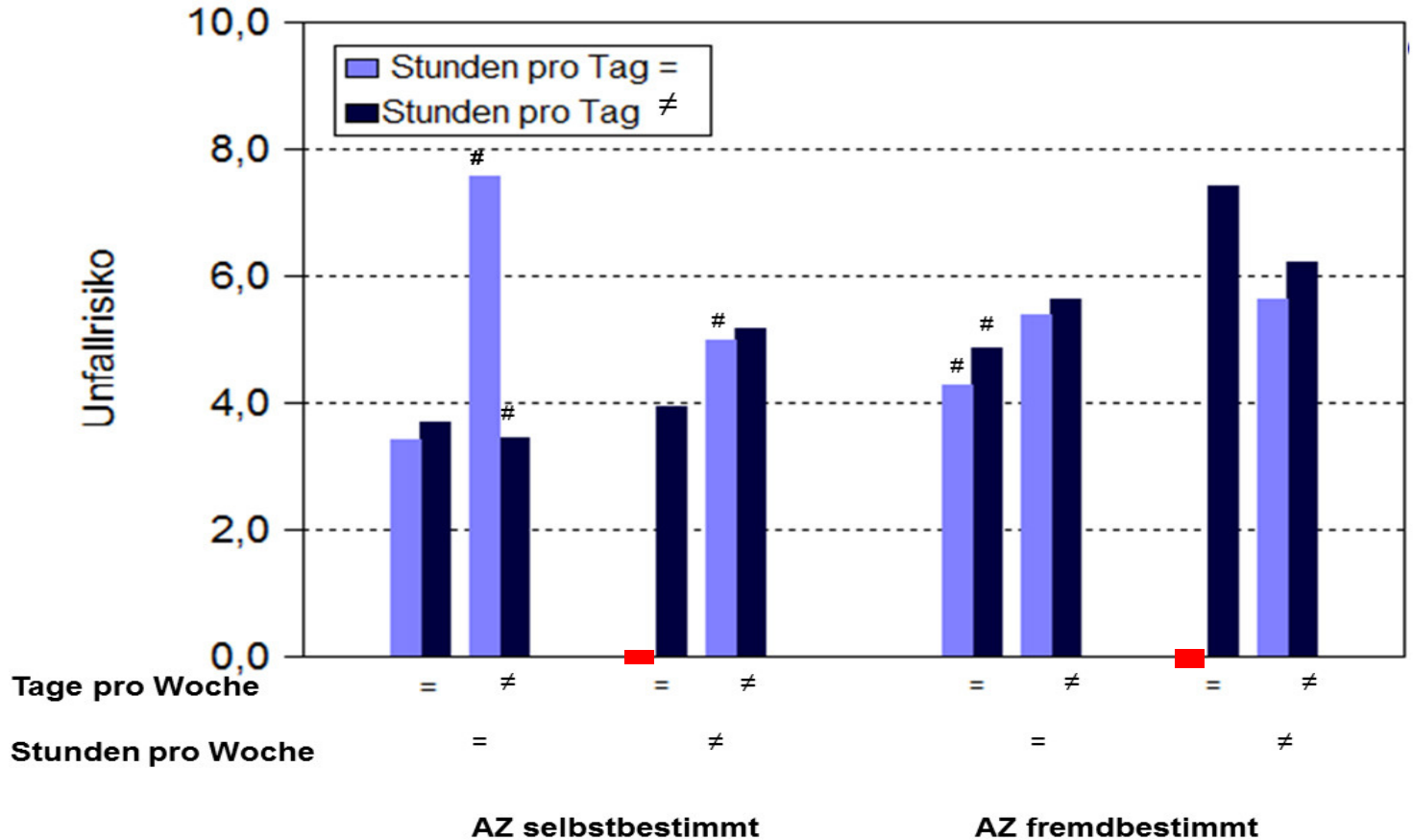
Background

e.g. Greubel et al. (2013) using categorial analyses have shown that the accident risk - even when controlling for shift work or the a priori risk of a job category - increases substantially with increasing variability and decreasing autonomy in the regulation of work hours



Aufgrund geringer Zellenbesetzung unzuverlässiger Schätzwert

Background



Aufgrund geringer Zellenbesetzung unzuverlässiger Schätzwert

- ✓ **Problems of such analyses**
 - only insufficient use of the available variance
 - ◆ e.g. when constructing indices of variability or flexibility
 - loss of relevant information
 - leading to imprecise tests of differences in risks across subgroups
 - breakdown of cell frequencies in multiple classifications
 - ◆ *accidents are rare events* (usually about 4.5 %)

- ✓ Preferable would instead be analyses that
 - ✓ make a better use of the available data, e.g. distributions, variances and covariances
 - ✓ allow for a better control of potential confounders
 - ✓ allow for a more precise estimation of the accident risk in relation to the variability of work hours

- ✓ Can the results of categorial analyses and estimates be validated by using appropriate parametric analyses ?

- ✓ Can the available results of categorial analyses be stated more precisely when using such analytical procedures ?
 - in estimating the increased accident risks
 - in estimating interaction effects
 - in controlling for confounders

- ✓ 5th European Working Conditions Survey, 2010

- ✓ n = 35,187 employed respondents

- ✓ 34 countries

(27 EU-member states, Norway, Turkey, Croatia, Macedonia, Montenegro, Albania, Kosovo)

- ✓ representative samples for each country

- ✓ 50.7 % female

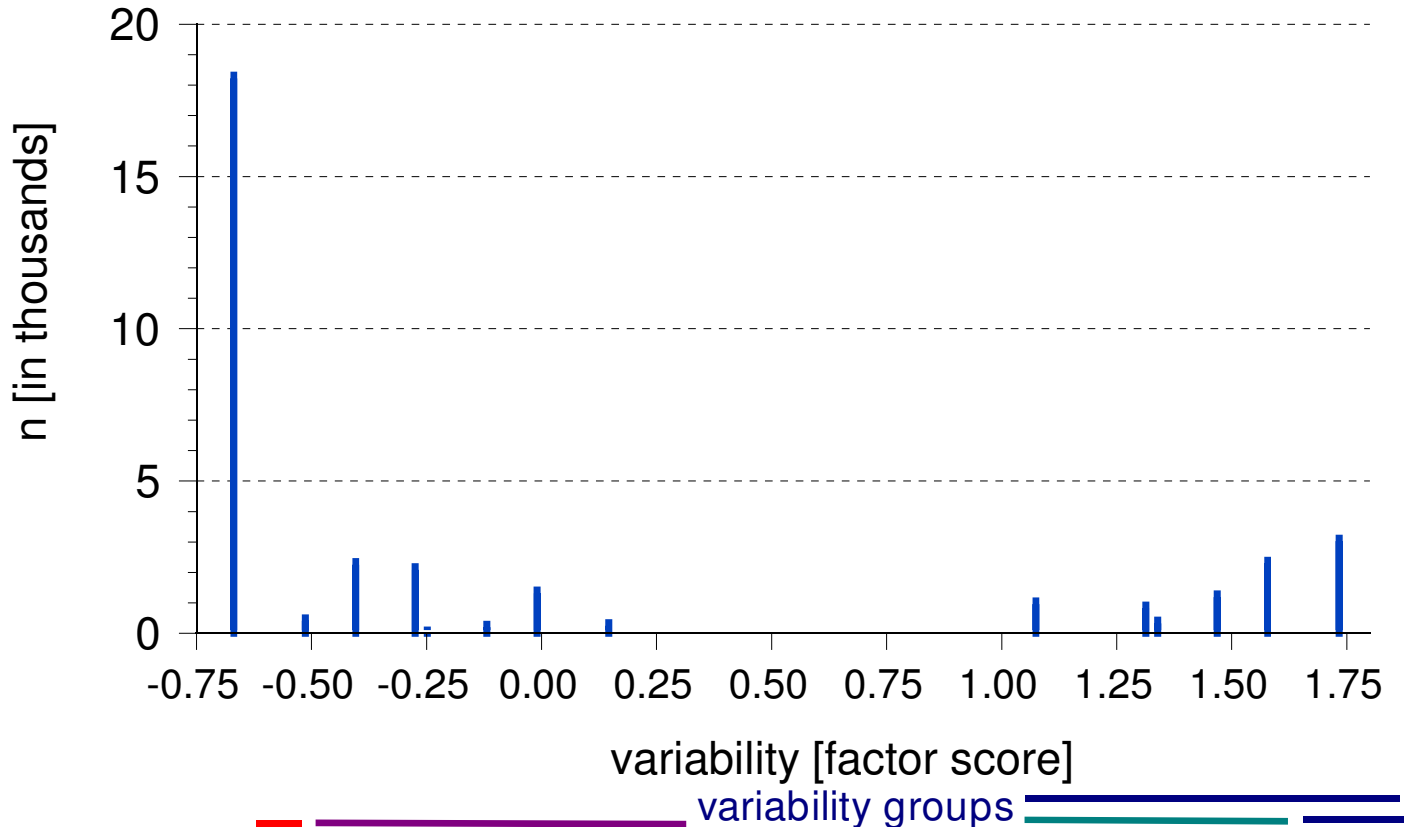
- ✓ mean age 41.1 years (SD: 11.8)

- ✓ Factor-analytical construction of indices for
 - Variability / Flexibility
 - (reported) stress / work load
 - ▶ physical
 - ▶ mental
 - ▶ autonomy

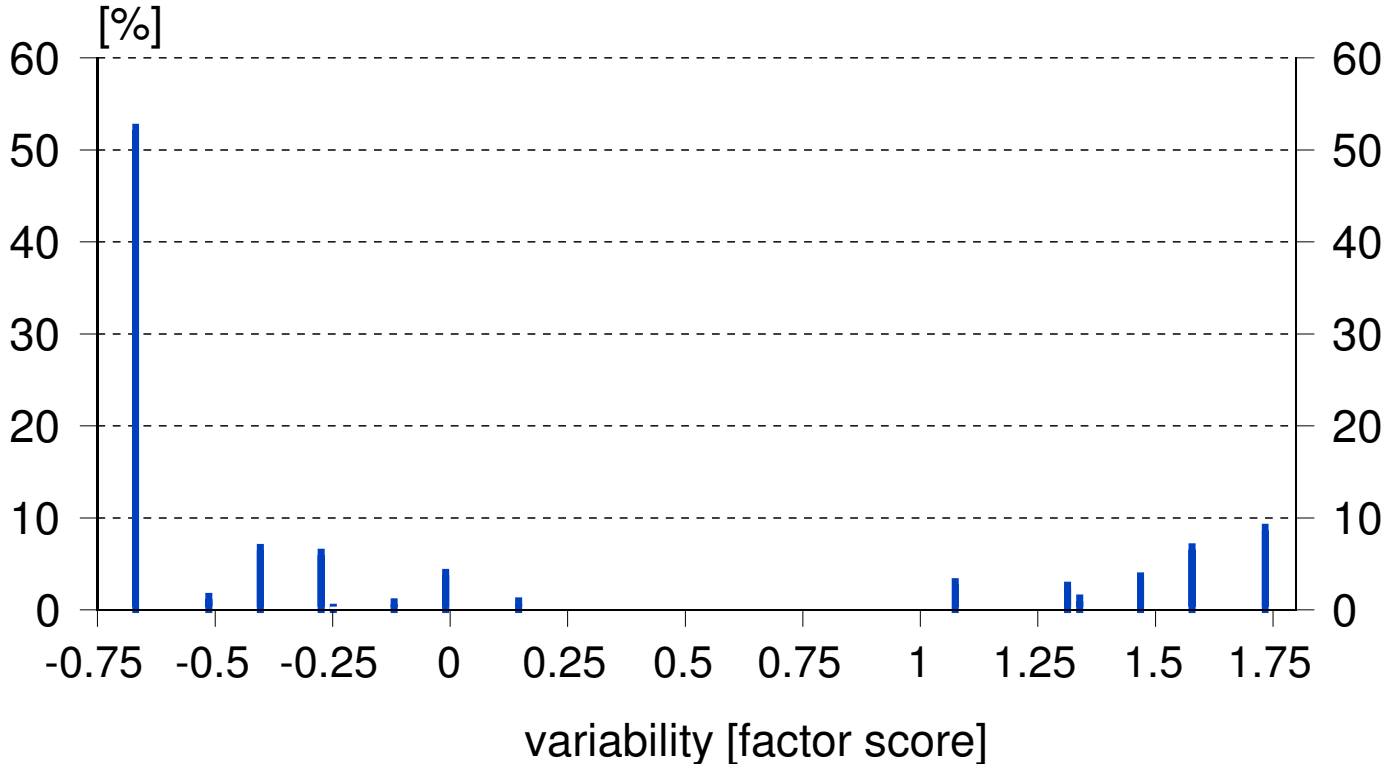
- ✓ Diverse regression analytic procedures
 - ➔ for analyzing effect sizes of the independent variable (variability)
 - ➔ for controlling for potential confounders

- ✓ ordinary multiple regression
- ✓ binary logistic regression
- ✓ multinomial regression
- ✓ Poisson regression
 - ➔ depending on the character of the dependent variable in the analysis
 - ▶ accident risk (accident yes/no) during the last year
 - ▶ days lost during the last year due to an accident
 - both raw and transformed

Distribution of flexfactor scores / variability

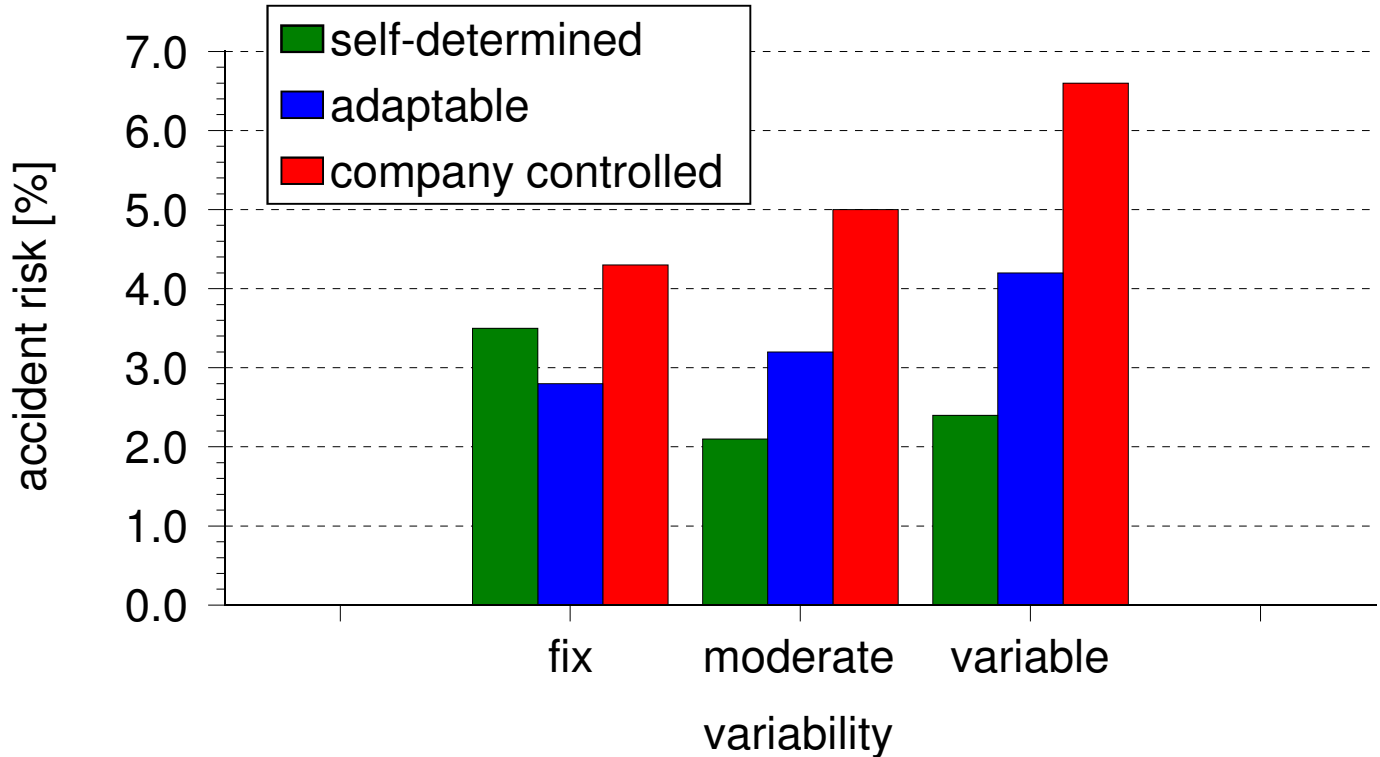


Distribution of flexfactor scores / variability

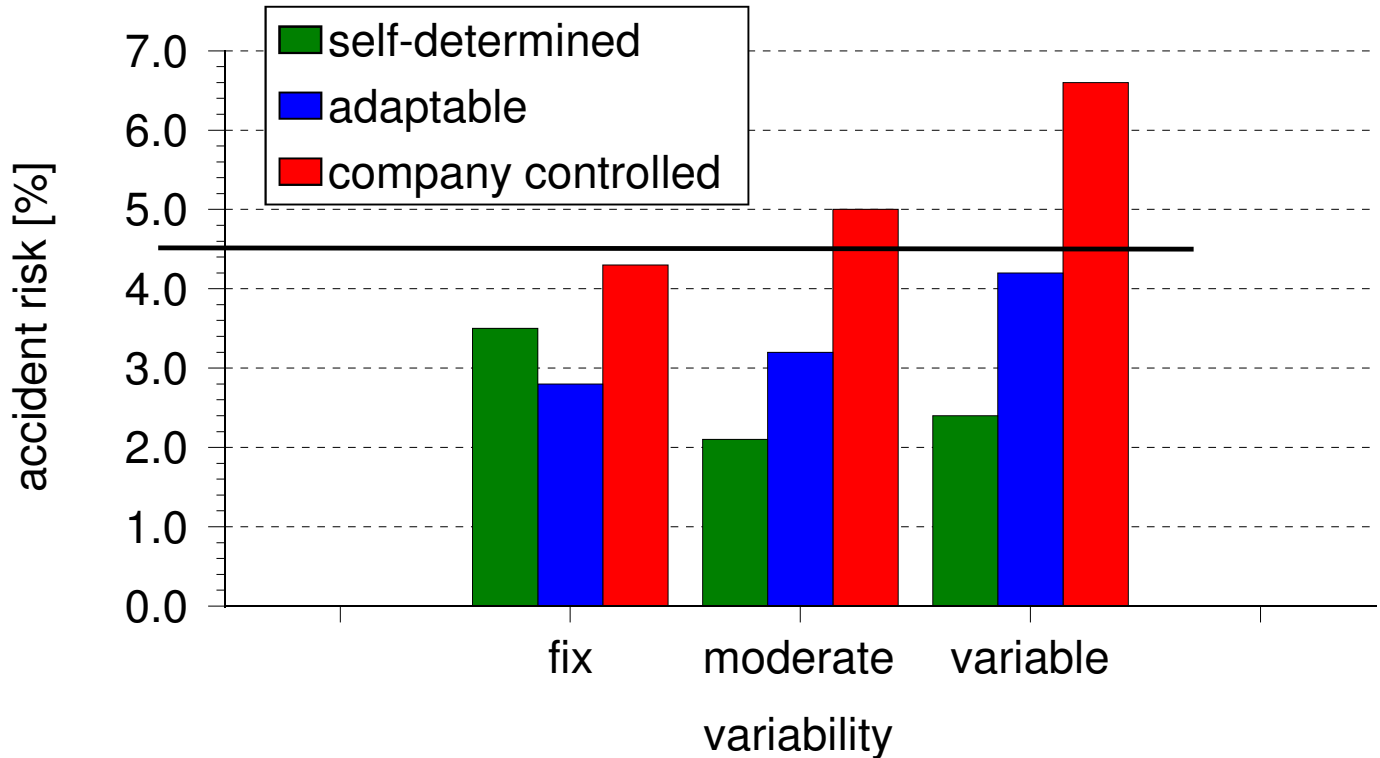


variability groups

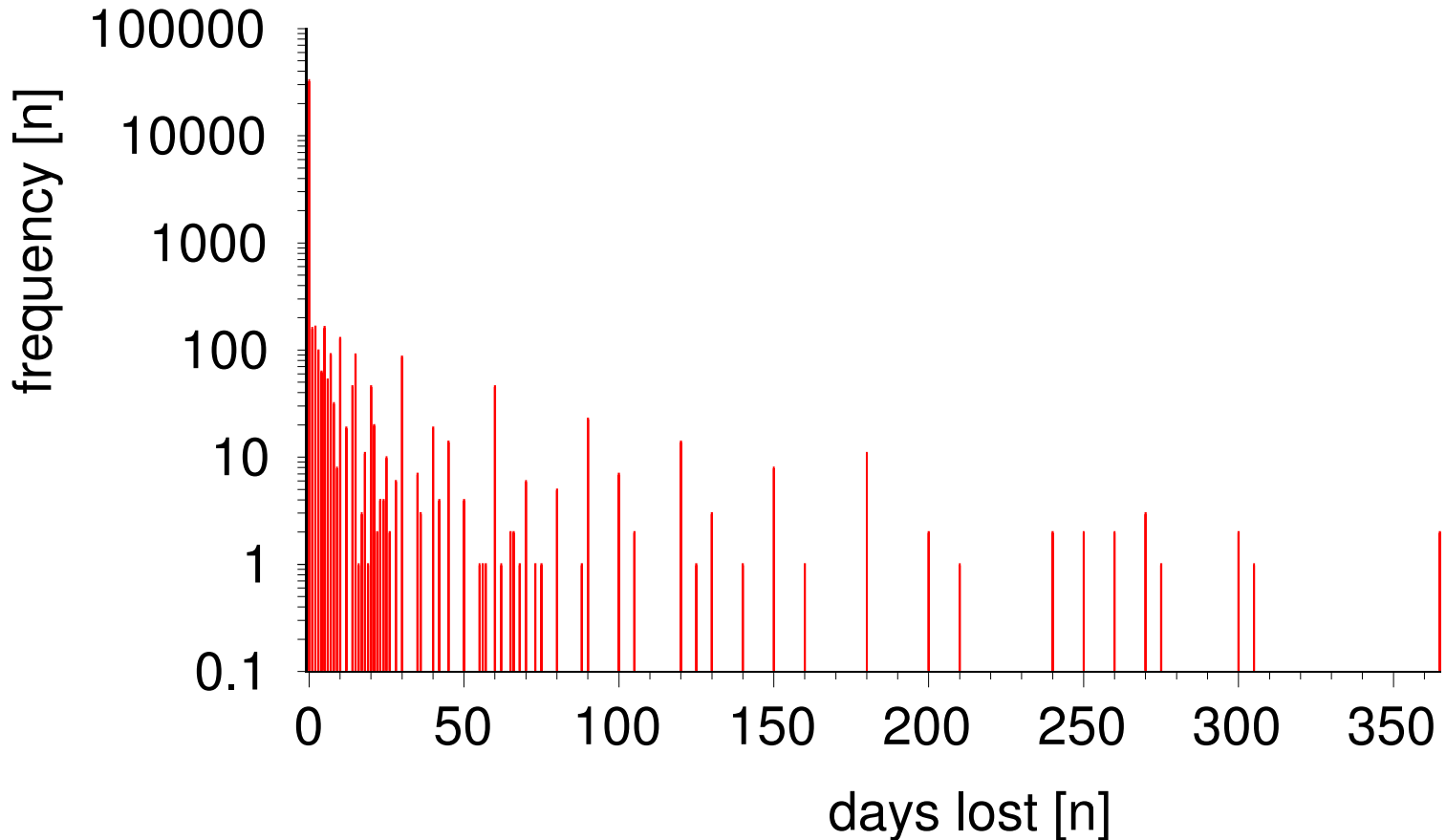
Variability, autonomy, and accident risk



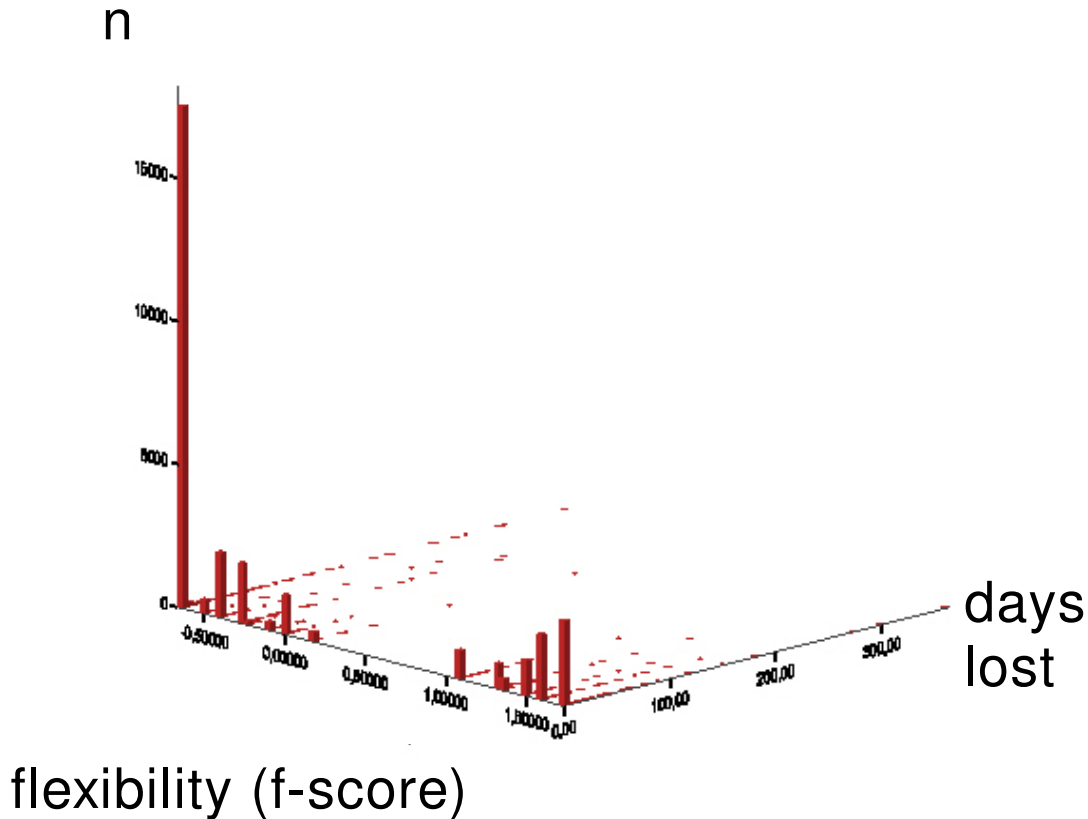
Variability, autonomy, and accident risk



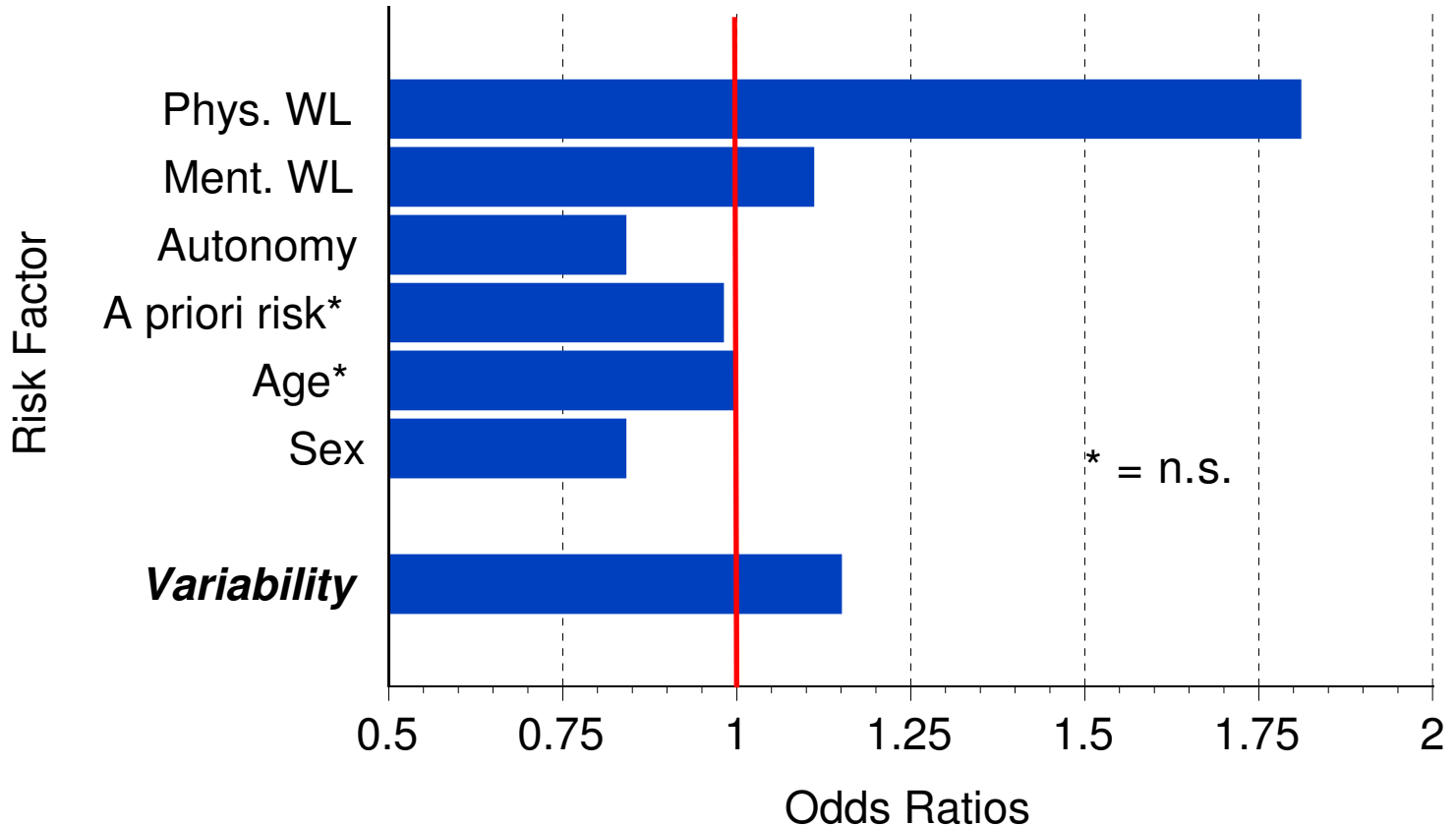
Distribution of accident related lost days (per respondent)



Distribution of days lost x variability

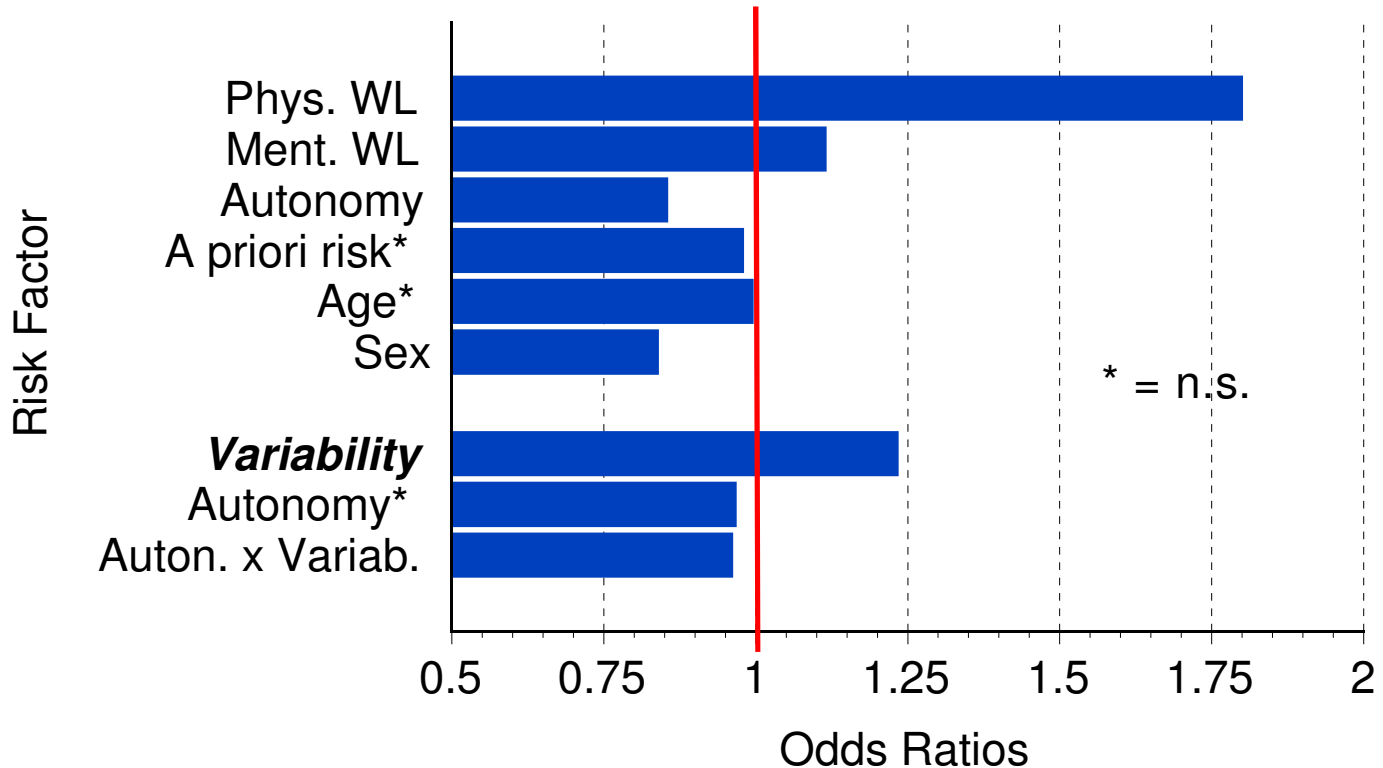


Odds ratios accident risk (yes/no)

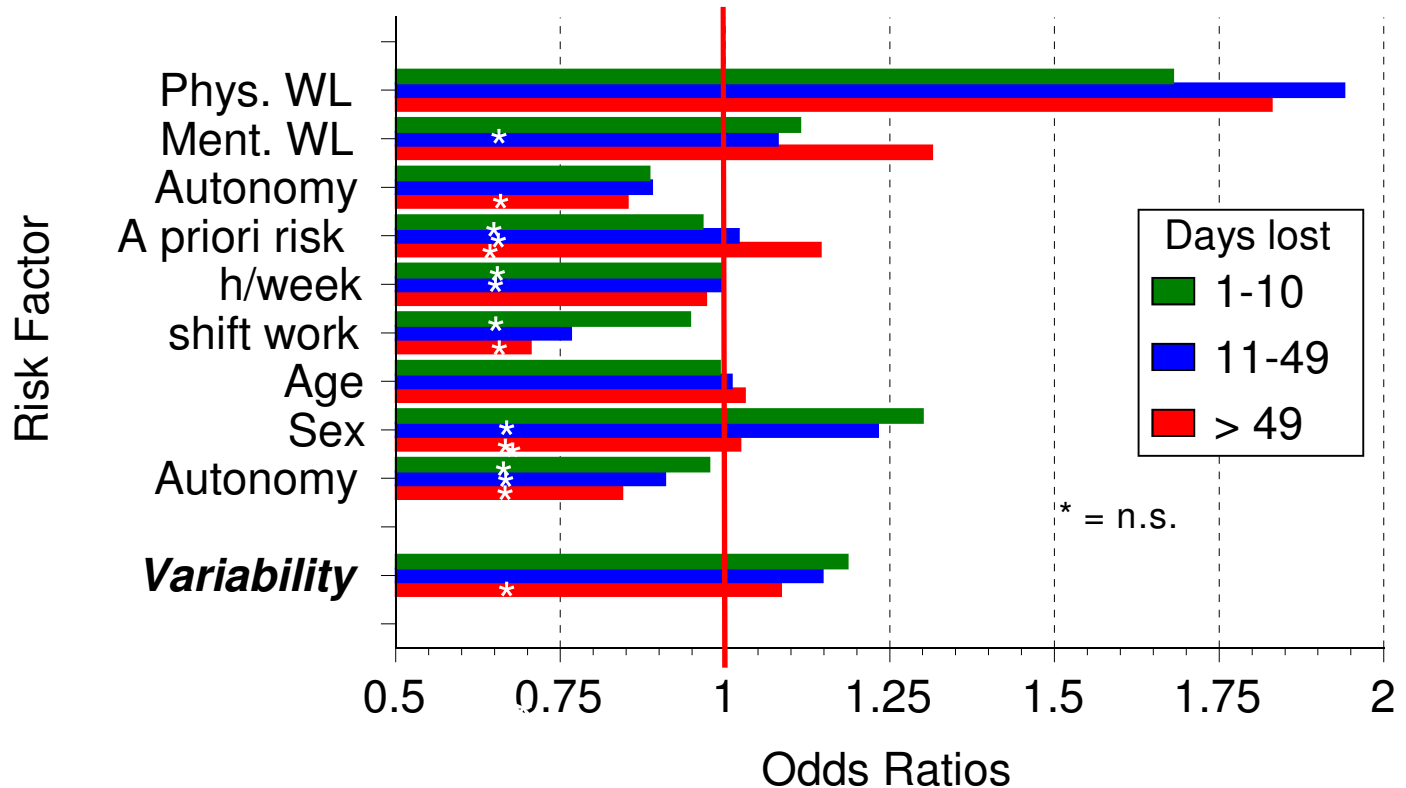


Odds ratios for accident risk

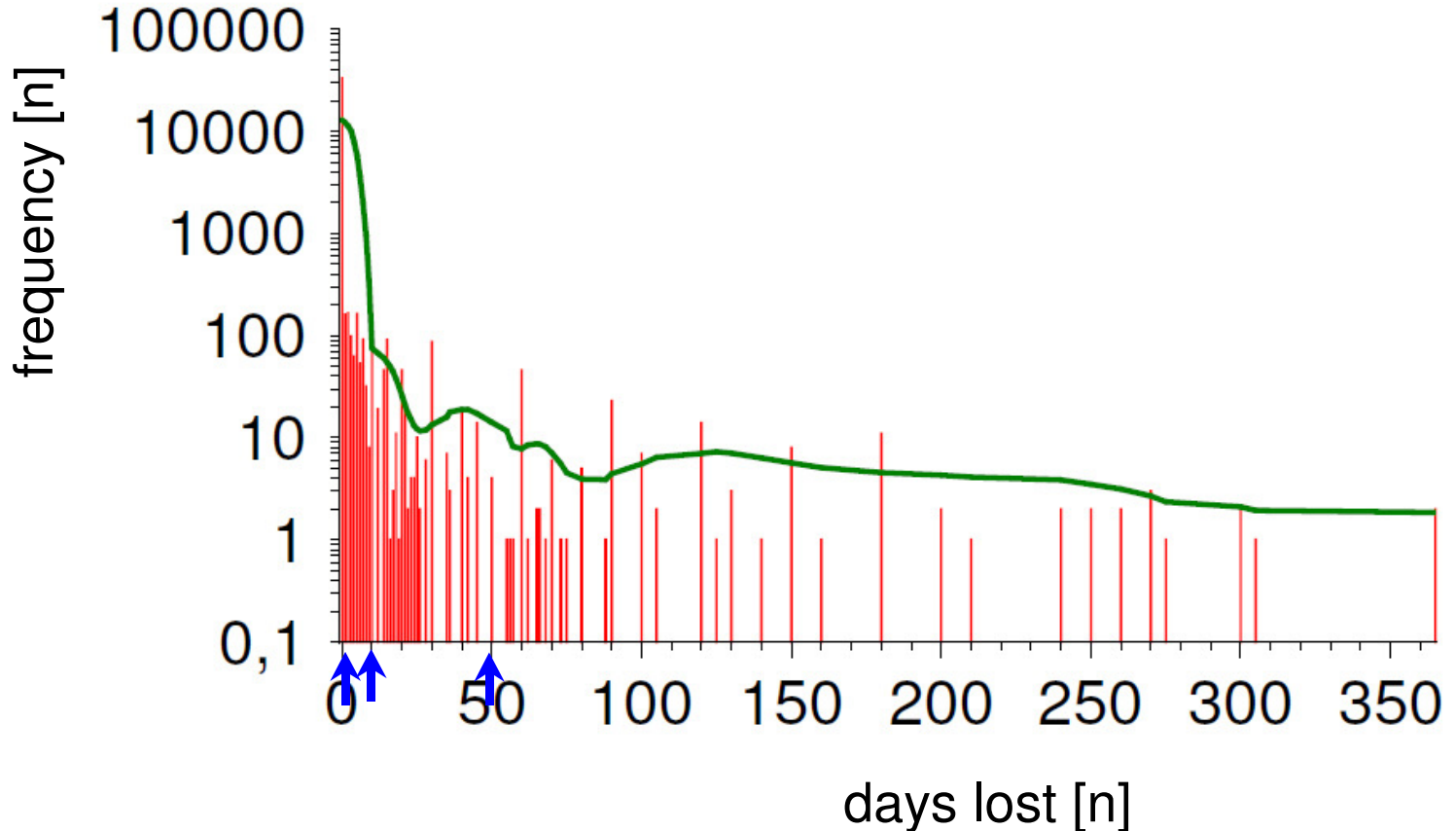
incl. interaction autonomy x variability



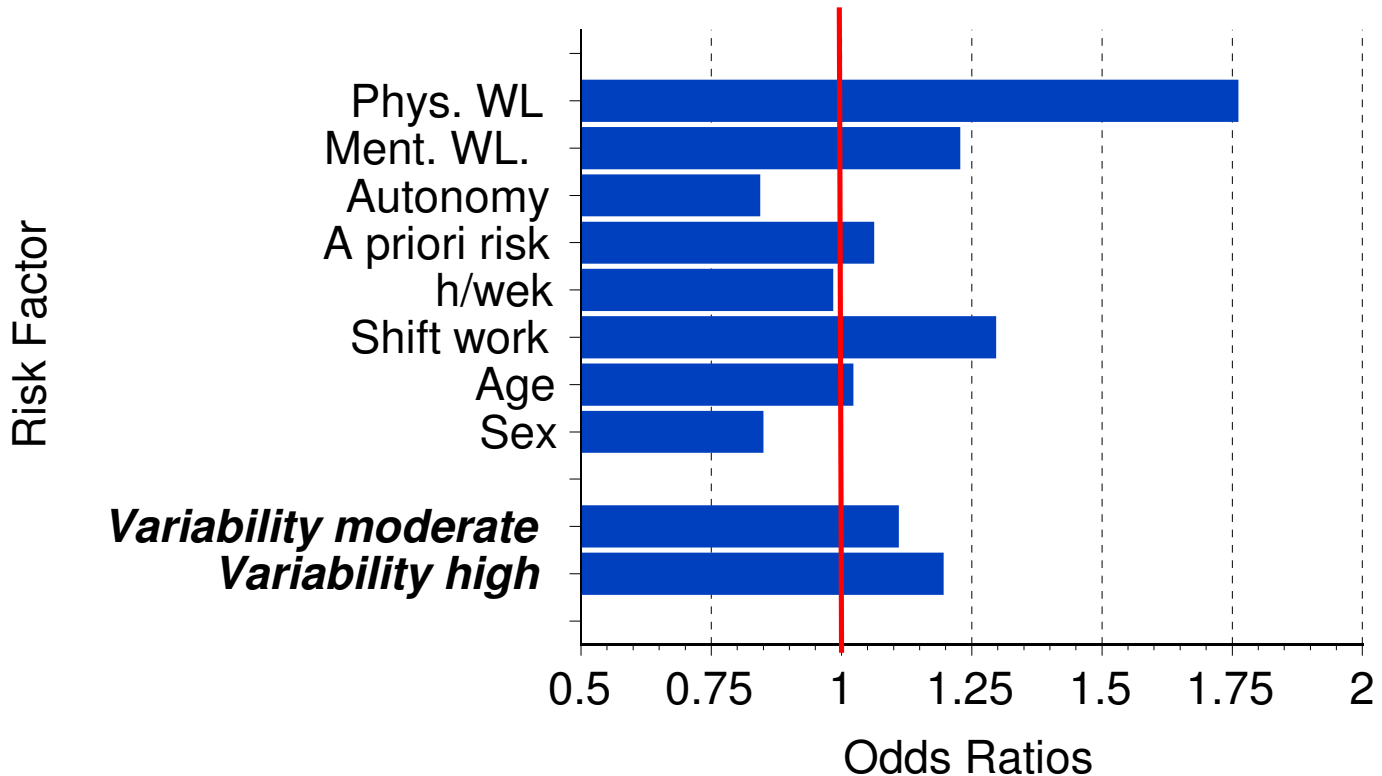
Odds ratios for four categories of days lost



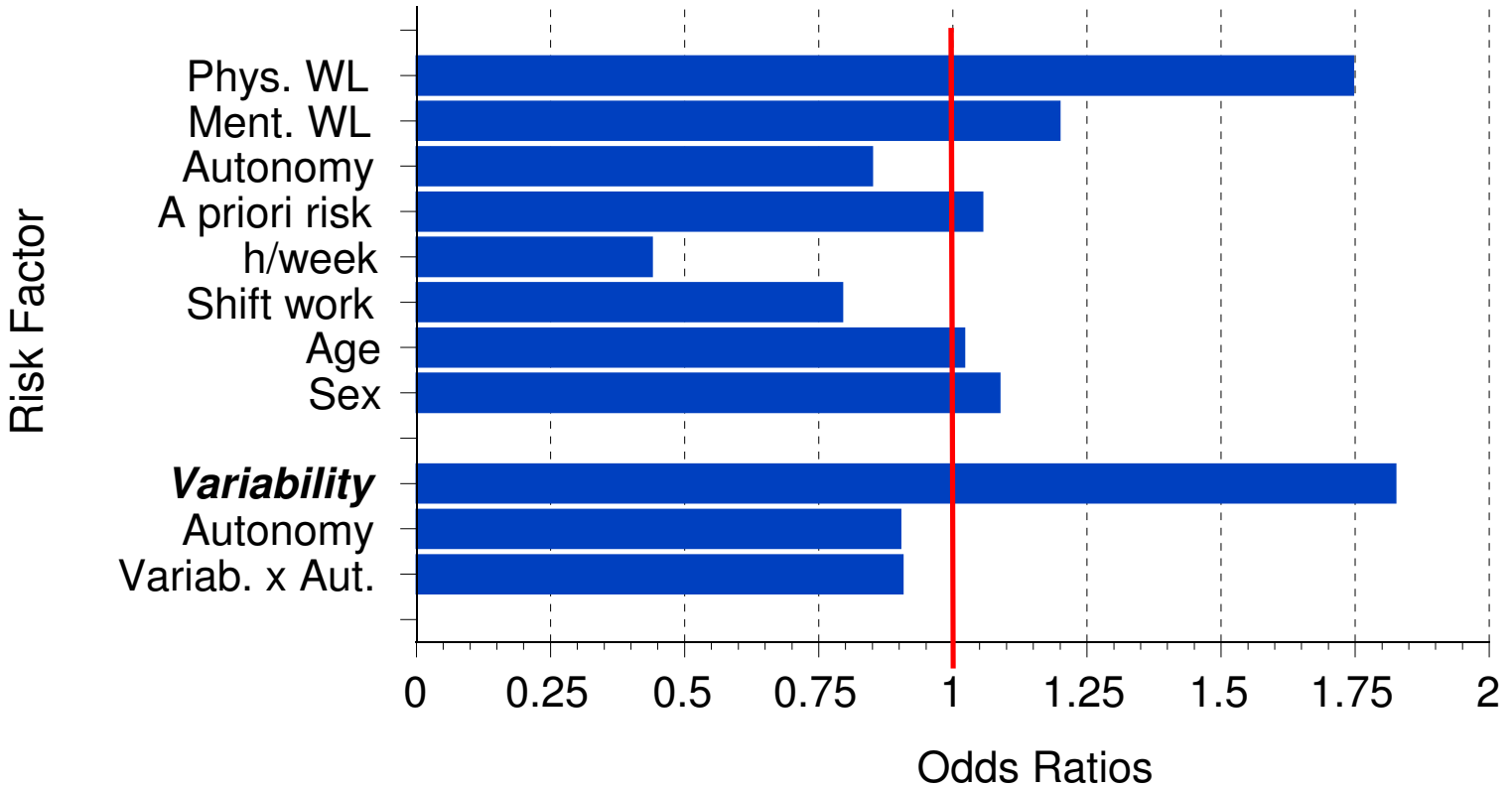
Distribution of accident related lost days (per respondent)



Odds ratios for days lost, 3 levels of variability



Odds ratios for days lost, Poisson regression



Conclusions

✓ **General**

- ✓ The results support the conclusion that there is
 - ✓ in general an increased accident risk associated with variable work hours
 - ✓ a further increased risk if these work hours are not self but company controlled

- ✓ The results further document an increased risk for an increased number of accidents related days lost due to variable / flexible work hours

- ✓ The results point to the fact that the variability of work hours has a differential effect on the accident risk for accidents of different severity, e.g. as shown by different numbers of days lost

Conclusions (2)

- ✓ The results confirm the suitability of the approaches chosen
 - ✓ by an improved estimation of the relevant parameters
 - ✓ by exploitation of the available variance and covariance
 - ✓ by enabling analyses and modeling of interactive effects
- ✓ The approach should be extended with the existing data base
- ✓ A more precise and reliable database would be urgently required

✓ **Theoretical conclusions**

- ✓ the concept of desynchronisation seems to be theoretically sound also for such kinds of work hour related problems
- ✓ methods / procedures for assessing the desynchronisation should be developed / tested in order to achieve results with an improved theoretical foundation

✓ **Practical conclusions**

- ✓ the variability of work hours should be limited to endurable limits
 - ✓ in spite of the demands for more flexibility of work hours
- ✓ possibilities for compensating the increased risk should be explored, if variability cannot be controlled for
- ✓ controlling the increased risks due to variable work hours should
 - **preventative** - be considered when introducing or extending flexible work hours

Thank you for your attention !

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