Flexible work hours and accident risk

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Background

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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

Background

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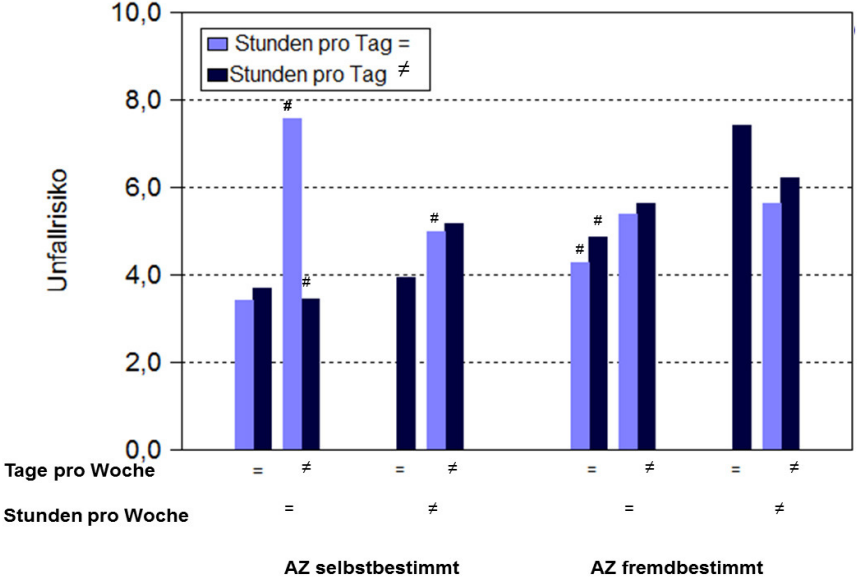
- For shift work the effects of this desynchronisation are well known and documented
  - among others as impairments to safety, health, and social participation

- 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.

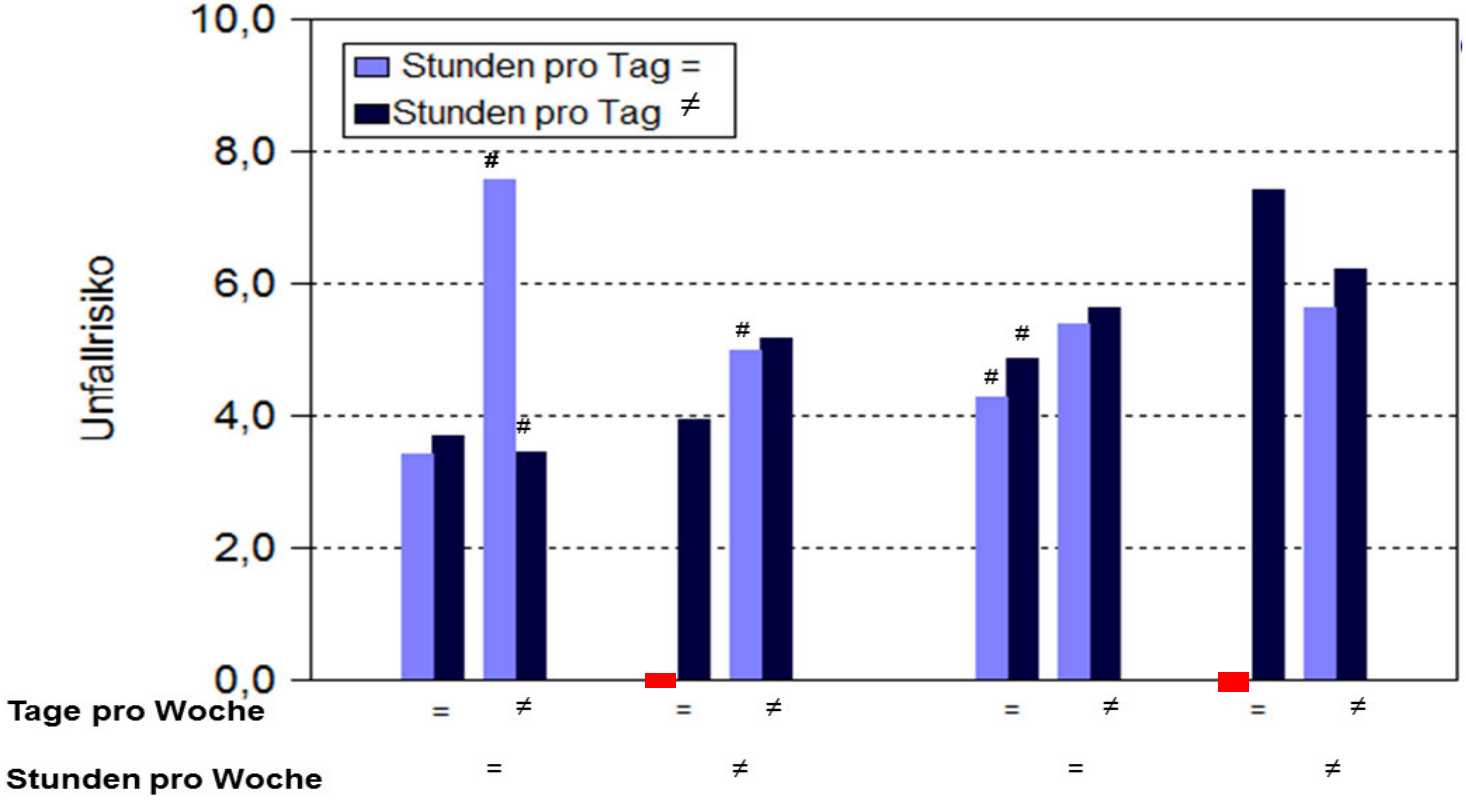
Background

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 subsantially with increasing variability and decreasing autonomy in the regulation of work hours



Aufgrund geringer Zellenbesetzung unzuverlässiger Schätzwert

Background



Aufgrund geringer Zellenbesetzung unzuverlässiger Schätzwert

Problems

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✓ Problems of such analyses

- only insufficient use of the available variance
  - e.g. when constructing indices of variability or flexibiity
- 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 %)

Problems

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- 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

Research questions

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- ✓ 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

Sample

- ✓ 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)

Methods

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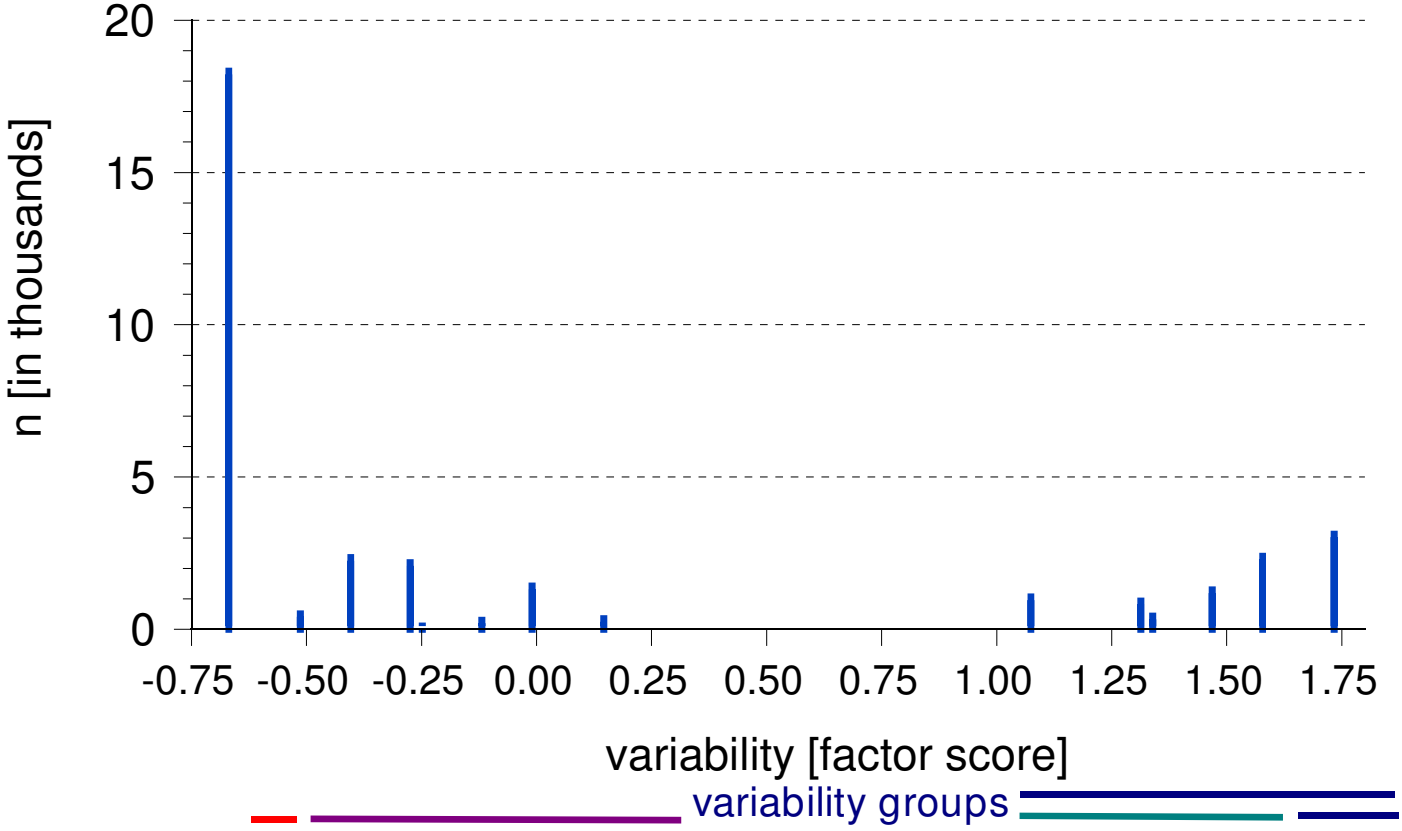
- ✓ Factor-analytical construction of indices for
  - Variability / Flexibility
  - (reported) stress / work load
    - physical
    - mental
    - autonomy

Methods

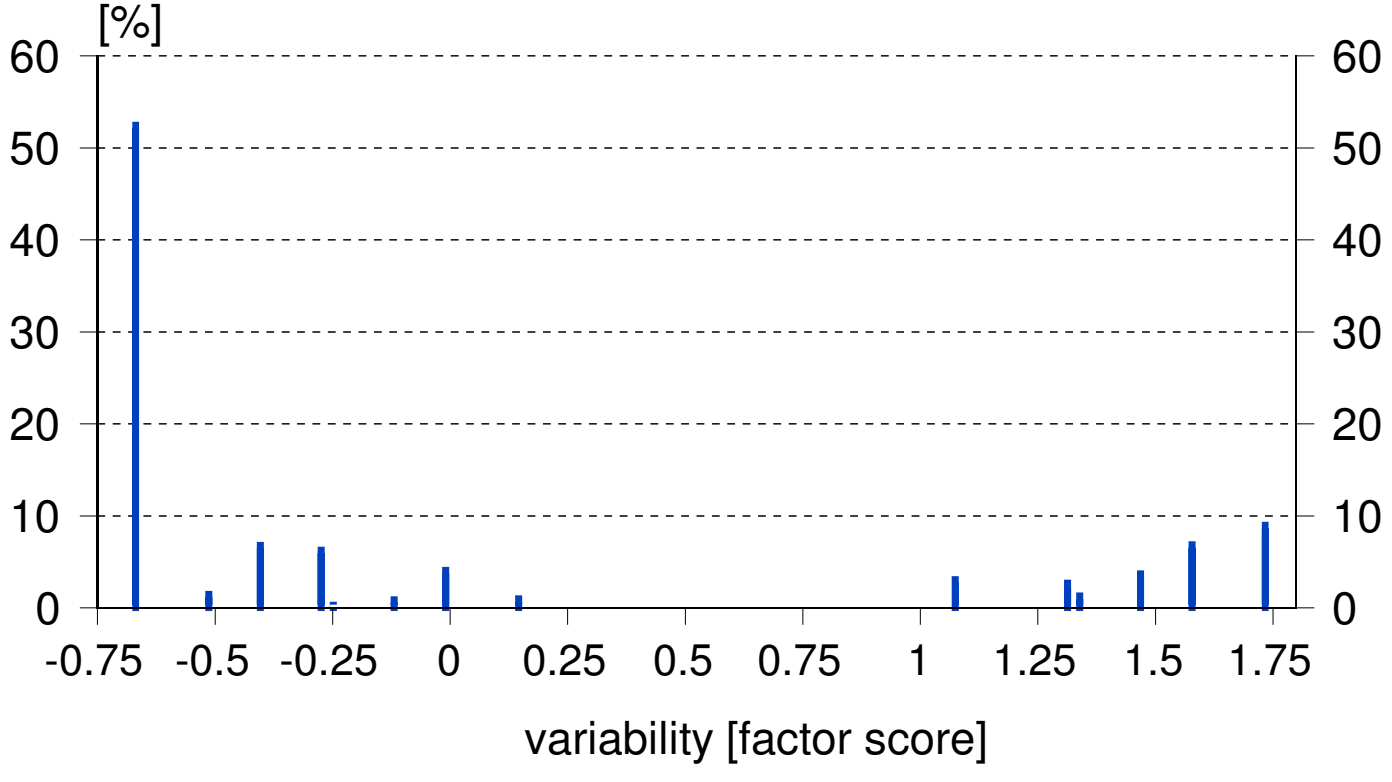
- ✓ Diverse regression analytic procedures
  - ➔ for analyzing effect sizes of the independent variable (variability)
  - ➔ for controlling for potential confounders

- ✓ 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

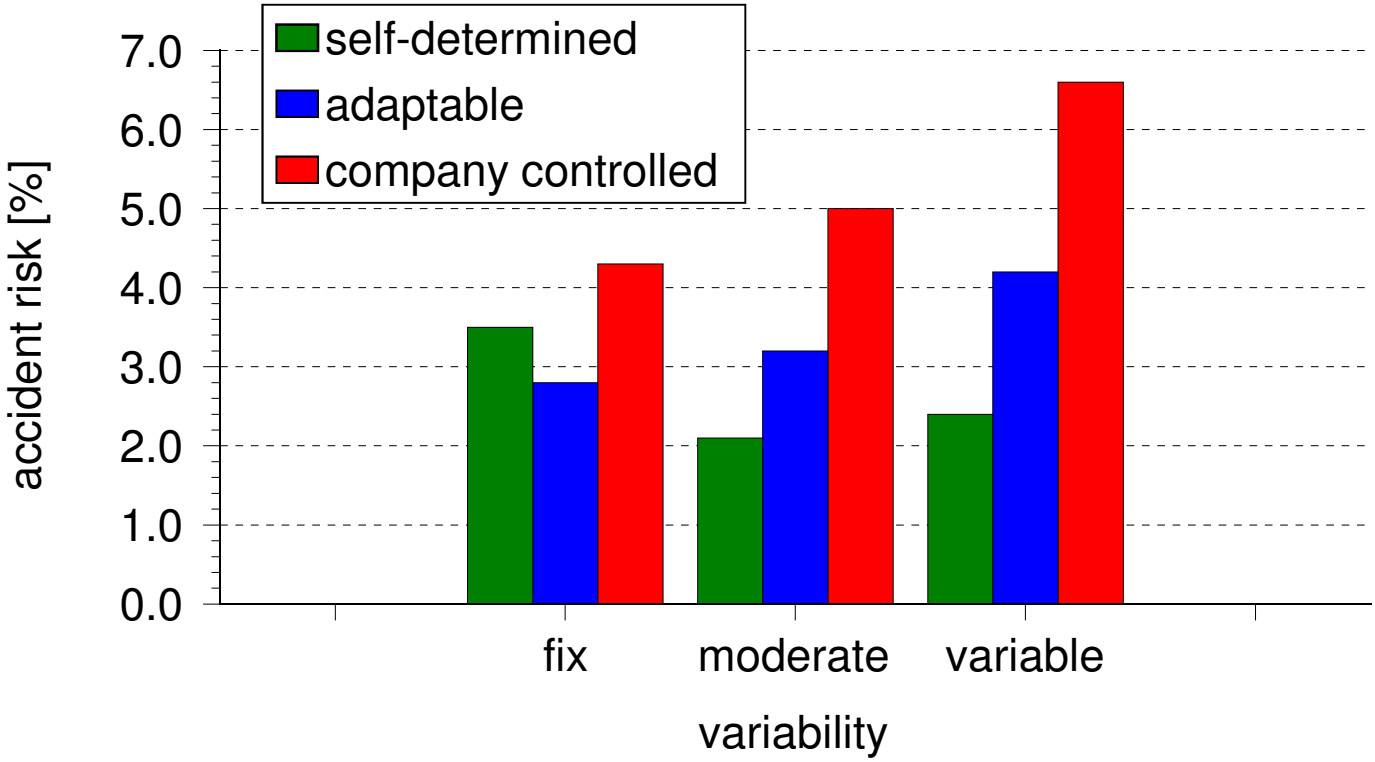
Distribution of flexfactor scores / variability



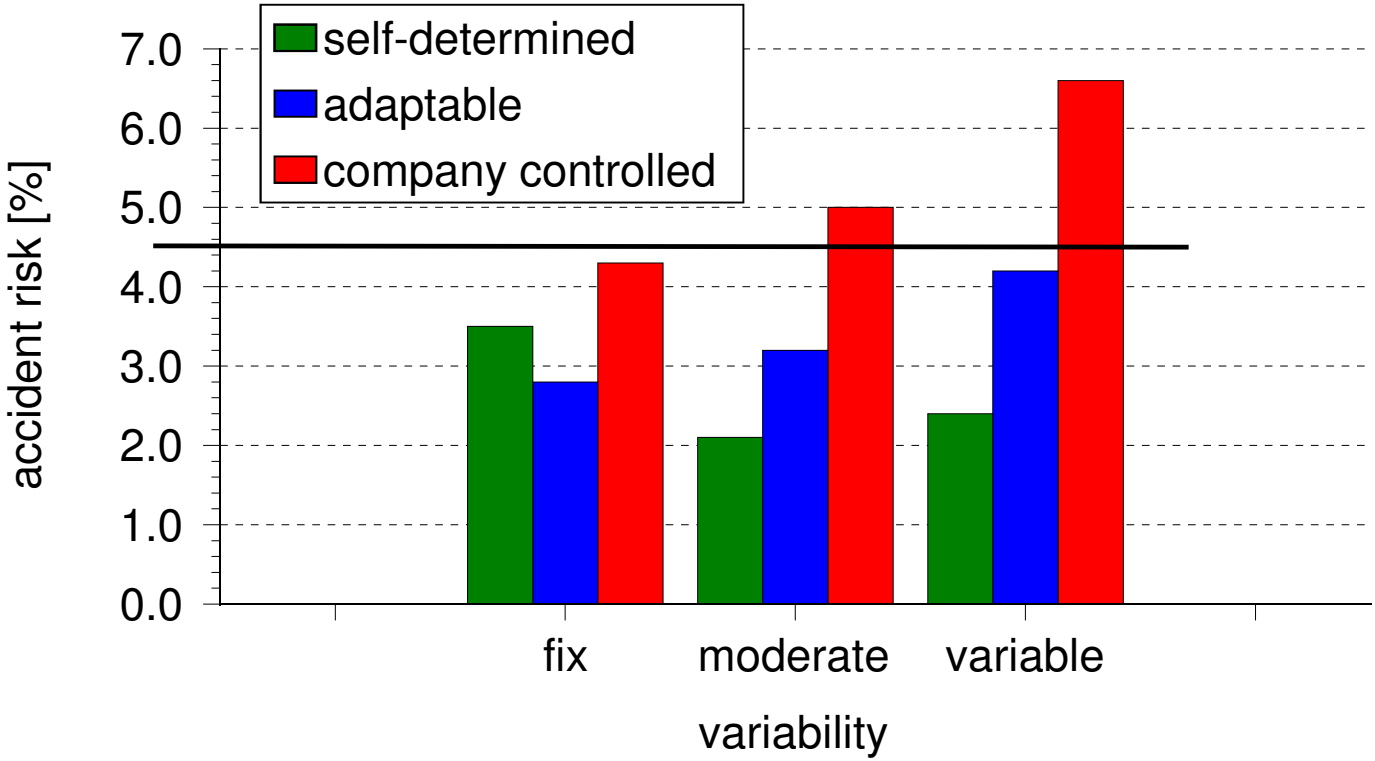
Distribution of flexfactor scores / variability



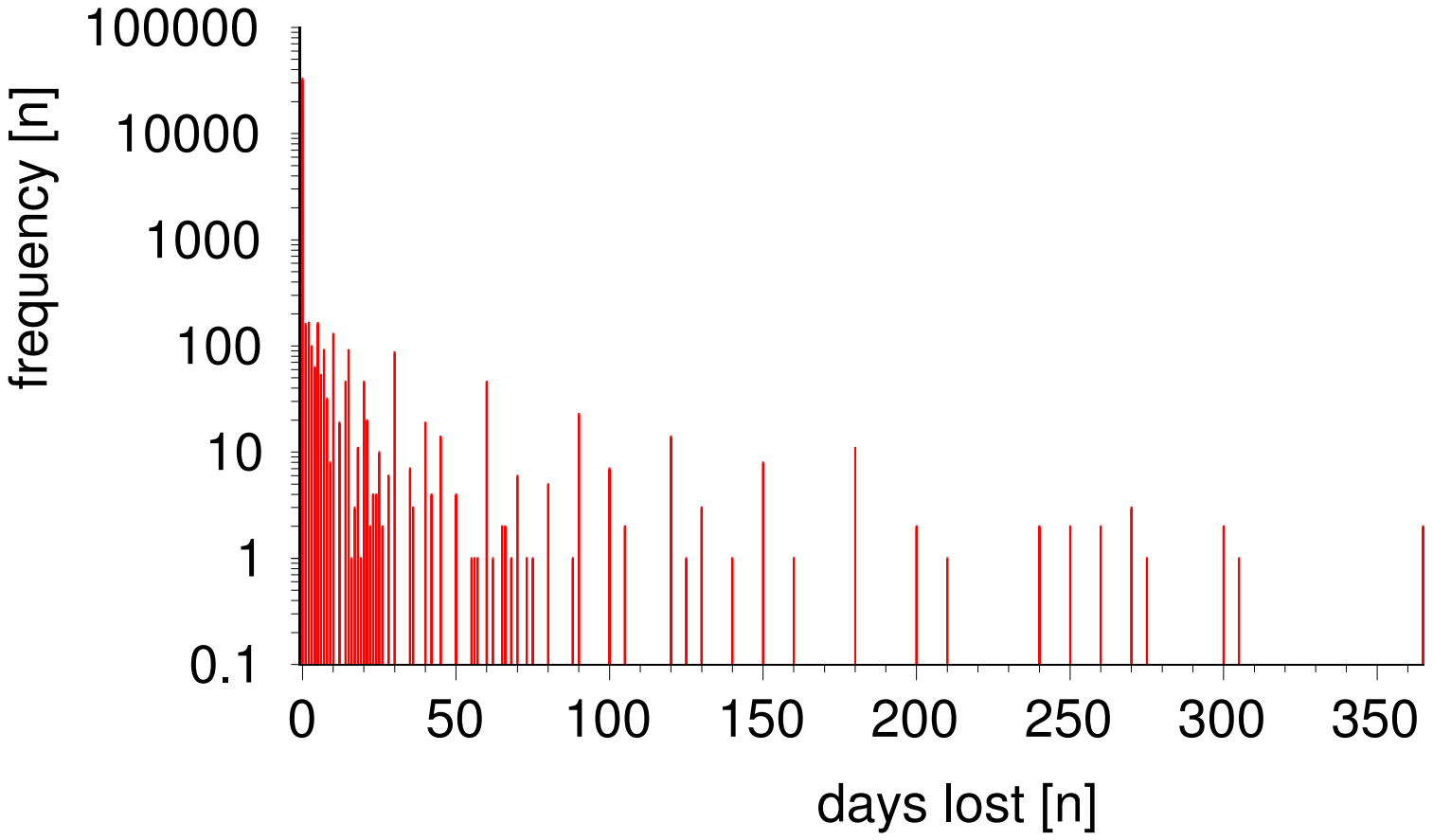
Variability, autonomy, and accident risk



Variability, autonomy, and accident risk



Distribution of accident related lost days (per respondent)



Distribution of days lost x variability

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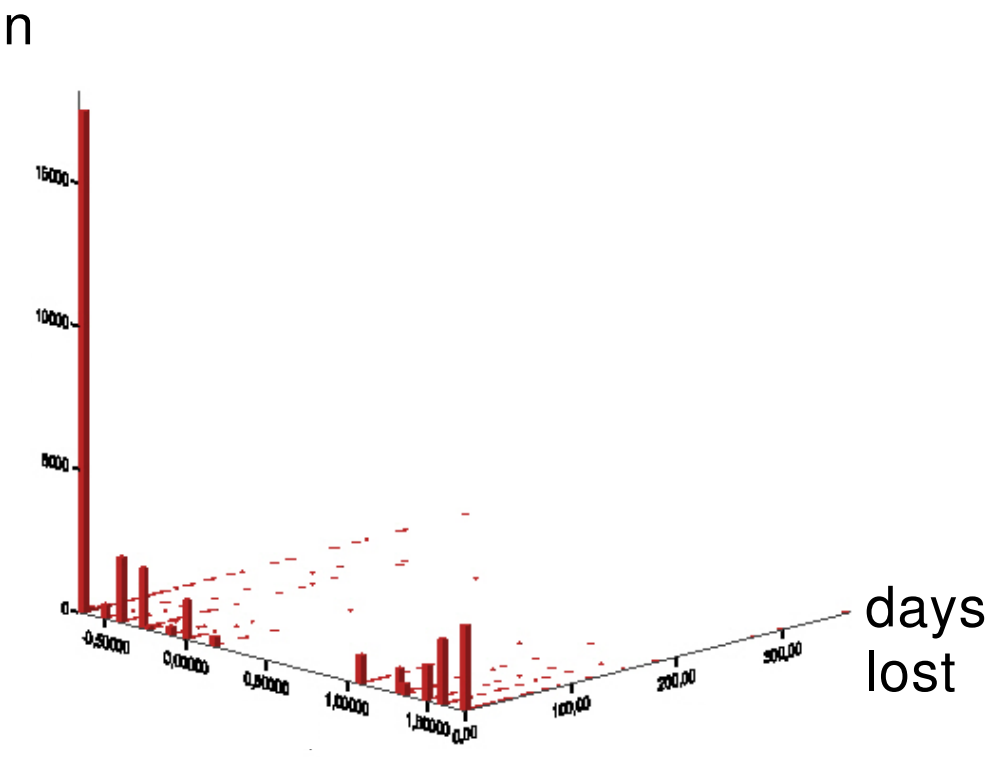
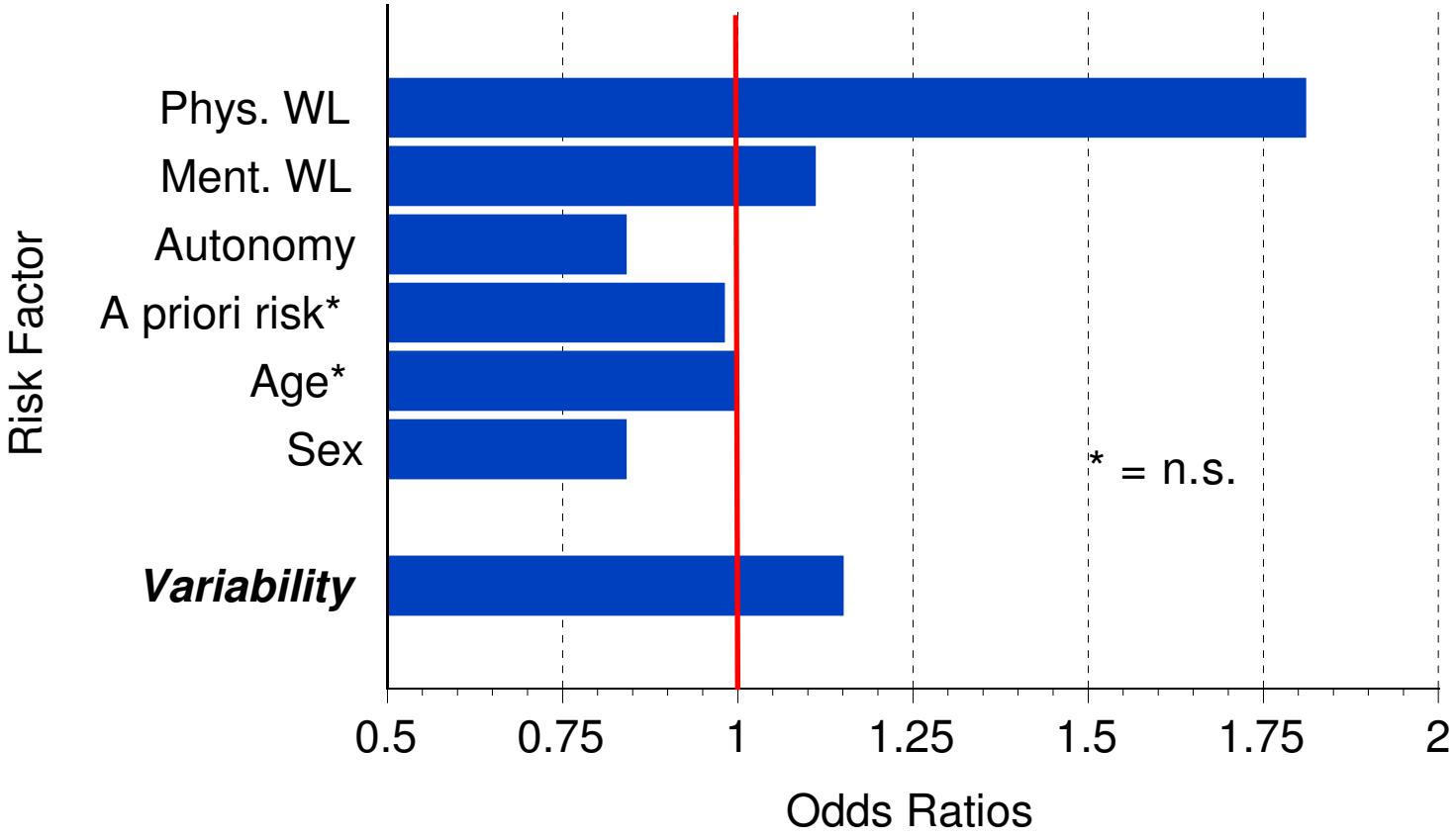
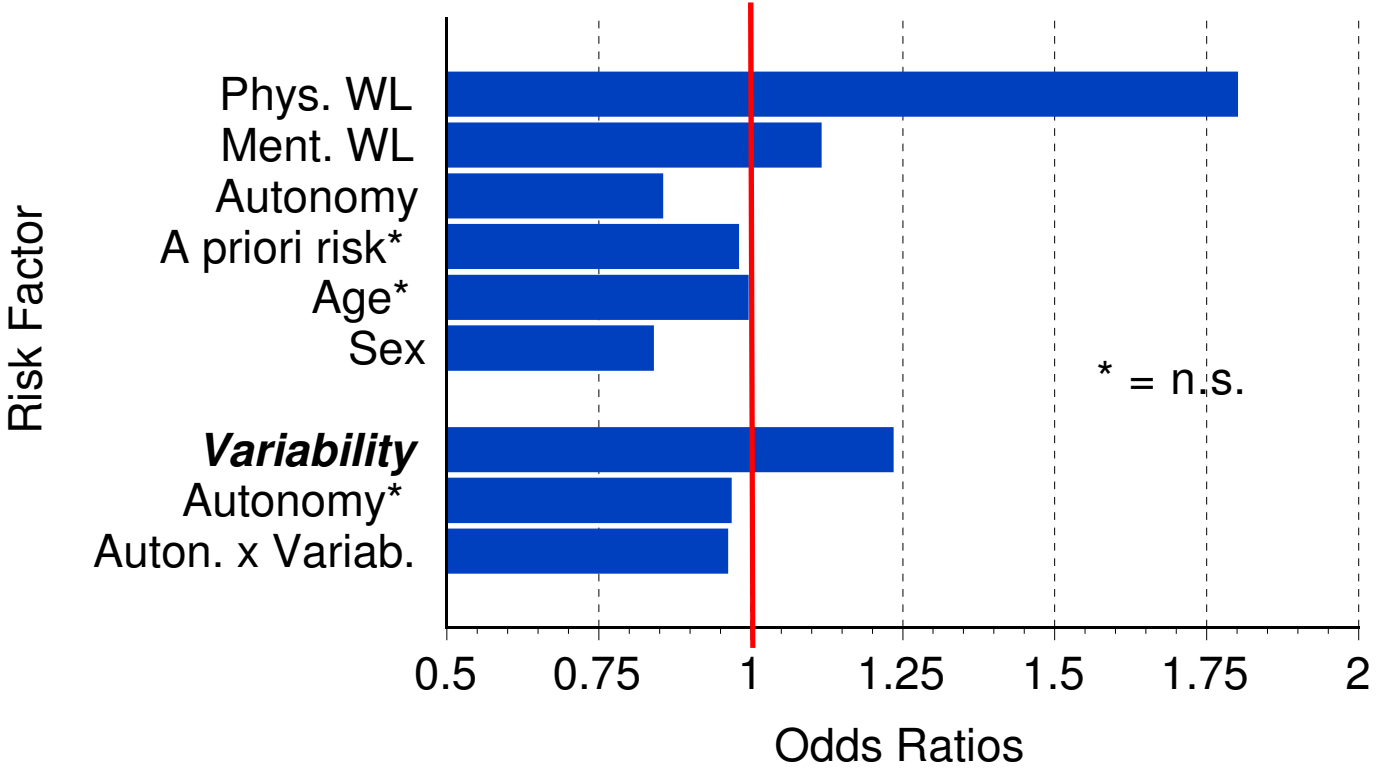


Odds ratios accident risk (yes/no)



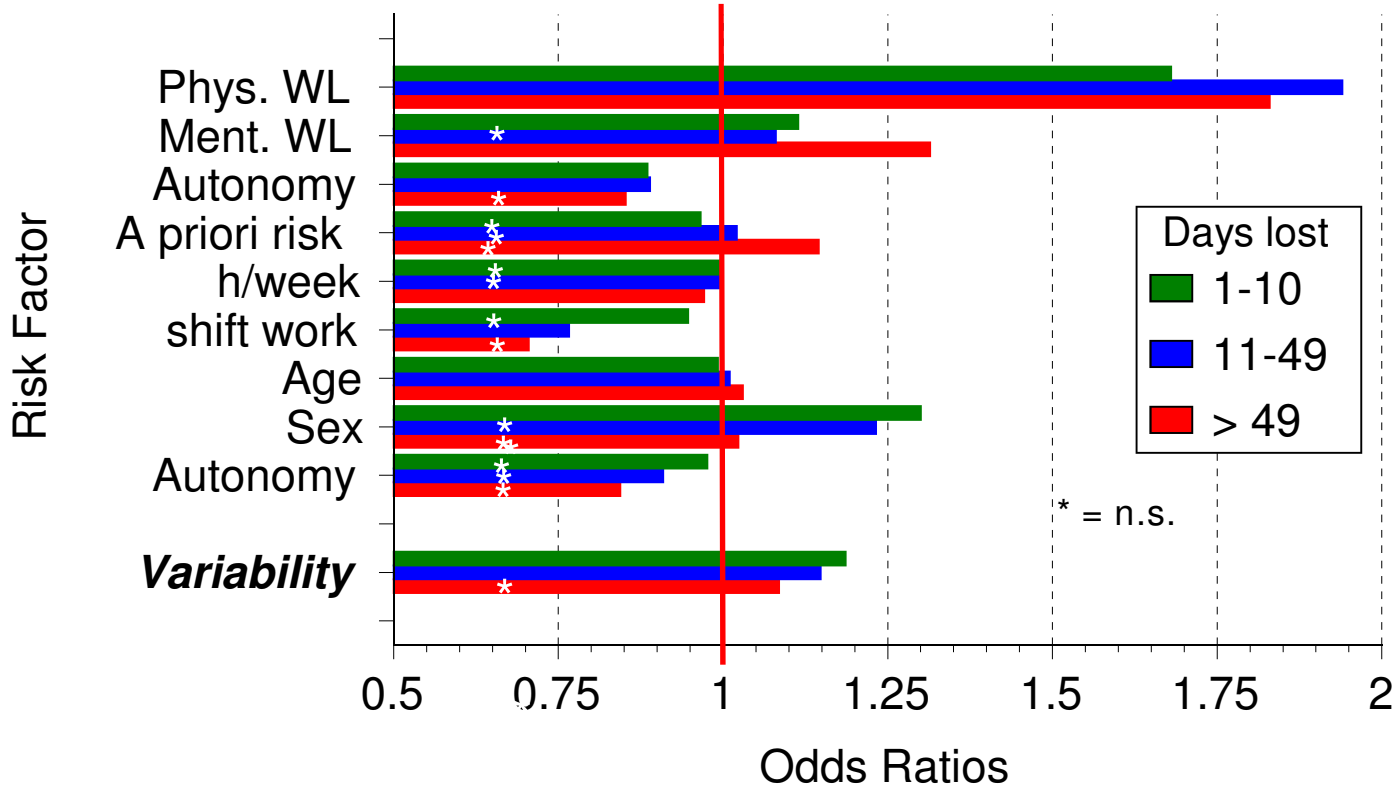
Odds ratios for accident risk

incl. interaction autonomy x variabilty



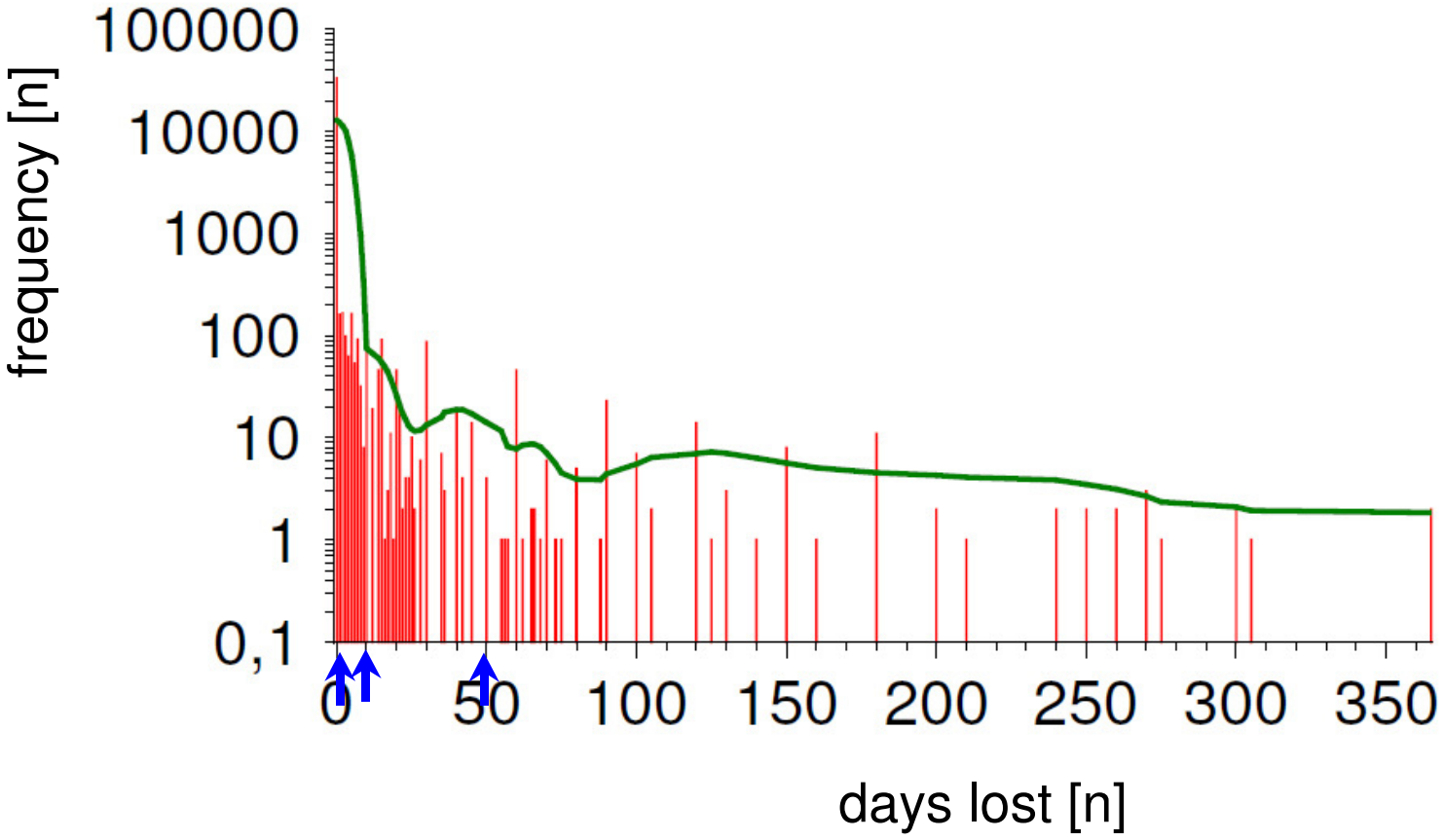
Binr log. regr., AR, with interaction

Odds ratios for four categories of days lost

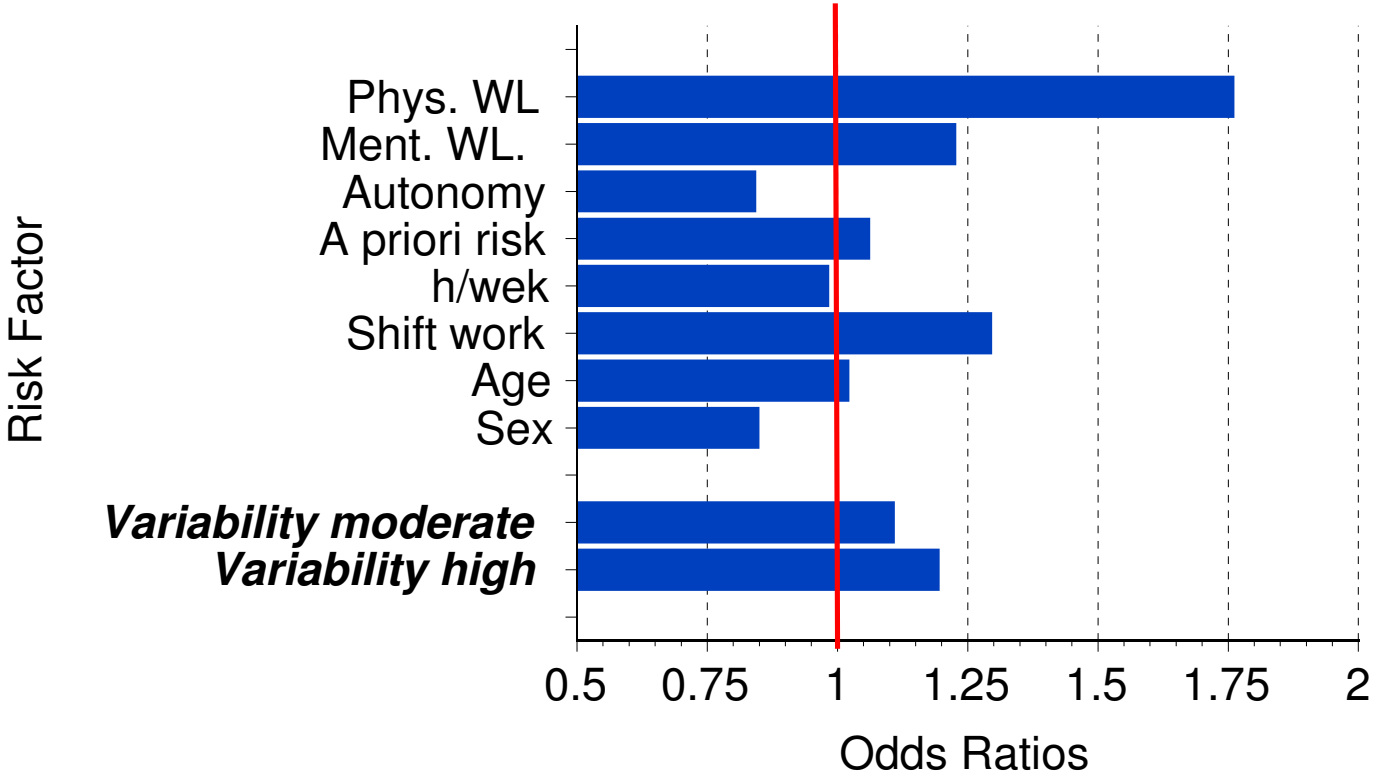


Multinom. log. regr., LD grouped

Distribution of accident related lost days (per respondent)

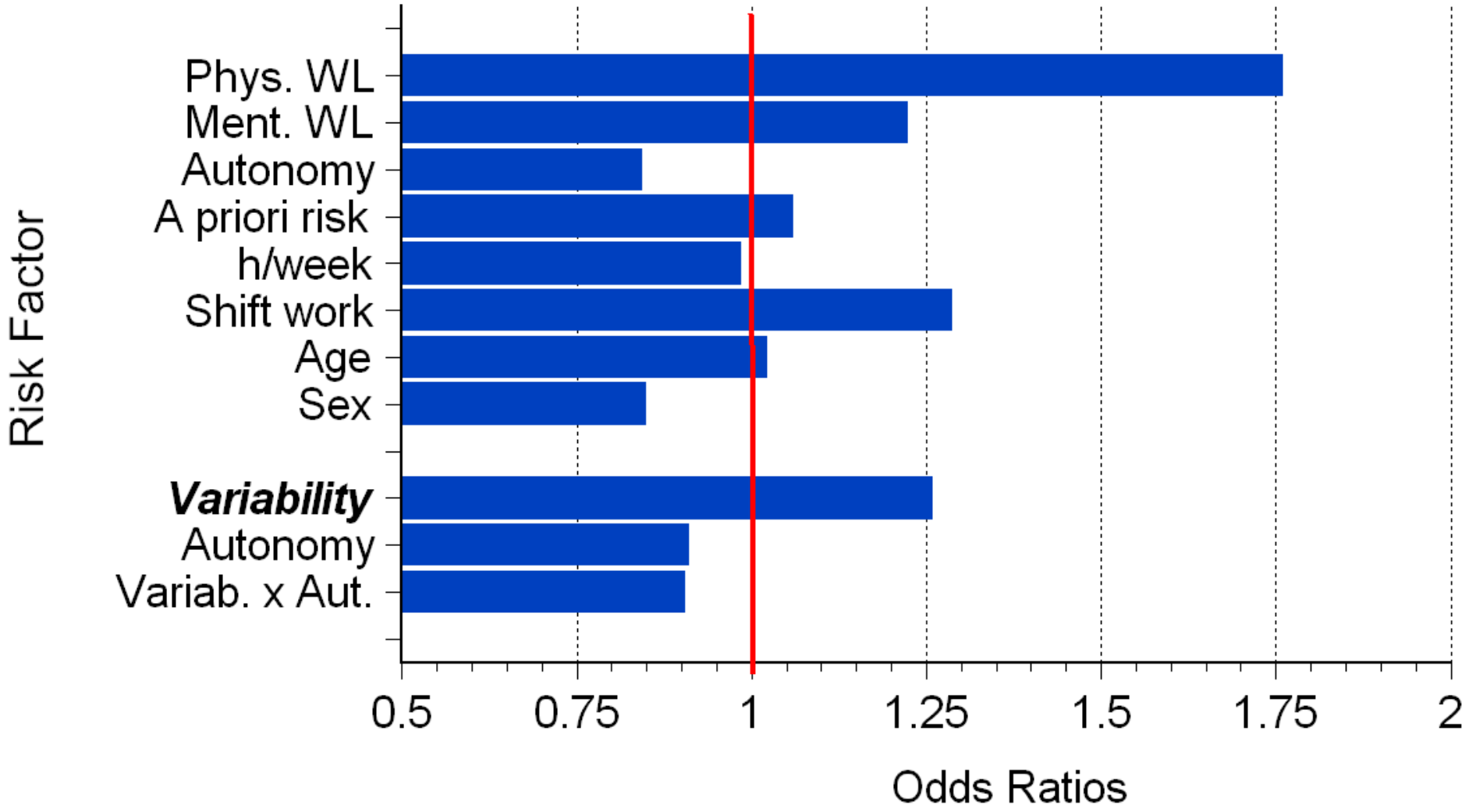


Odds ratios for days lost, 3 levels of variability



Poisson Regression, DL, Variab. grouped

Odds ratios for days lost, Poisson regression



Poiss.regr, DL , with interactions, updated version

Conclusions

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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)

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- 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

Conclusions (3)

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- **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

Conclusions (4)

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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

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Thank you for your attention !

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