BASS 4 – a software to assess the quality of working hours in relation to risks for safety, health and well-being

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Background

European Council Directive 89/391 (so called: framework directive) describes some general principles of prevention which employers have to observe:

1) avoiding risks
2) evaluating any risks which cannot be avoided
3) developing adequate measures to reduce the remaining risk

Background

Risks for safety, health and well-being are generally based on the design of the

- production process
- work equipment
- tasks
- work environment

Background

- **but also on the design of working hours, i.e**.
  - duration of shifts,
    e.g. more than 8 hours
  - rest periods between shifts,
    e.g. less than 11 hours (german law)
  - sequence of shifts,
    e.g. more than 4 consecutive night shifts

Problems of risk assessment

- insufficient transfer of available ergonomics knowledge into occupational health & safety practice
- schedules work and are accepted by workers – so don't touch them !

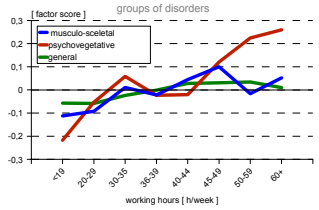
- Ergonomics knowledge must be taken into account
- Verification of legal requirements is rather difficult
- No consideration of new research results
- Great complexity of working hours arrangements

Problems of risk assessment

- e.g. the German law on working hours contains 25 articles with a number of legal requirements but also exemptions, e.g. compensation rules for daily working hours or rest periods

- Ergonomics knowledge must be taken into account
- Verification of legal requirements is rather difficult
- No consideration of new research results
- Great complexity of working hours arrangements

Problems of risk assessment



- Health effects due to extended working hours (Rädiker, Hoofddorp 2005)
- Time on-tasks effects on safety (Nachreiner, Hayama 2001)

- Ergonomics knowledge must be taken into account
- Verification of legal requirements is rather difficult
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Problems of risk assessment

Gruppe	Mo 1	Di 1	Mi 1	Do 1	Fr 1	Sa 1	So 1
Gruppe 1		M	M		M	M	M
Gruppe 2			E	E	E	E	
Gruppe 3		E	E		N	E	
Gruppe 4	N	N	N	N			

- Any risks for safety, health and well-being in this schedule?

- Ergonomics knowledge must be taken into account
- Verification of legal requirements is rather difficult
- No consideration of new research results
- Great complexity of working hours arrangements

Aims of this research project

Development of a **risk index** for the quality of schedules to indicate risks for safety, health and well-being

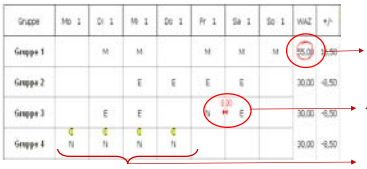
- purpose of index is to provide a general information which can be used for preventive interventions
- intended users are *non-experts* with regard to the design of working hours

Existing approaches

- **R**ota **R**isk **P**rofile **A**nalysis (Jansen, 1985)
- Work schedule risk analysis with regard to performance and accidents / incidents (Folkard & Lombardi, 2004)

Basic idea of risk index

- Based on developments of BASS 4 – a computer progamm for the design and evaluation of working hours (Schomann, Santos 2003)



Violation 1 (weekly WH)

+ Violation 2 (rest period)

+ Violation 3 (night sleep)

$\sum V_{(1\text{-}n)}$ = Risk Index

Basic idea of risk index

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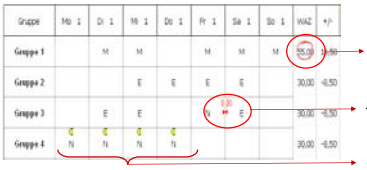


Violation 1 = 0.45

+ Violation 2 = 0.9

+ Violation 3 = 0.3

Risk Index ($\sum V_{(1\text{-}3)}$) = **1.65**

Basic idea of risk index

High value of risk index indicates:

the schedule is not designed on the basis of common ergonomic recommendations

Problems to be solved in developing a risk index

- Which legal and ergonomic criteria are relevant to indicate risks for safety, health and well-being?
- Definition and specification of criteria violation, e.g. 3 or 4 consecutive night shifts?
- Specification of weights for the calculation of one summative risk index based on different criteria, e.g. number of X consecutive working days = rest period of Y hours between shifts?
- Validation of the risk index based on employees health complaints

Methods I

Selection of criteria

Criteria

- Daily working hours
- Weekly working hours
- Number of consecutive working days

→ Duration

- Shift- and night work
- Interference with night-sleep

→ Position

- Rest period between shifts
- Unfavorable shift changes (N - M)

→ Sequence of work and rest

Methods I

Specification of violations

Criteria

- Daily working hours
- Weekly working hours
- **Number of consecutive working days** → Violation if number > 5 days
- Shift- and night work
- Interference with night-sleep
- **Rest period between shifts** → Violation if < 11 hours
- Unfavorable shift changes (N - M)

Methods I

Specification of weights

Criteria

- Daily working hours
- Weekly working hours
- Number of consecutive working days → Weight = 12.5
- Shift- and night work
- Interference with night-sleep
- Rest period between shifts → Weight = 10
- Unfavorable shift changes (N - M)

➢ **Weights preliminary based on expert ratings**

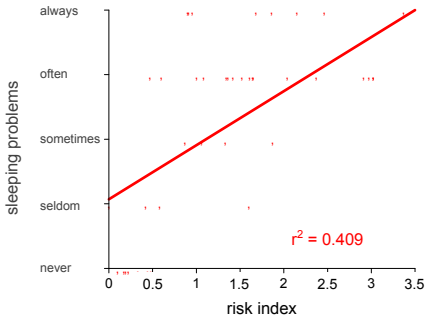
Methods II

Validation of the risk Index:
Correlation of the quality of schedules (= risk index) with employees' health complaints

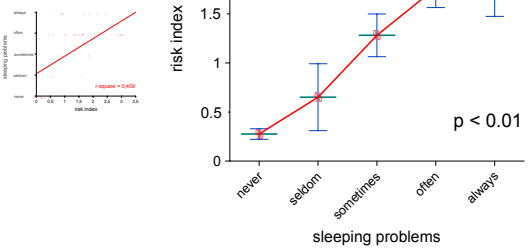
- Data from a questionnaire study on "Health and Psychosocial Effects of flexible Working Hours" (Janßen & Nachreiner, 2004)
- n = 40, individual schedules and frequencies of different health complaints
- Statistical analyses: linear regressions and one-way ANOVAs

Selected results

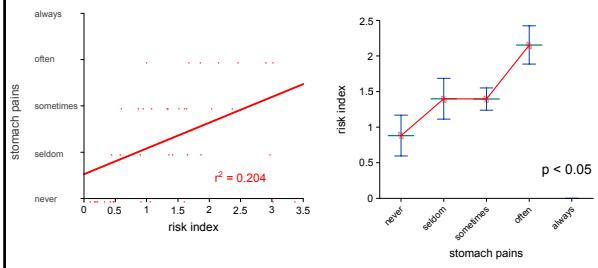
Sleeping problems



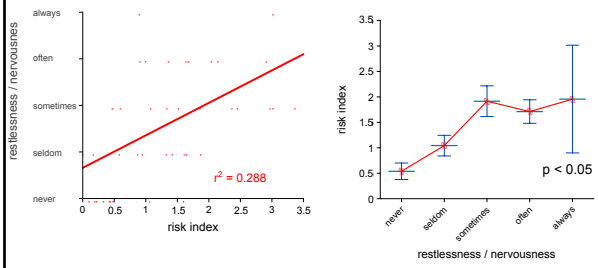
Sleeping problems



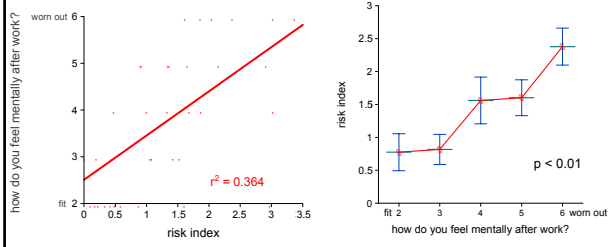
Stomach pains



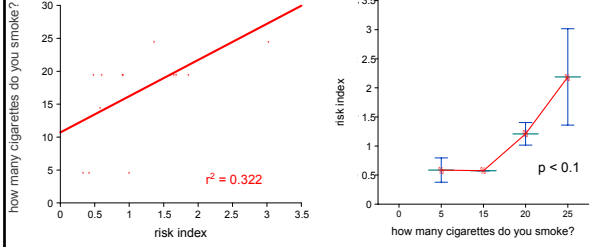
Restlessness / Nervousness



How do you feel mentally after work?



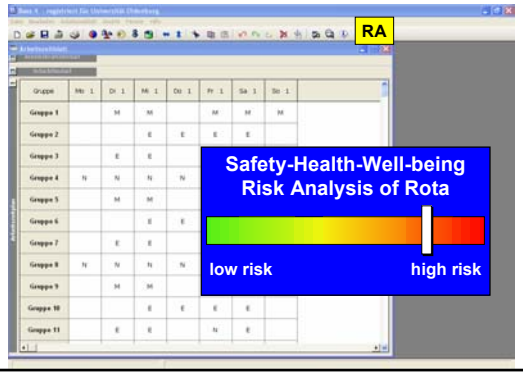
How many cigarettes do you smoke per day?



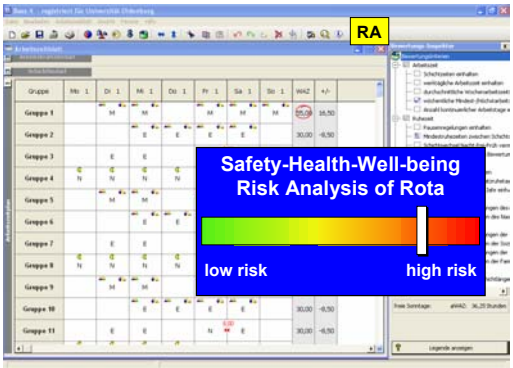
Summary and next steps

- Our first attempt takes the aspects duration, sequence of shifts and rest periods into account and shows clear correlations between the risk index and reported health problems
- The risk index seems to be a promising indicator for predicting risks for health complaints and well-being
- Development of an Index for predicting social impairments
- Refining and testing both indices on a larger sample
- Implementation into BASS 4 as a tool for occupational health & safety practicioners

Implementation into BASS 4



Implementation into BASS 4



Thank you for your attention!

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