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Wirtschafts- und
Organisationspsychologische
Forschung e.V.

Assessing the risk of different kinds of impairment as a function of the design of flexible work schedules

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Background

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- In Germany risk assessment is a statutory requirement
  - including the risk associated with the design of work schedules
- General statements, e.g. night work is dangerous for your health, are not helpful
- The question, however, is, how the risk (associated with a specific work schedule) can or should be assessed
- This question has been addressed in a research project on the design and evaluation of ergonomic shift systems

Background

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- Impairments to health and wellbeing have been reported to be associated with the design of work schedules, e.g. by the following characteristics
  - duration
  - time of day
  - work at weekends
  - dynamics of work and rest
  - …
- These characteristics have differential impacts on different impairments, e.g.
  - night work on sleep problems
  - extended working hours on social participation
  - …

Research question

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Can such impairments reliably and validly be predicted by a combination of these characteristics and their interactions?

- e.g. sleep problems by a combination of work at night with work at weekends?
  - combined with speed and direction of rotation?
  - and in combination with an early start of morning shifts
  - and …
- with acceptable hit and false alarm rates

Methods (database)

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- survey on the effects of flexible working hours (Janßen & Nachreiner, 2004) (n = 577)
- Description of work schedules
- Reported impairments
  - sleep problems
  - gastrointestinal complaints
  - decreased participation in social life
  - ...

Methods

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- correlation analyses
  - impairments / characteristics of work schedule
- logistic regression analyses
  - dependent var.: impairments (yes/no)
  - independent var.: characteristics of work schedule
- ROC-analyses
  - sleep problems
  - reduced participation in social life
  - …

Selected results (correlations)

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Work schedule characteristics	Sleep problems	Reduced participation social life
Working hours per week (h)	0.098(*)	0.152(**)
Leisure time per week (h)	-0.106(*)	-0.150(**)
Working at times for family activities (h)	0.223(**)	0.286(**)
Working at times for social activities (h)	0.315(**)	0.326(**)
Rest period < 11 h	0.160(**)	0.113(**)
Rest period > 35	-0.132(**)	-0.025
Evening shifts > 3 in a row	0.171(**)	0.241(**)
Nightshifts > 3 in a row	0.126(**)	0.146(**)
Early start (before 07 – am)	0.168(**)	0.075
Backward shift rotation	0.209(**)	0.177(**)
Long shift rotation	0.193(**)	0.131(**)
Working hours in the morning (%)	-0.270(**)	-0.304(**)
Working hours in the evening (%)	0.133(**)	0.164(**)
Working hours at night (%)	0.271(**)	0.286(**)
Working at weekends (yes / no)	0.294(**)	0.329(**)

(**) $p < 0.01$
(*) $p < 0.05$

Selected results (correlations)

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Work schedule characteristics	Working hours per week (h)	Working at times for social activities (h)	Working hours at night (%)	Working at weekend (yes/no)
Working hours per week (h)	1	,292(**)	.097(*)	,071
Leisure time per week (h)	-,991(**)	-,299(**)	-.081	-,069
Working at times for family activities (h)	,391(**)	,863(**)	.110(**)	,483(**)
Working at times for social activities (h)	,292(**)	1	.365(**)	,538(**)
Rest period < 11 h	,216(**)	,450(**)	.099(*)	,315(**)
Rest period > 35	-,423(**)	-,099(*)	-.235(**)	-,009
Evening shifts > 3 in a row	,184(**)	,633(**)	.174(**)	,299(**)
Nightshifts > 3 in a row	,054	,145(**)	.586(**)	,175(**)
Early start (before 07 – am)	,191(**)	,121(**)	.139(**)	,031
Backward shift rotation	,118(**)	,489(**)	.111(**)	,436(**)
Long shift rotation	,089(*)	,373(**)	.224(**)	,194(**)
Working hours in the morning (%)	-,252(**)	-,753(**)	-.544(**)	-,476(**)
Working hours in the evening (%)	,232(**)	,643(**)	-.048	,316(**)
Working hours at night (%)	,097(*)	,365(**)	1	,361(**)
Working at weekends (yes / no)	,071	,538(**)	.361(**)	1

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Selected results (log. regression)

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sleep problems	B	p <	Exp(B)
working hours at night (% of total wh)	2.932	0.01	9.099
working at weekends (y/n)	0.879	0.01	2.204
backward shift rotation (y/n)	0.611	0.01	1.843
early start (before 07 – am)	0.277	0.01	1.319
R^2 = .194			

reduced participation at social life	B	p <	Exp(B)
working hours at night (% of total wh)	3.649	0.01	38.434
working at weekends (y/n)	0.858	0.01	2.358
working at time for social activities (h)	0.080	0.05	1.083
working hours per week (h)	0.021	0.05	1.021
R^2 = .215			

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Selected results (shift systems)

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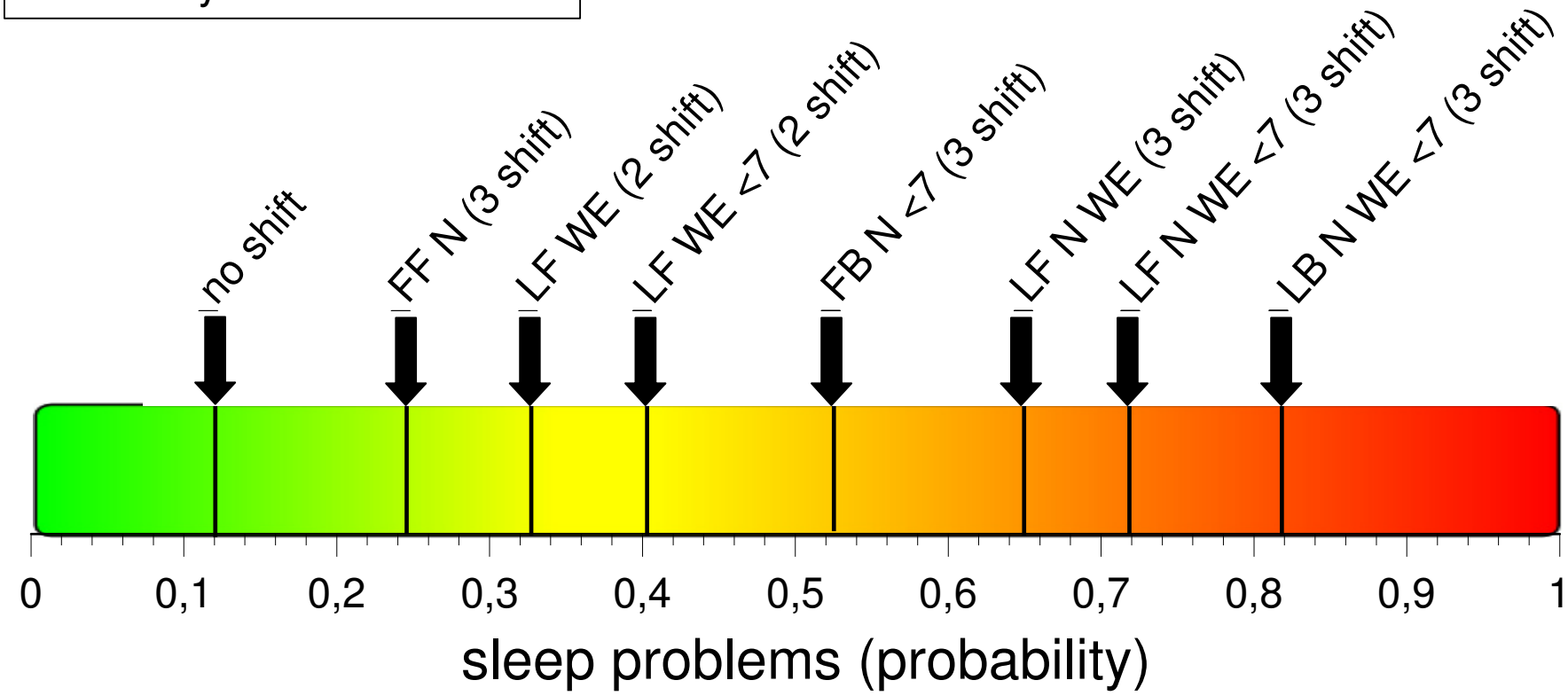
FF = fast forward rotation
LF = long forward rotation
FB = fast backward rotation
N = night work
WE = week end
<7 = early start < 07 am



ROC- curves for sleep problems

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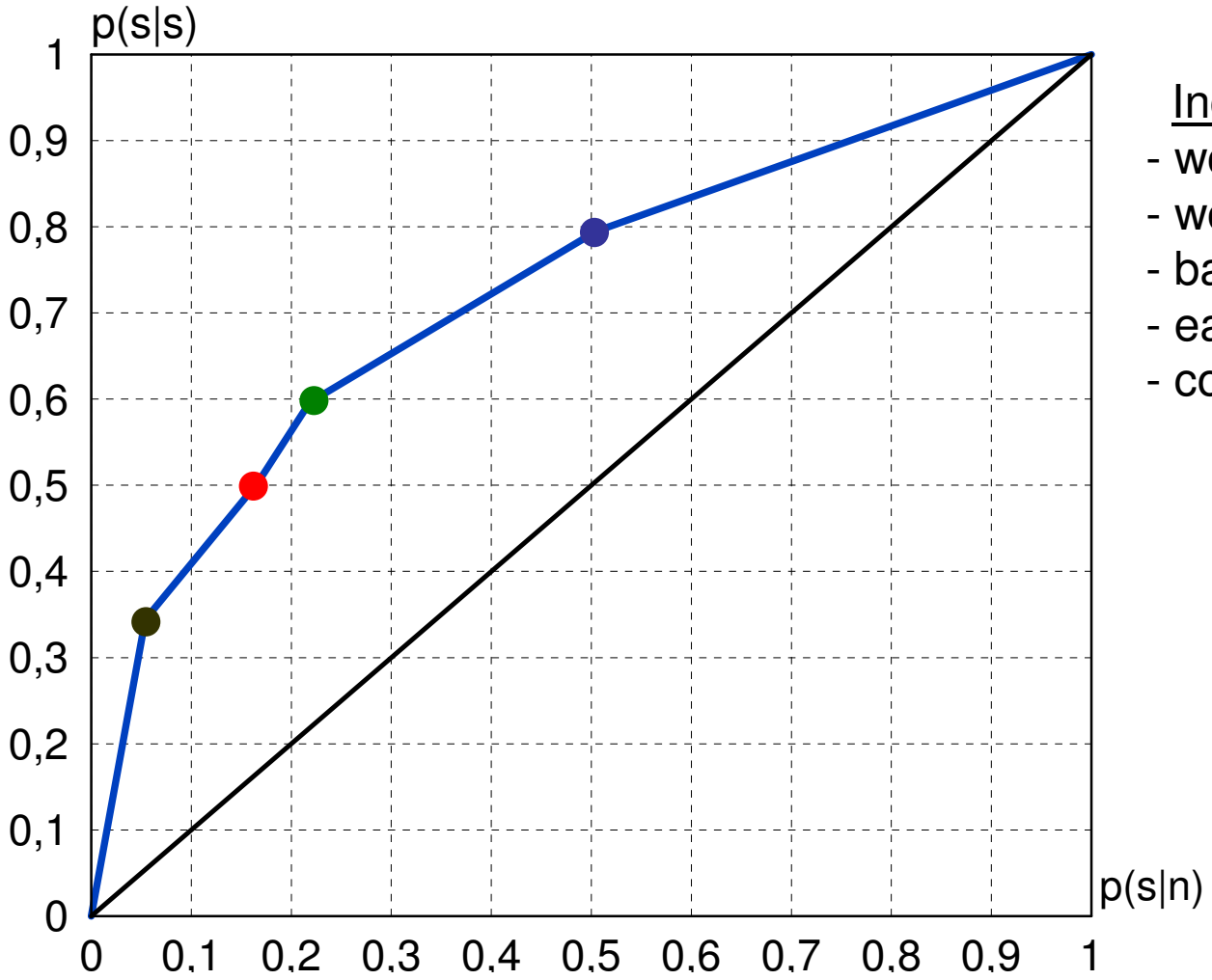
sleep problems (always / often)



Included Variables

- working hours at night (%)
- working at weekend (y/n)
- backward shift rotation (y/n)
- early start (before 07 – am)
- constant term

Legend (cut off)

- 0.5
- 0.35
- 0.335
- 0.15

Conclusions (1)

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Different impairments can be predicted by different characteristics and their combination

- more or less precisely

e.g.

- Impairments due to working at night will be increased by
  - working at weekends
  - starting too early
  - backward shift rotation

Conclusions (2)

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- thus more complex models allow for a better prediction
- in order to assist people from the shop floor as well as from the administration and the labour inspectorates in assessing the risk associated with different work schedules

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Thank you for your attention!

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