

The interference of flexible working times with the usability of free time – a predictor of social impairment ?

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➤ **Background:**

- biological & social rhythms are rather fixed
- Working times (WT) can be
 - regular / irregular,
 - in / out of phasewith biological rhythms (e.g. shift work)
- very irregular WTs are connected to increased impairments of health & social well-being (Costa et al., 2003)

➤ **Research Questions:**

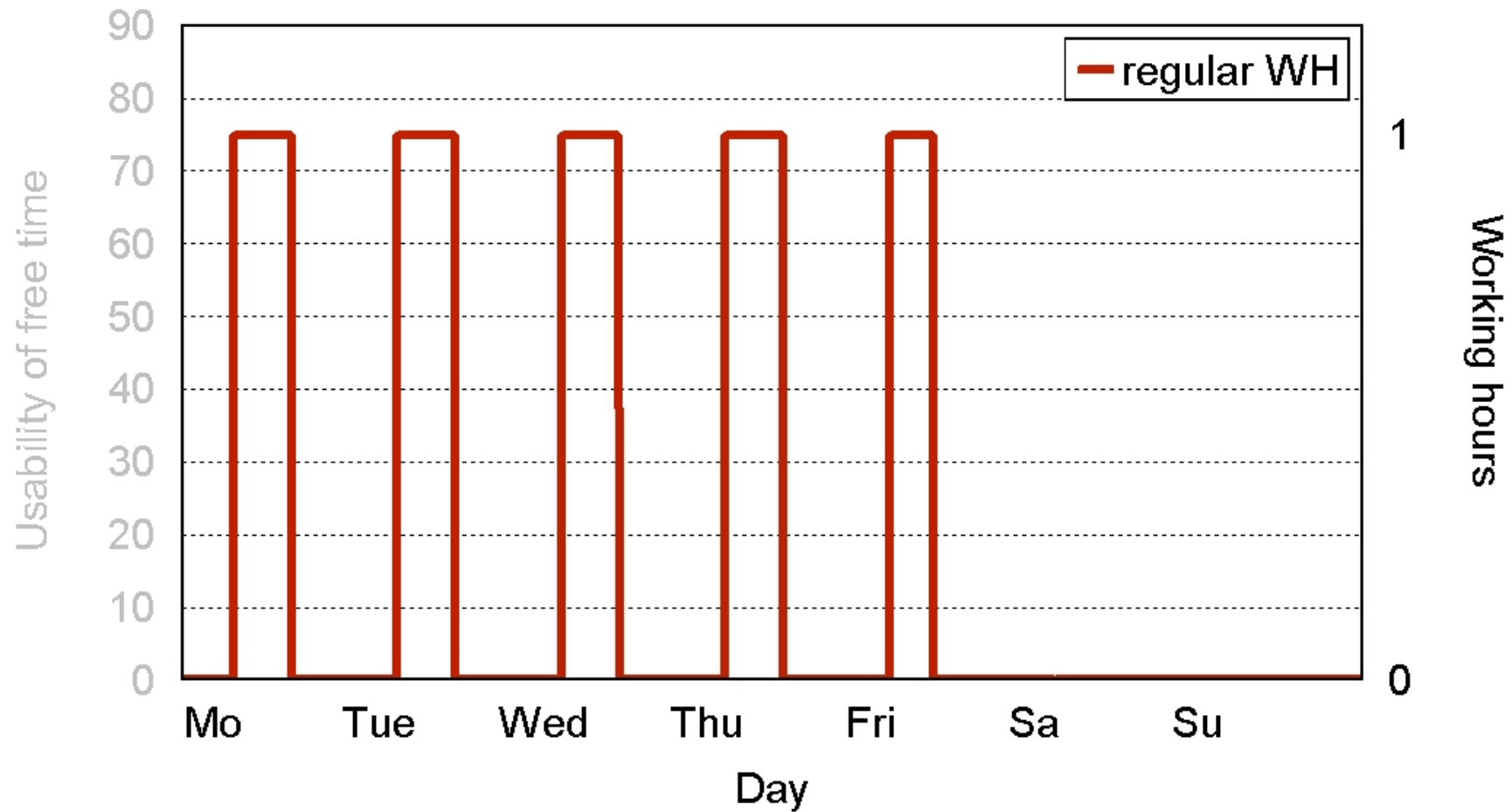
- Is it possible to measure rhythms inherent in flexible WTs and their interference with social / biological rhythms?
- Are interferences of WTs with social / biological rhythms associated with health and social impairments?
 - Can the amount of impairment be predicted from indicators of the interference?

➤ **Secondary analyses, using data from 2 surveys**

- survey 1 on **flexible working times**
 - reported working hours over 4 weeks,
 - (= first time series; working time = 1, time off-work = 0
→ rectangular signal)
 - questions on social and health impairments
 - dependent variables

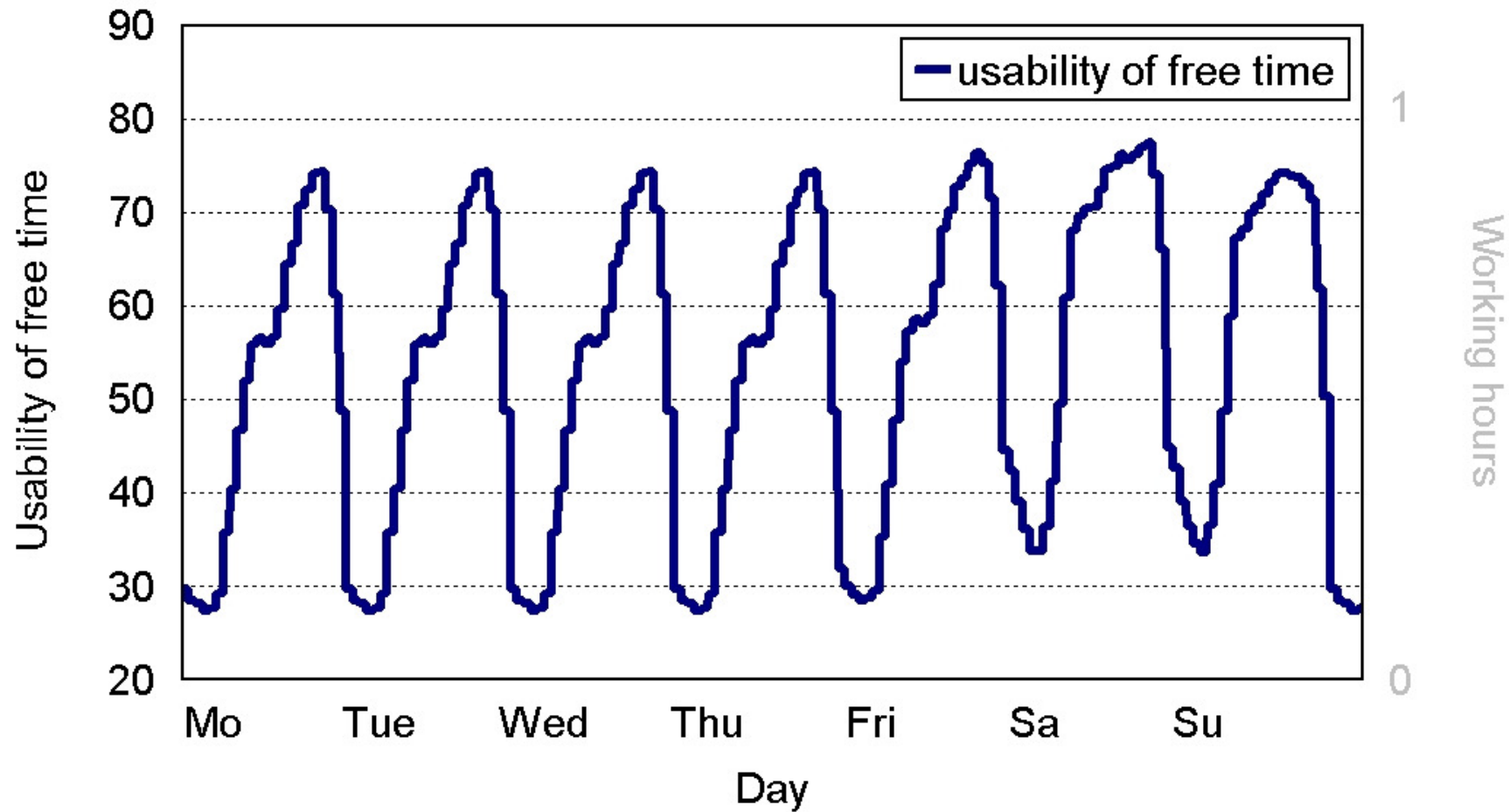
- survey 2 on the **usability of free time**
 - data indicating the social rhythm
 - (= second time series)

Data base – time series 1



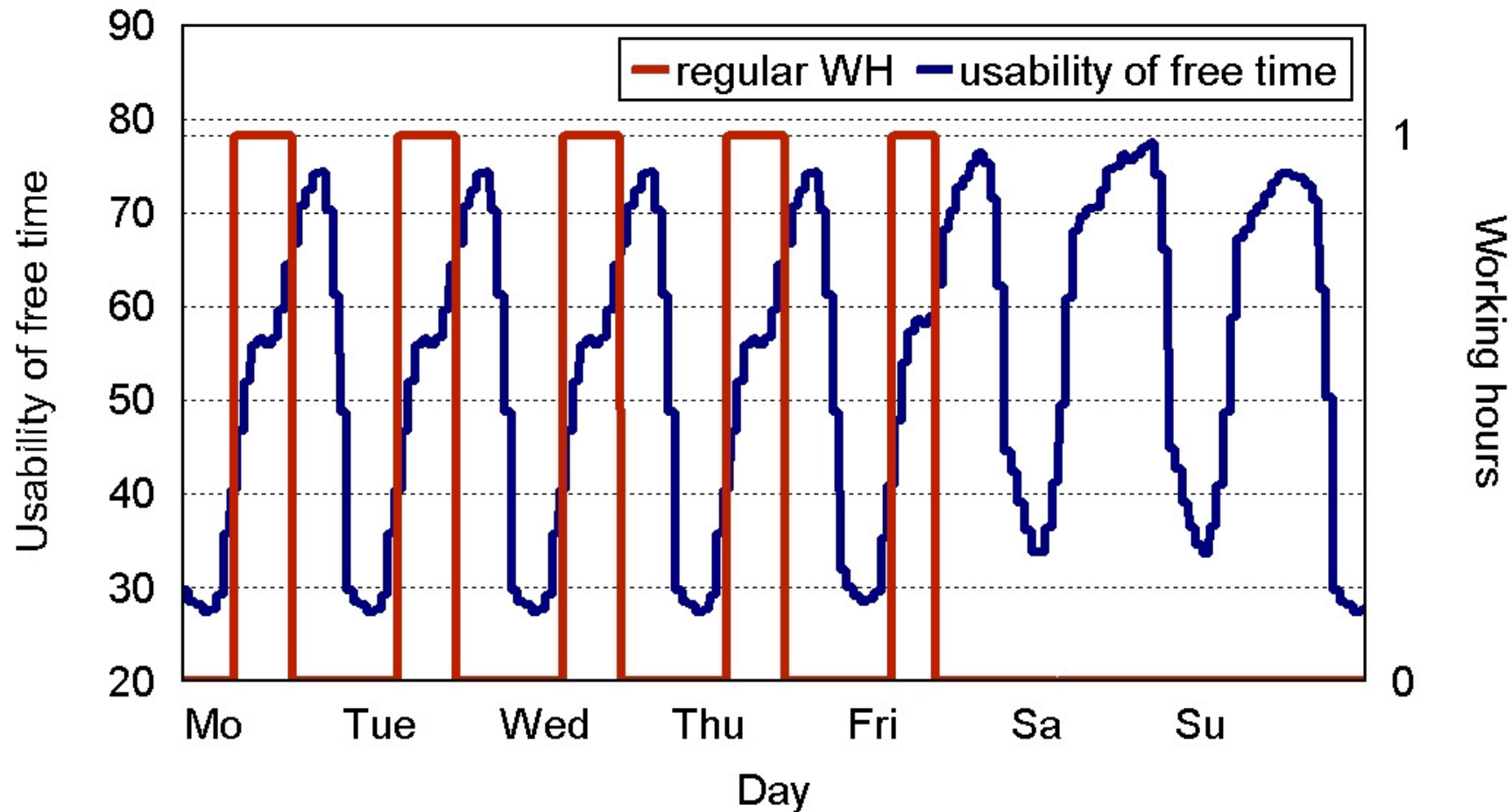
Regular working hours as time series (on/off), one week

Data base – time series 2



Index of social rhythm, operationalized through the usability of free time

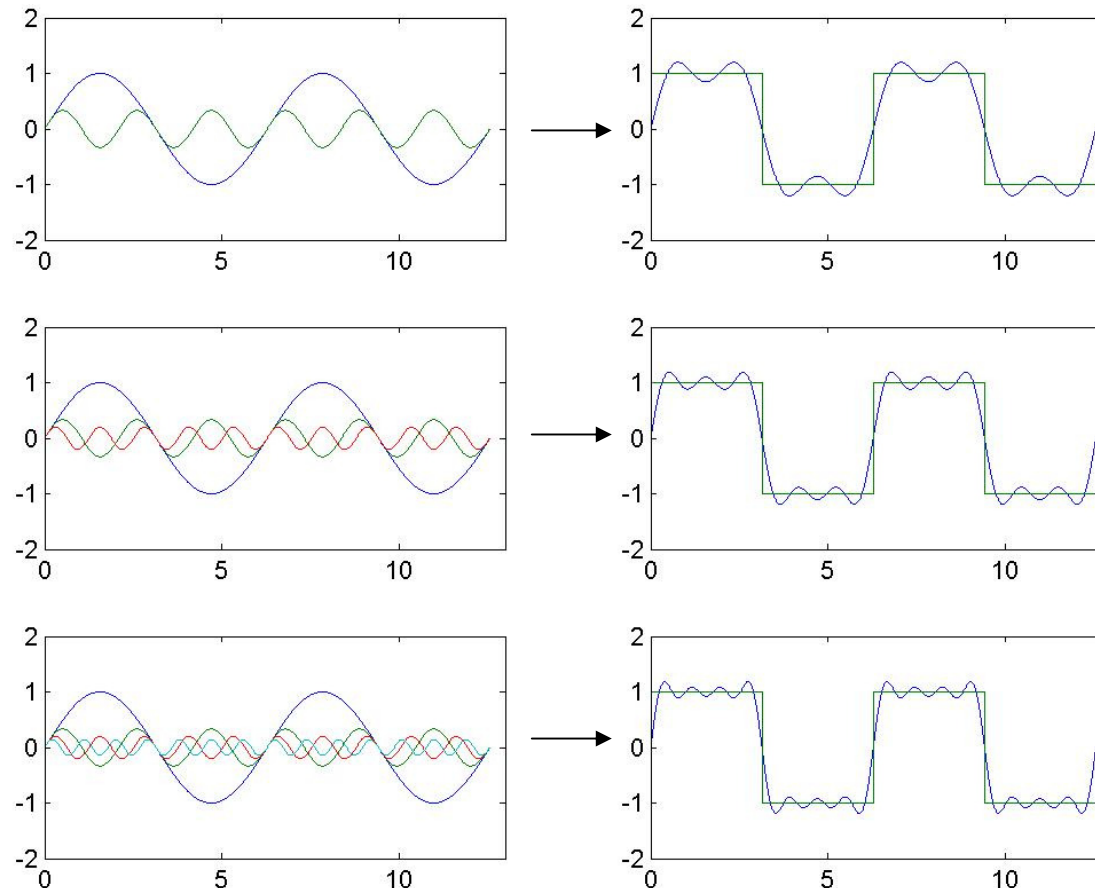
Interference between working hours and the usability of free time?



Both time series (working hours and usability) combined

Method – spectrum analysis

- **Fourier Analysis:** describing a (here: rectangular) signal as an infinite series of sinus curves



Addition of sinus curves to represent a rectangular signal

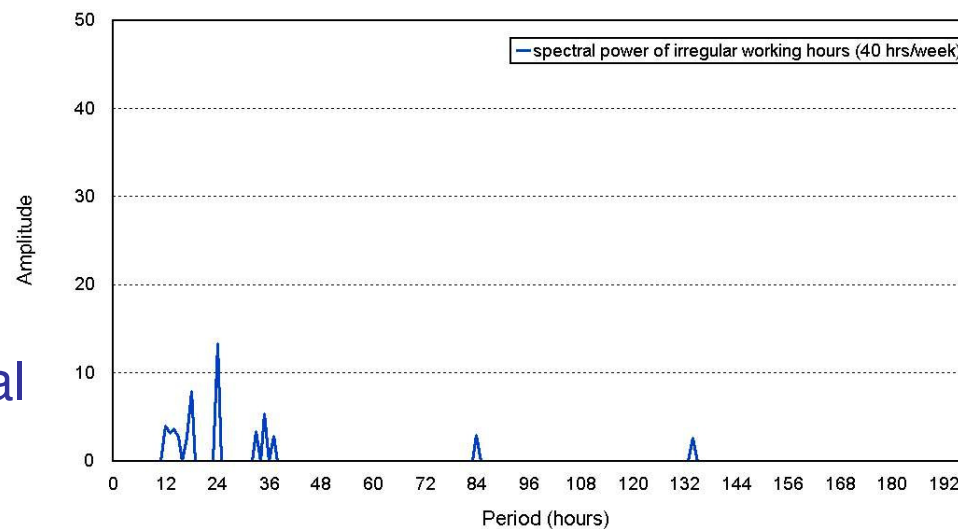
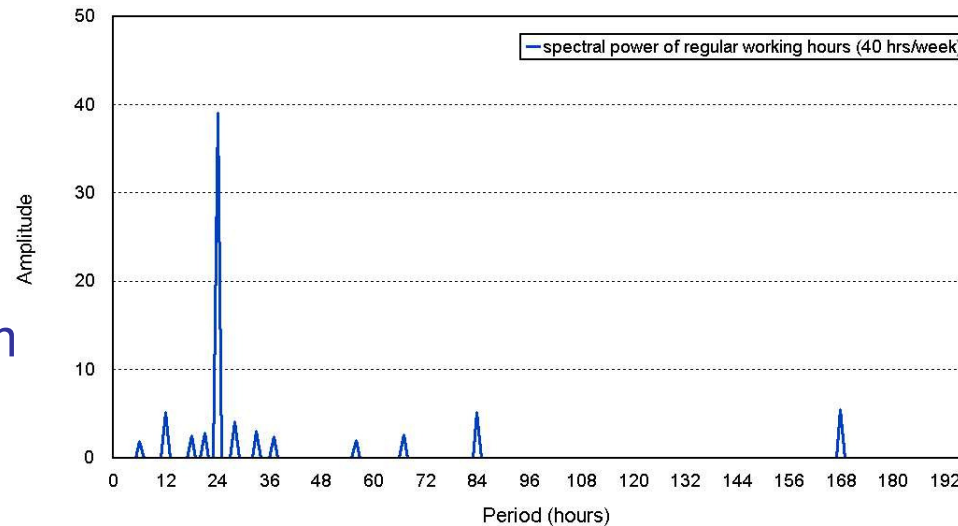
Method – spectrum analysis

- power spectra of working schedules
 - 24 hrs = day rhythm
 - 168 hrs = week rhythm

– **regular WTs**

– **irregular WTs**

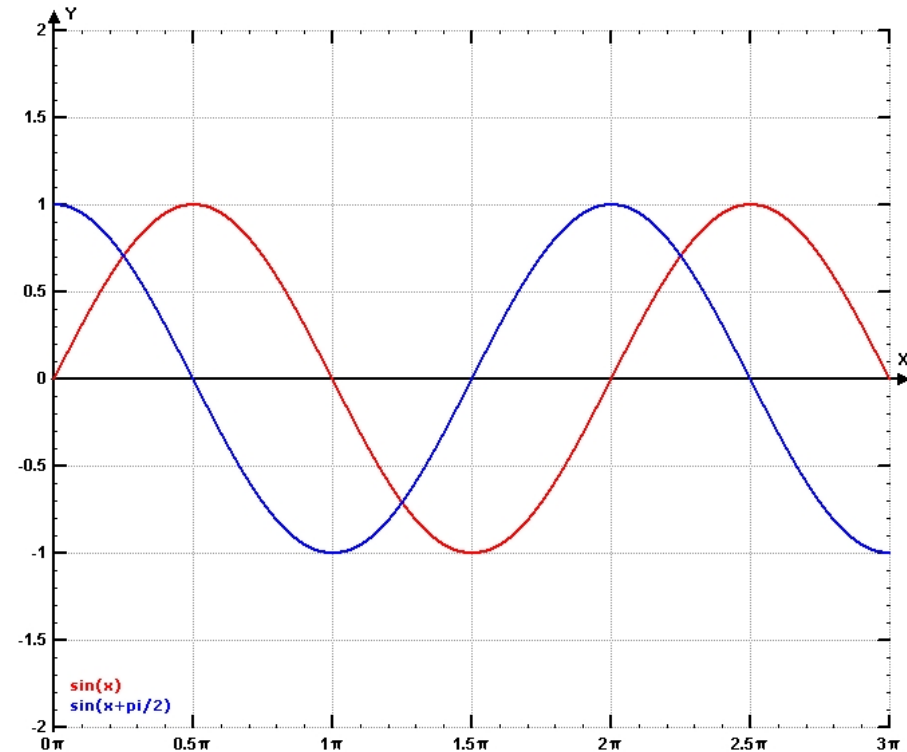
– suppression of spectral power



Spectral power of different working schedules

Method – cross spectrum analysis

- detection of the phase shift (φ) between two signals
- calculated for daily (24h) and weekly (168h) rhythms of working time and the index of the social rhythm
- Notation:
 - φ_{24} : phase shift between daily rhythms in WT and usability of time
 - φ_{168} : phase shift between weekly rhythms in WT and usability of time



Graph of 2 sinus curves with phase shift $\varphi = \pi/2$

Results

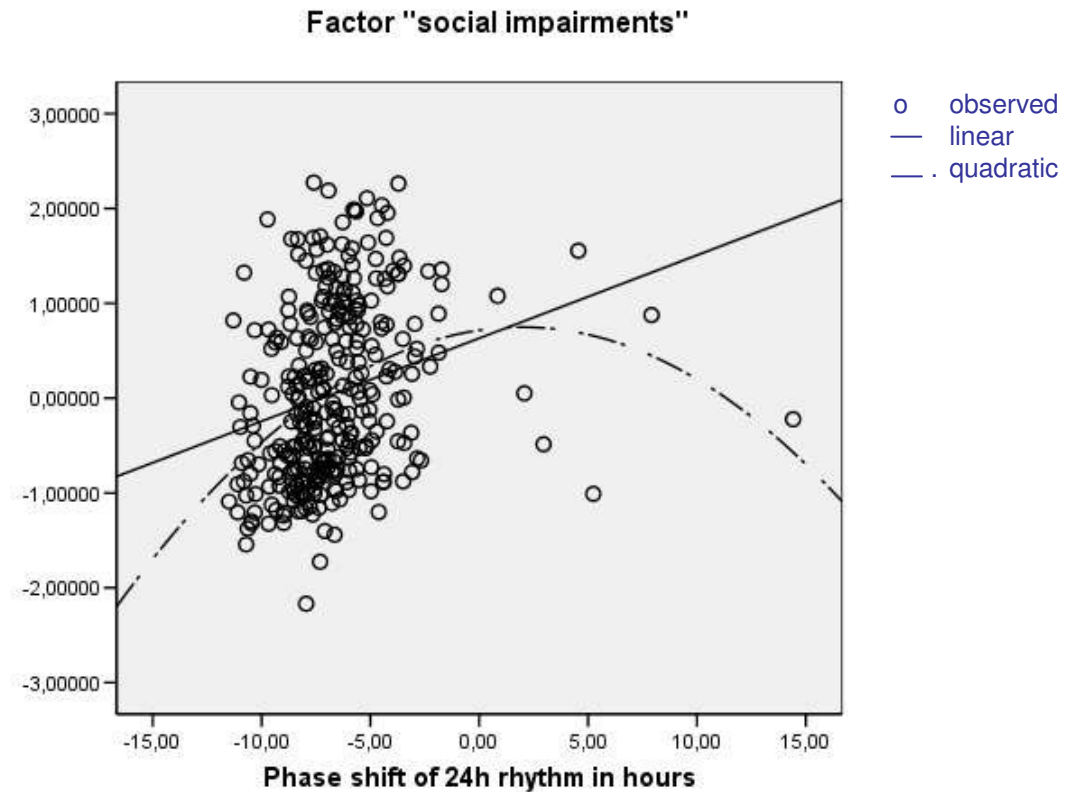
Correlation coefficients –
 correlation between spectral indicators and selected social impairments

Social impairments	Spectral power 168 h	Spectral power 24 h	φ 24 h	φ 168 h
Influence of working schedule on free time	-.403 (**)	-.388 (**)	-.313 (**)	-.487 (**)
Hobby suffers from working schedule	-.379 (**)	-.190 (*)	-.136	-.262 (**)
Partner suffers from working schedule	-.358 (**)	-.386 (**)	-.317 (**)	-.408 (**)
Arguments with partner because of working schedule	-.259 (*)	-.320 (**)	-.429 (**)	-.334 (**)

(**) p<0.01 / (*) p<0.05

Results

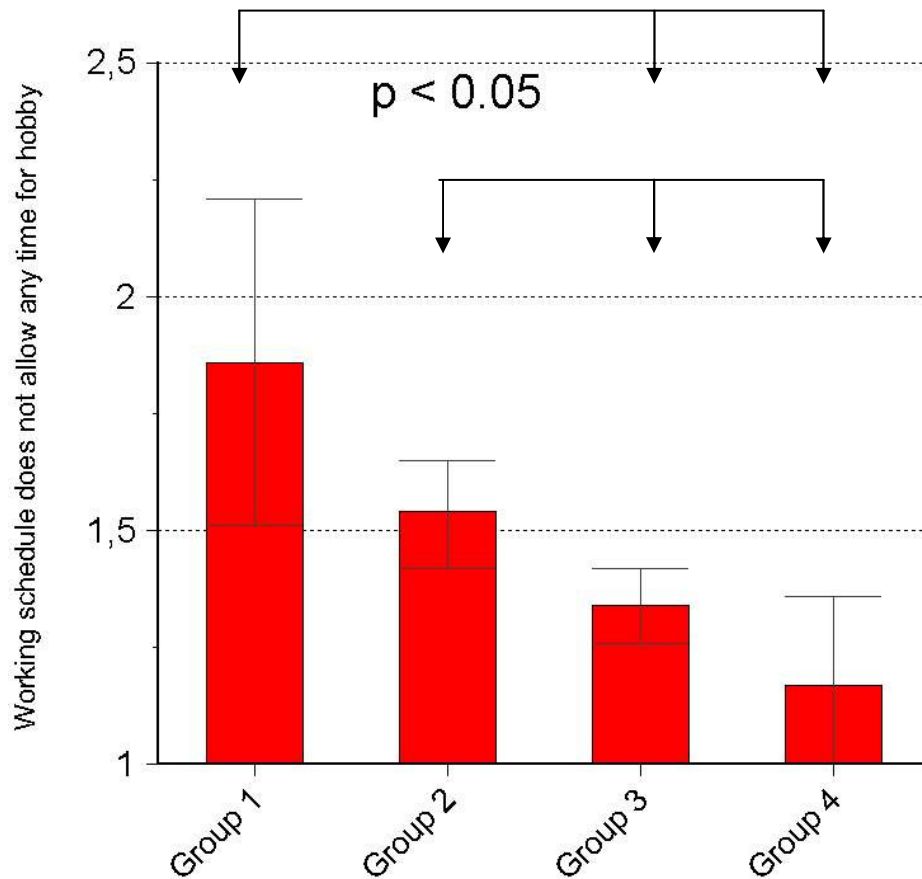
- covariation between **phase shift** of the daily & weekly rhythms in working time with social rhythms and reported social impairments
- low phase shift relates to high social impairments (maximum in curve fit at $\phi=0$ hrs)
- low phase shift = high interference between working time and social rhythms



Social impairments [factor score] in relation to ϕ_{24}

Curve fit linear: $r^2 = .06$ / quadratic: $r^2 = .11$
 $p < .01$ (both curve fits)

Results



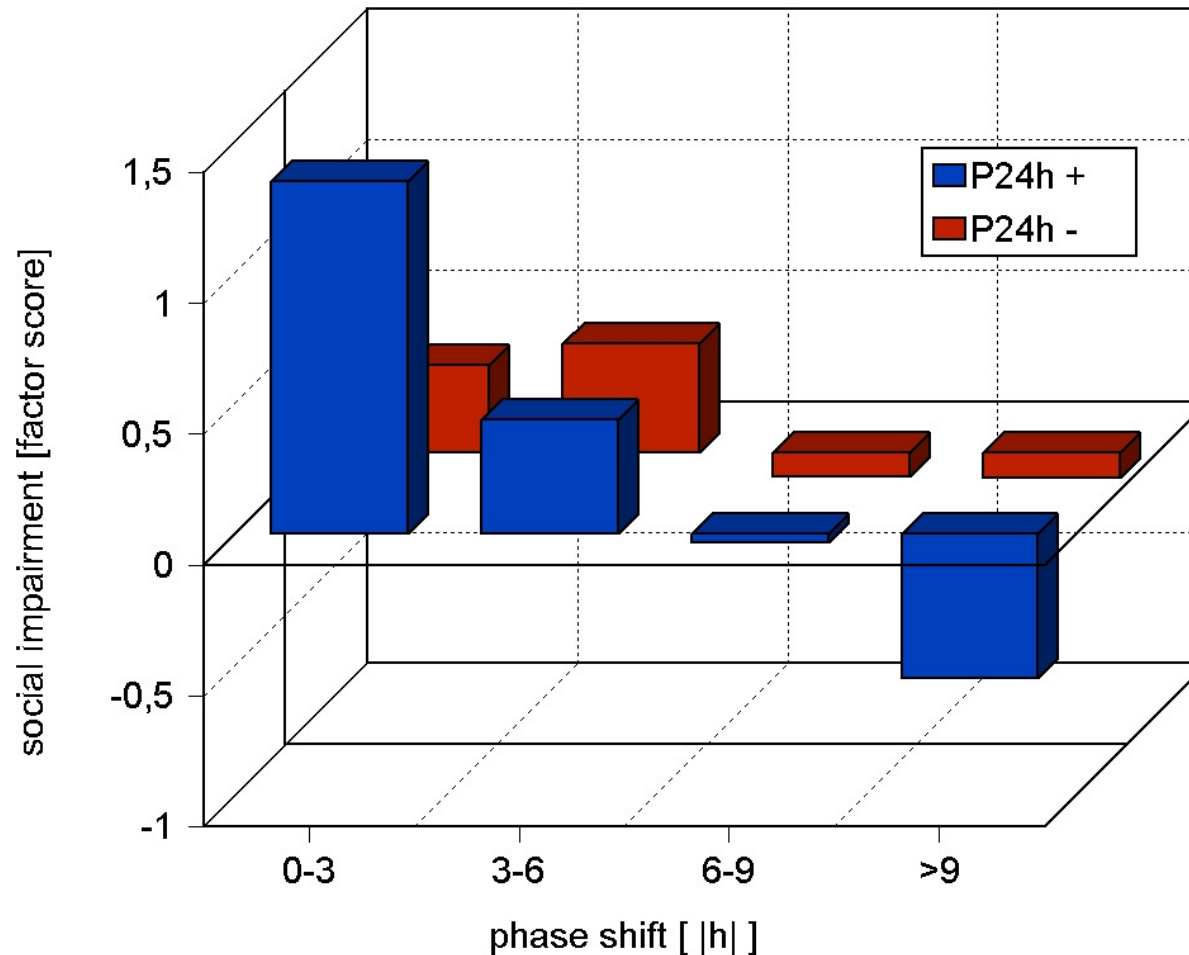
Amount of social impairment in relation to daily phase shift
[lack of time for hobbies]

- splitting the sample into 4 categories of phase shift φ_{24} :
 - group 1: $\varphi_{24} = 0 - 3$ hrs
 - group 2: $\varphi_{24} = 3 - 6$ hrs
 - group 3: $\varphi_{24} = 6 - 9$ hrs
 - group 4: $\varphi_{24} = 9 - 18$ hrs
- In groups with lower φ_{24} , reported impairments are significantly higher than in groups with higher phase shift

- Impairments are not only a function of single characteristics, but also of their interactions
- **multiple regression analysis:**
social impairments (factor score) depend on
 - power of 168h (**weekly**) **rhythm** of WT
($\beta = -0.278$)
 - **interaction** „daily rhythm of WT“ x „phase shift of daily rhythms of WT with usability“
($\beta = -0.247$)

($p < .05$, $R^2 = .21$)

Results



Relation of the interaction of spectral power P24 and phase shift ϕ_{24} to social impairments [factor score]

Discussion & Conclusions

- Approach of using spectrum analysis seems promising
 - for measuring rhythmic components inherent in working hours
 - for examining the interference of working times with social rhythms

- Results should be validated with other kinds of irregular working hours, e.g. flexible shift work

- Further and more spectral indicators should be used to describe working hours in more detail

- Objective data on working times, the use of free time and also sleeping behaviour may be useful for further validation

Thank you for your attention!

Contact details for further information

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