Oltre l'orario di lavoro

Gli effetti del lavoro supplementare digitale sulla quantità e qualità del sonno

Luca Menghini
Merylin Monaro, Luciano Gamberini
HTLab, HIT Research Centre
University of Padova

ONIRICAMENTE (II edizione)
Giornata di studi sulla Psicologia del Sonno
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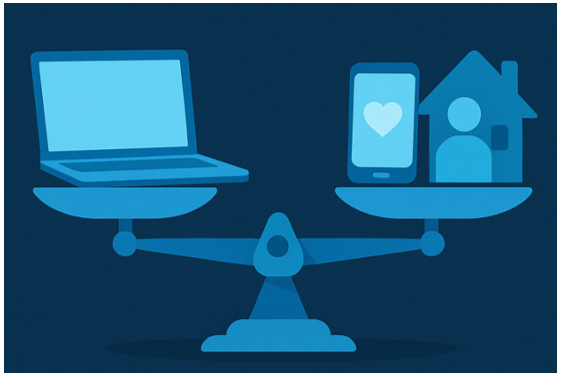
Digital Work-Life Balance



- **Work-Life Balance**
  = extent to which an individual is equally engaged in - and equally satisfied with - their **work** and **family** [and other non-work] role[s]
  Greenhaus et al (2003)
- Multifaceted & bidirectional: Conflicts, facilitation, enrichment, etc.
- **Digital Transition Era**:
  Mobile & pervasive technologies + Always-on connectivity
  enabling flexibility at the cost of new forms of **digital strain**

Digitalization & constant connectivity

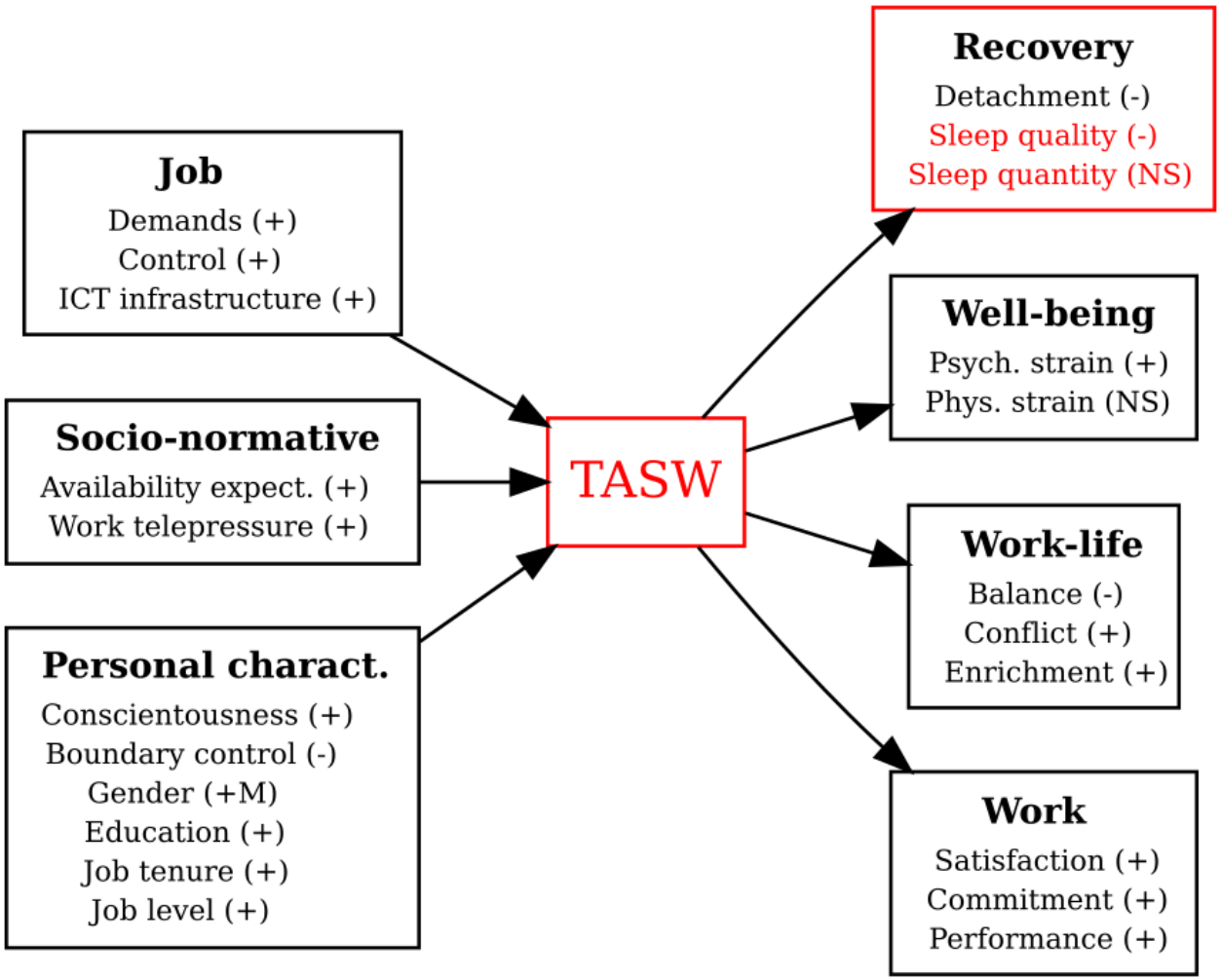
Work intensification & digitalization: remote working after regular work hours as a common practice → About 20% of European employees (Eurofound, 2017)

- **Techno-stress creators**
  = Main sources of stress experienced in organizations as the result of ICT use
  (Ragu-Nathan et al. 2008)
- Techno-overload
- Techno-complexity
- Techno-uncertainty
- Techno-insecurity
- **Techno-invasion**
  = Invasive effect of ICT when workers can be reached anytime and feel the need to be constantly connected

- **Tech-Assisted Supplemental Work (TASW):** Self- or other- initiated ICT-mediated 'extra' job tasks outside regular work hours
- **Constant connectivity:** Perpetual availability and 24/7 connectedness to the organization
- **Workplace Tele-pressure:** Thinking about ICT messages accompanied and an overwhelming urge to respond
- Problematic smartphone/e-mail use and **addiction** to technology

Technology-Assisted Supplemental Work

= Performance of "role-prescribed tasks at home after regular work hours with the aid of technological tools" (Fenner & Renn, 2010)



Kühner et al. (2023)

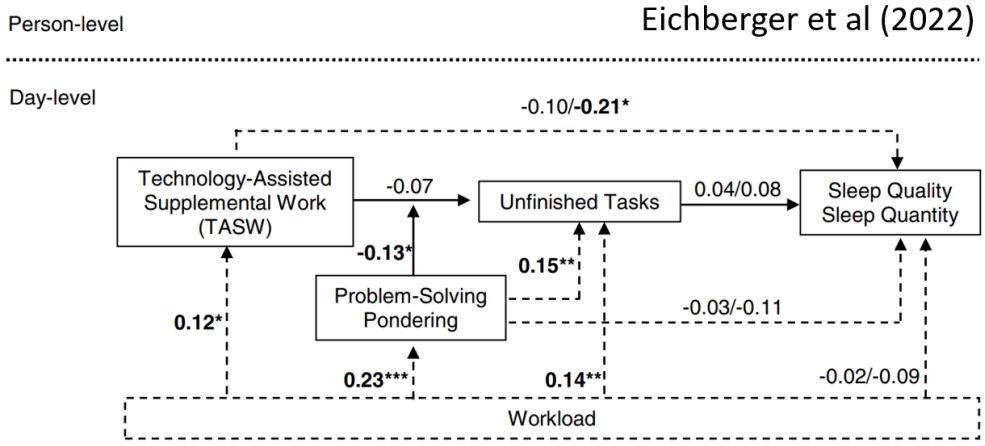
J Vocat Behav

$K = 89$ indep. samples,

$N = 39{,}085$ employees

TASW effects on sleep quantity & quality

- M-A predictive of **lower sleep quality** ($\bar{\rho}$ = -.10, $k = 9$)
  but **unrelated with sleep quantity** ($\bar{\rho}$ = -.06, $k = 4$)
  Yet, few studies, mainly cross-sectional self-report measurements



- TASW-related mental and emotional activation should delay sleep onset and increase WASO (Hyperaroual HP, Cognitive Activation Theory) + blue-light emitters and lack of detachment
- Any role played by **work-related rumination** and **chronotype**?

Research studies (ongoing)

Study #1

Large-scale cross-sectional

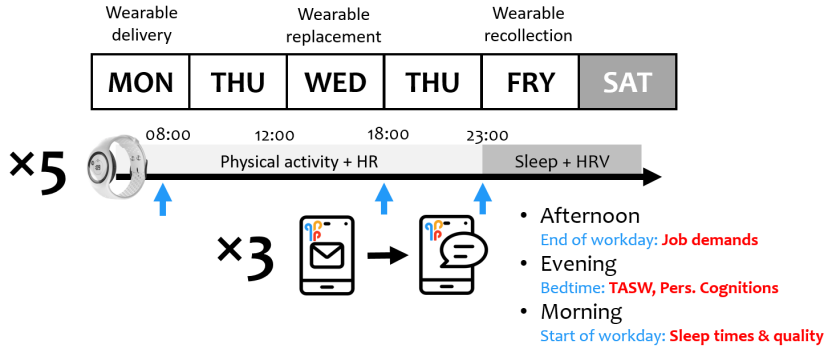
as a first step of a 3-wave 6-month-lag longitudinal study on **risk factors** for worker mental health

*Do **workers** performing higher TASW sleep worse than those performing lower TASW? Mediating role of rumination?*

Study #2

Ecological Momentary Assessment

5-workday protocol with event-contingent ESM ($3/day$) and continuous passive wearable measures



*Do people sleep worse in those **workdays** where they perform higher TASW than usual? Objective vs. subjective?*

Participants & Procedure

1966 employed adults (50.9%F, 47.3 ± 12.8 y)

Job tenure: 17.4 ± 12.3 y, 37.8 ± 8.6 hours/week

77% employees, 12% managers, 11% other

39% remote/hybrid workers

Ongoing occupational classification with `labouR`

Recruitment & Procedure

Professional recruitment service

Exclusion criteria:

- Unemployed/Students/Trainees
- Less than 18 work hours/week
- Nocturnal shifts
- Careless resp. (attention checks)
- TIB $<$ 3 or TIB $>$ 10 hours (n=41)

Cross-sectional online survey (~20 min)

Measures:

- $TASWscale$
- Sleep quantity: $\mu MCTQ$
- Sleep quality: $MiniSleep$
- Rumination: $WRRS$
- Job demands: QWS
- Demographics
- Occupational

Measures

All using 5-point response scale (Never - Always) "over the last 2 weeks"

TASW scale (Fenner & Renn 2010)
Back-translated (e.g. *Perform job-related tasks at home at night/weekends using digital devices*)

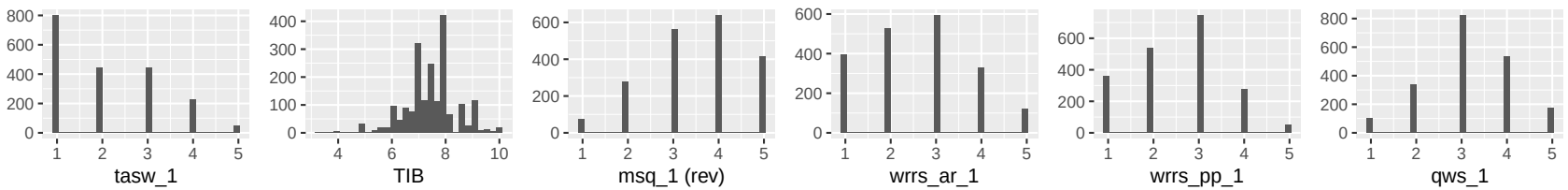
μMCTQ (Ghotbi et al. 2020)
Weekday/Weekend Bedtime + Wake-up
→ TIB (hours) + chronotype (min)

Mini Sleep Qs (Natale et al. 2008)
4 items from "sleep" subscale
e.g., *Difficulties in falling asleep*

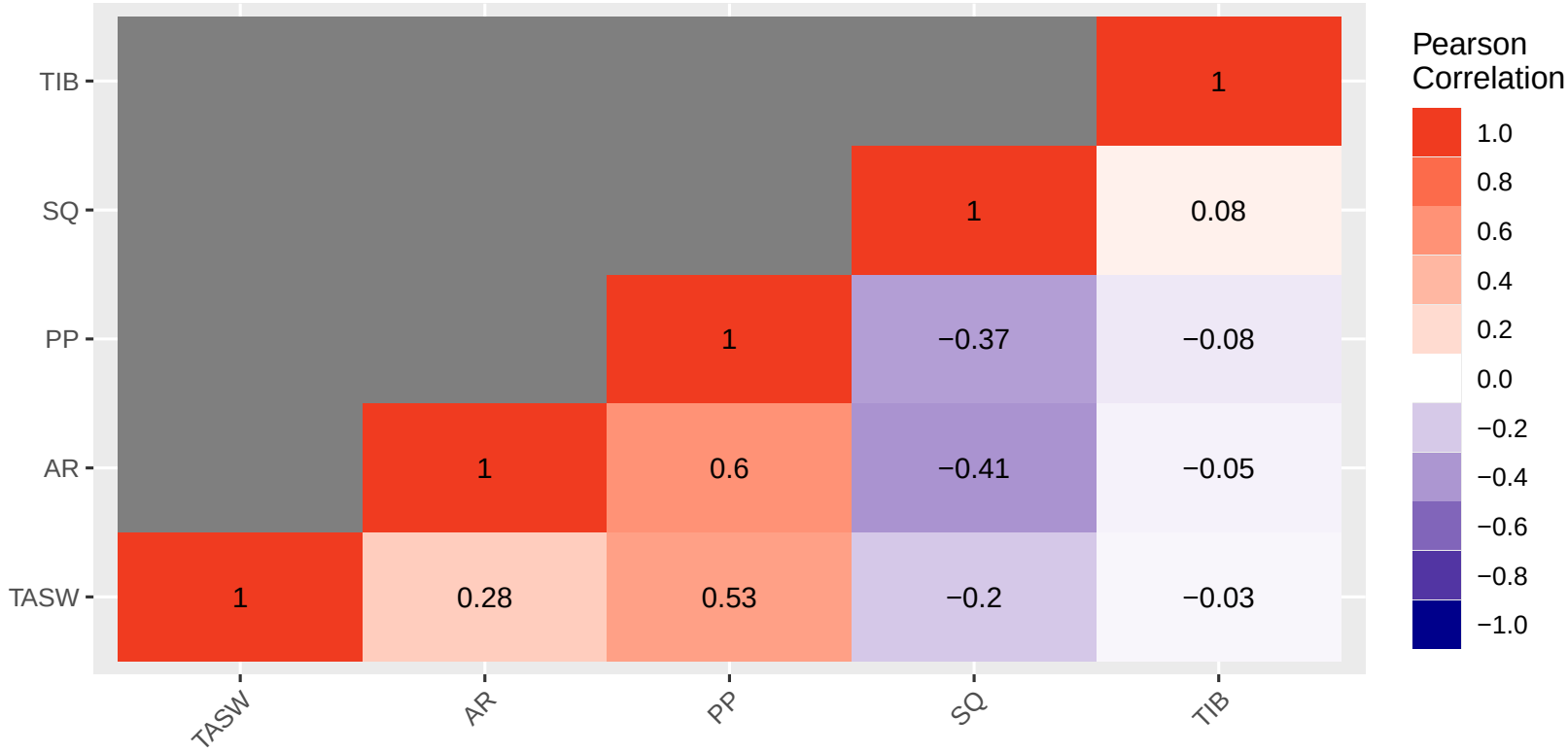
Work-Related Rumination Scale
8 items (Cropley et al. 2012)
Back-translated & culturally adapted

- Affective rumination (e.g. *Become tense when think about work in free time*)
- Problem-solving pondering (e.g. *Find solutions to work-related problems in free time*)

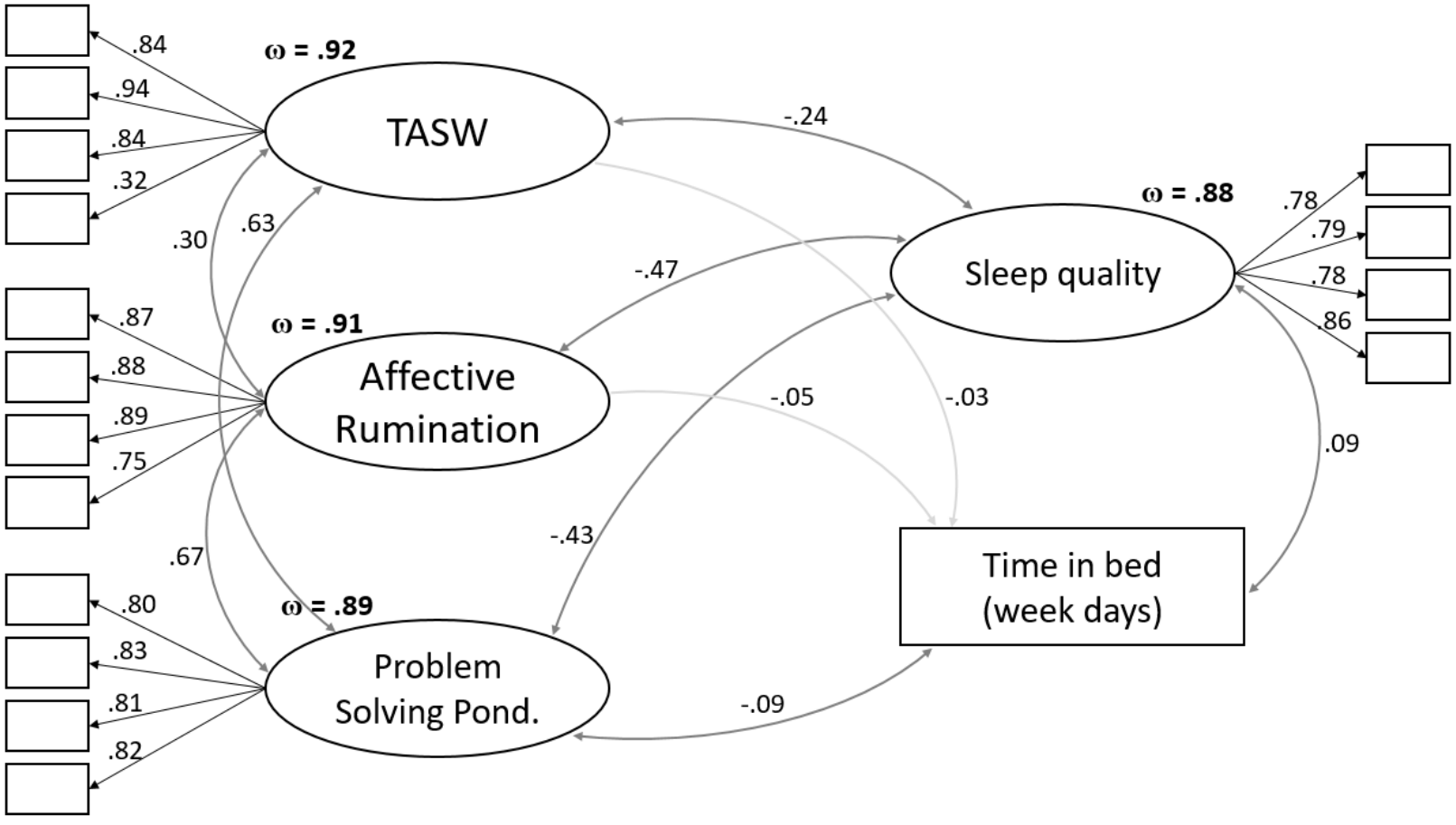
Quant. Workload Qs (Spector & Jex 1998)
5 items (e.g. *My job requires me to work very hard*)



Results: Correlations



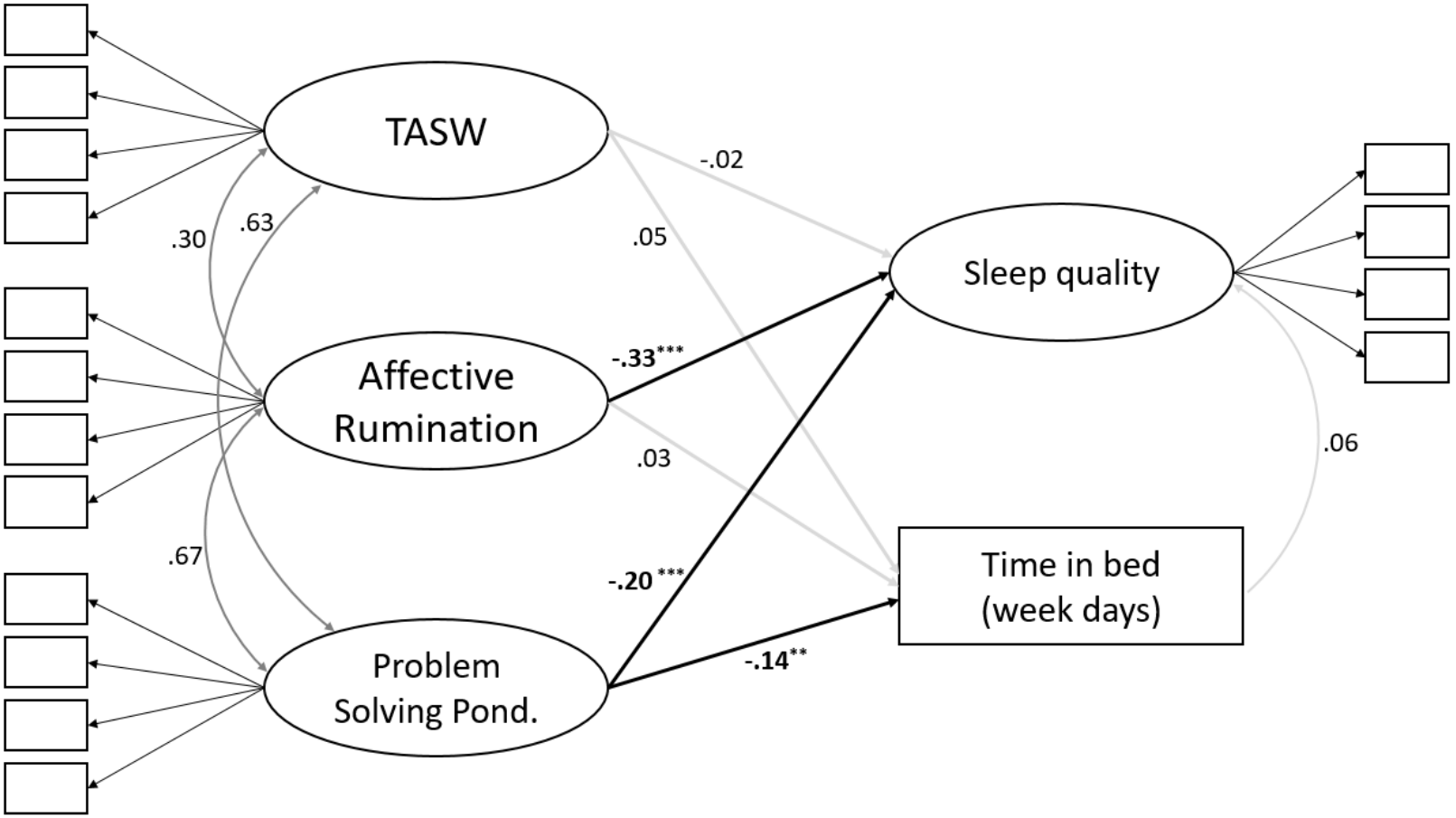
Results: Measurement model




```
library(lavaan)
fit1 <- cfa(m1,data=tot,ordered=ord_vars, estimator="WLSMV",std.lv=TRUE)
```

```
rmsea   cfi   tli   srmr
0.062 0.994 0.993 0.045
```

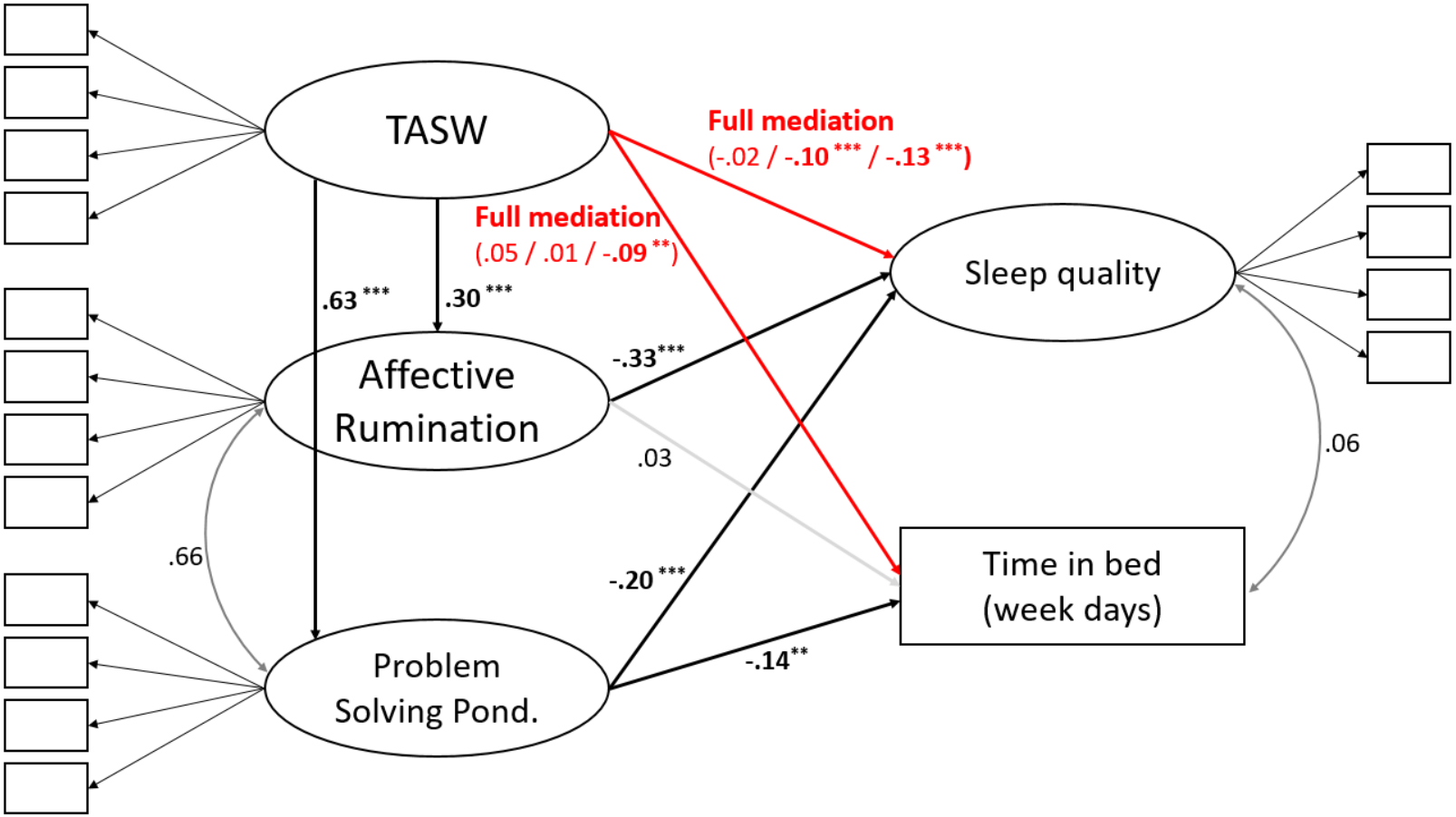
Results: Structural paths




```
library(lavaan)
fit2 <- cfa(m2,data=tot,ordered=ord_vars, estimator="WLSMV",std.lv=TRUE)
```

```
 rmsea    cfi    tli   srmr  R2_SQ R2_TIB
 0.062  0.994  0.993  0.045  0.250  0.010
```

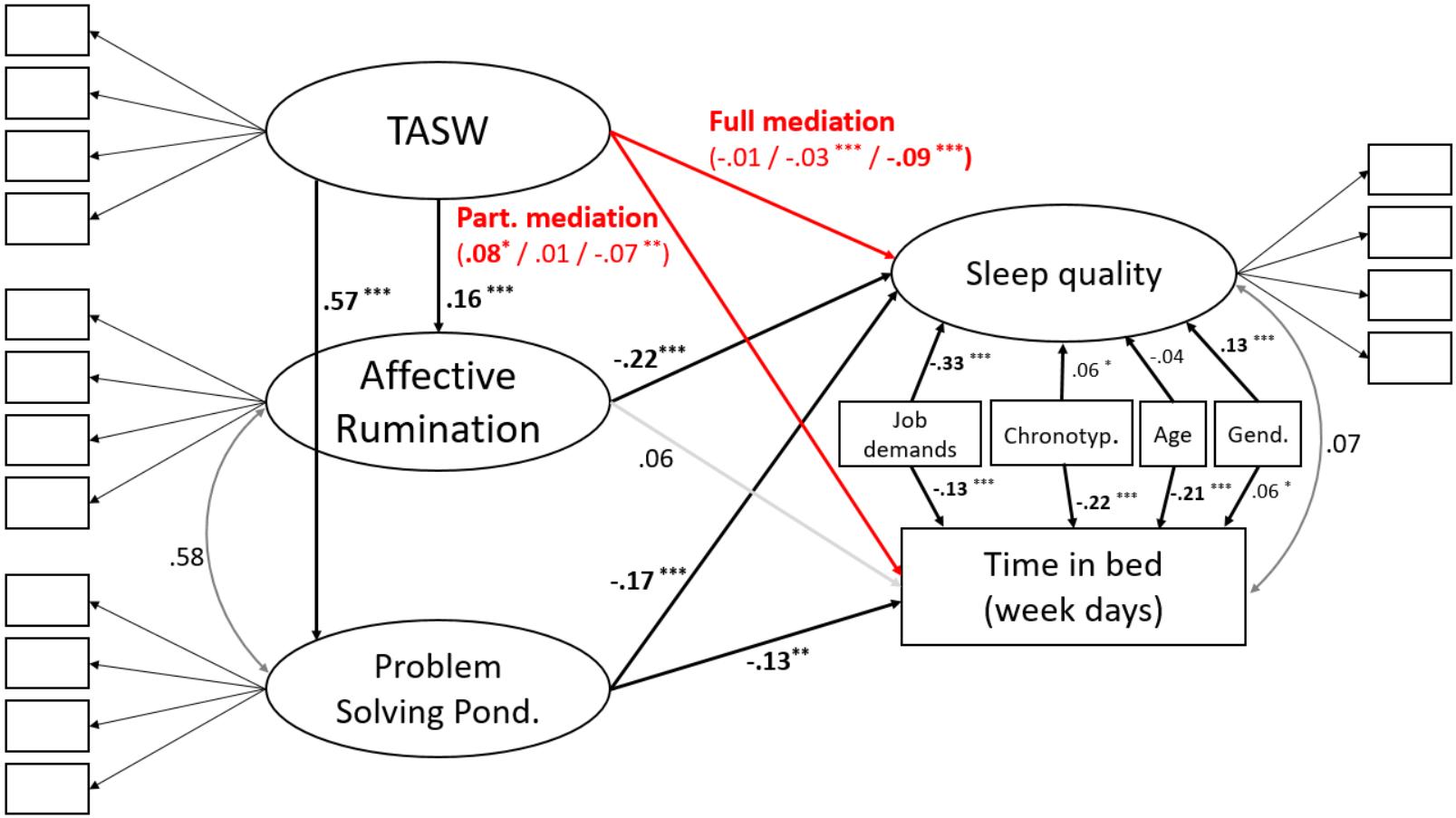
Results: Mediation




```
library(lavaan)
fit3 <- cfa(m3,data=tot,ordered=ord_vars, estimator="WLSMV",std.lv=TRUE)
```

```
 rmsea    cfi    tli   srmr  R2_SQ R2_TIB
 0.062  0.994  0.993  0.045  0.250  0.010
```

Results: Control variables




```
library(lavaan)
fit4 <- cfa(m4,data=tot,ordered=ord_vars, estimator="WLSMV",std.lv=TRUE)
```

```
 rmsea    cfi    tli   srmr  R2_SQ R2_TIB
 0.123  0.948  0.958  0.050  0.250  0.090
```

Participants & Procedure

18 employed adults (44.4%F, 41.8 ± 11.7 y)

Job tenure: 14.7 ± 9.9 y, 43.7 ± 5.4 hrs/week

61% employees, 6% managers, 33% other

61% remote/hybrid workers

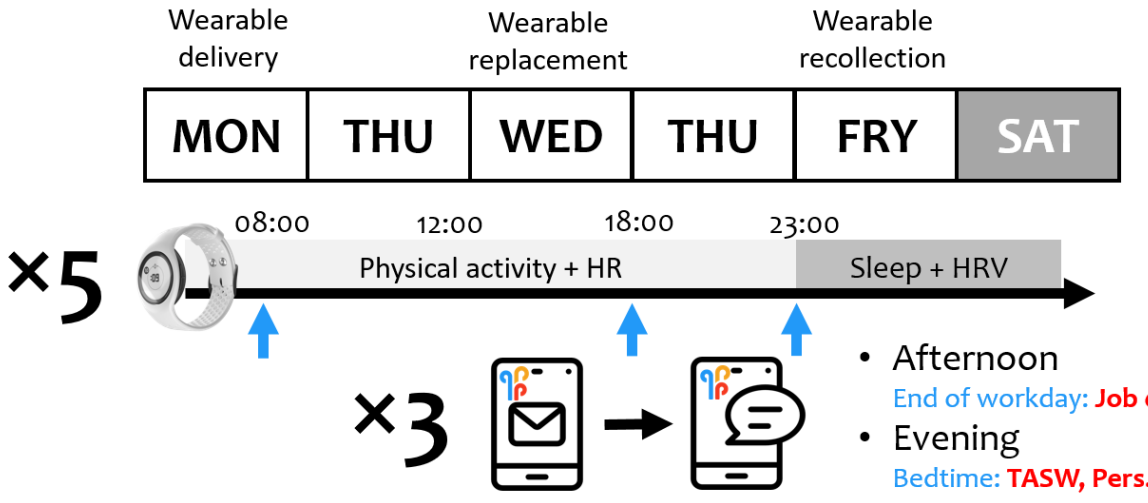
Recruitment & Procedure

Convenience sampling, 5-day EMA

90 daily observations

Exclusion criteria:

- Unemployed/Students/Trainees
- Less than 6 work hours/day
- Nocturnal shifts
- Careless resp. (attention checks)
- Manual workers
- Full remote workers



- Afternoon
  End of workday: **Job demands**
- Evening
  Bedtime: **TASW, Pers. Cognitions**
- Morning
  Start of workday: **Sleep times & quality**

Experience Sampling Measures

All using 7-point response scale (Not at all - A lot) "*Today, after work...*"

Intensive smartphone-use scale

(Fenner & Renn 2010; Eichberger et al 2021)

4 items, back-translated (e.g. *"I was available for colleagues, customers, and boss until I went to bed*)

TASW reasons : **S** elf-initiated (e.g. *Work on mind*, *Planned*) vs. **O**ther-initiated (e.g. *Message*) vs. **N**o TASW

Pers. Cognitions

(Sonnentag et al. 2024, Rutten et al. 2022)

3 items backward (e.g. *Kept thinking about things happened at work*), 3 items forward (e.g. *Thought about work I have to do in the next days*)

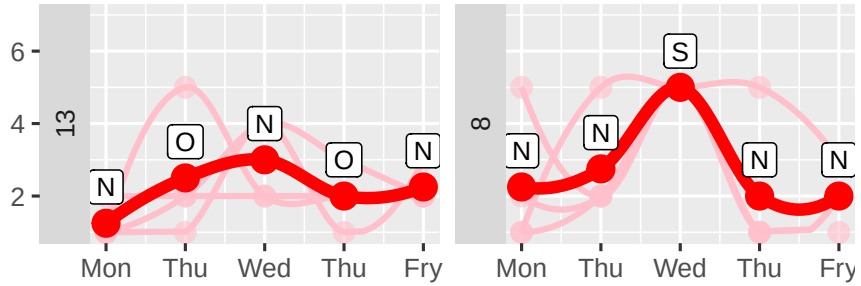
Mini Sleep Qs (Natale et al. 2008)

4 items from "sleep" subscale

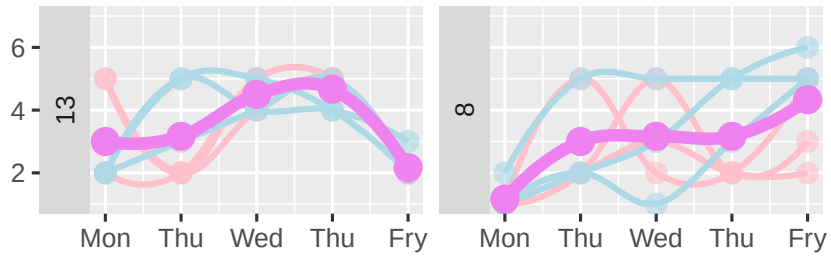
e.g., *Difficulties in falling asleep*

Sleep times : bedtime + wake-up

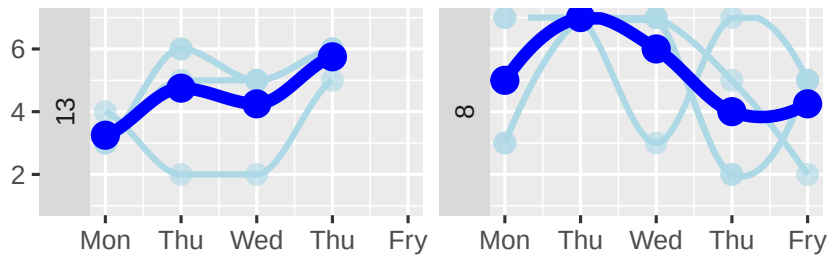
TASW: $R_{kF} = 0.98$, $R_C = 0.73$



Pers. Cognitions: $R_{kF} = 0.97$, $R_C = 0.86$



Sleep quality: $R_{kF} = 0.92$, $R_C = 0.85$



Wearable measures

Embrace Plus wristband (Empatica, Milan)

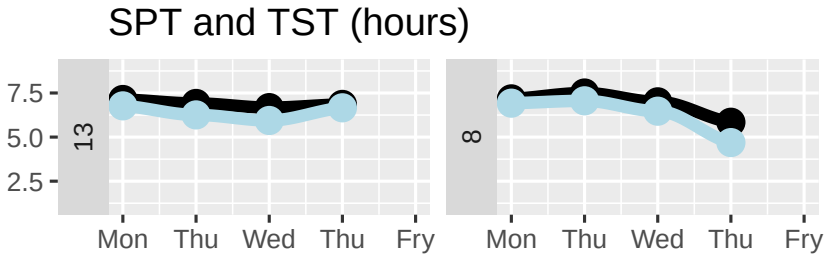
3-axis acc + PPG (64 Hz)

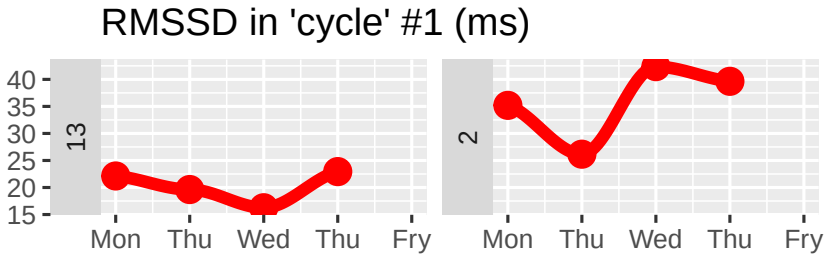
Replaced every 2 days (40-h memory)

```
GGIR(
  ...
  mode=c(1:5),rmc.unit.acc = "g",
  ignorenonwear = FALSE, ...
  includenightcrit = 10,
  loglocation="path_to_sleeplog",
  sleepwindowType="SPT", ...)
```

Pre-processing pipeline

- Raw ACC+PPG export (AVRO)
- Temporal synch. + signal extraction
- Sleep logs adjustements
- Sleep scoring with `GGIR` algorithm (van Hees et al. 2018)
- 5-min RMSSD over 1-min windows
- RMSSD averaging by 90-min epochs from sleep onset to wake-up only if ACC < 0.035 mg





♡ Thanks Marcello Scibaldi (uniBO)

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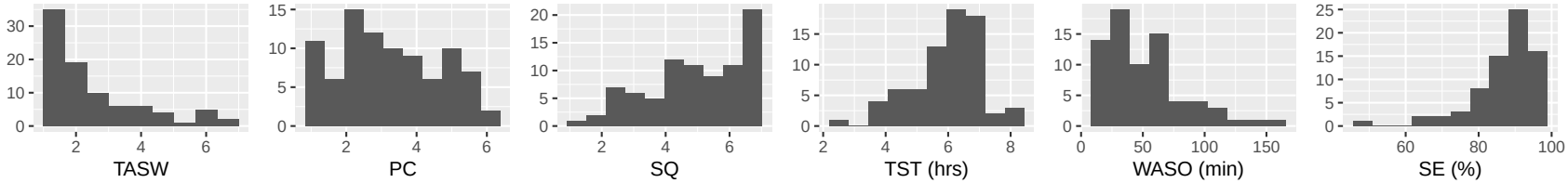
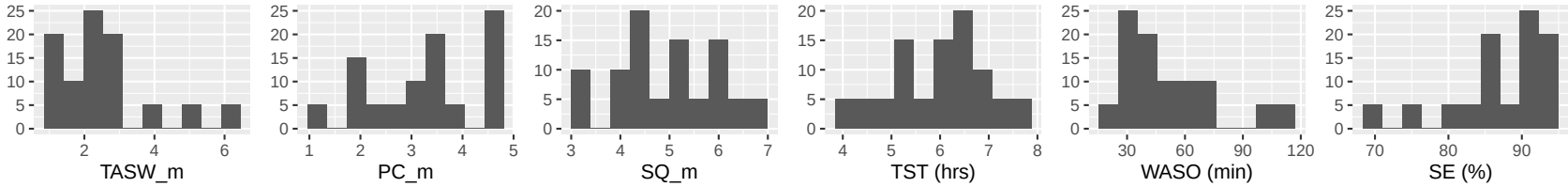
Results: Descriptives

	n	mean	sd	ICC
TASW (1-7)	88	2.48	1.58	0.67
PC (1-7)	88	3.24	1.42	0.48
SQ (1-7)	85	4.99	1.56	0.27
TST (hours)	72	5.94	1.10	0.63
WASO (min)	72	51.44	31.59	0.49
SE (%)	72	87.13	8.75	0.40

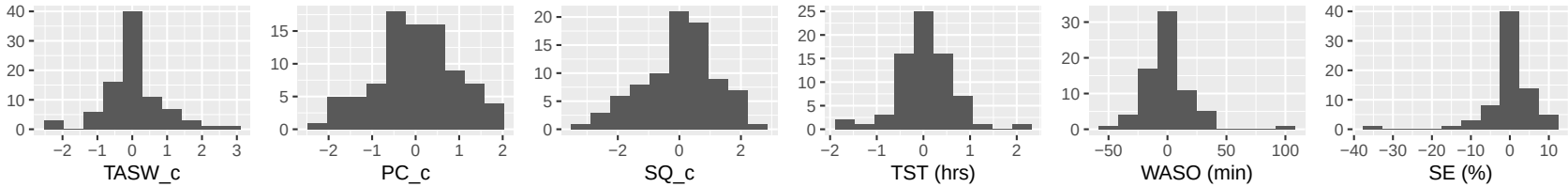


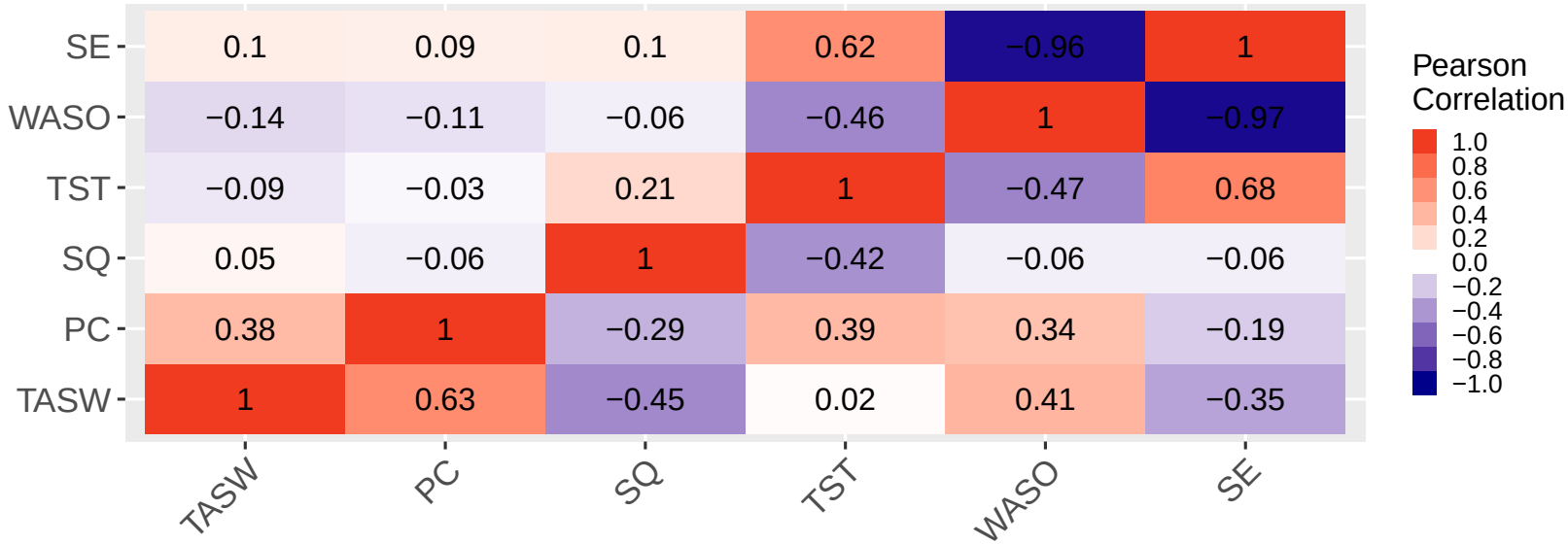
Results: Level-specific correlations

- Below main diagonal: Between-individual (person mean scores, $N = 18$)



- Above main diagonal: Within-individual (person-mean-centered scores, $N = 70$)





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TASW effects on sleep quantity & quality

- TASW: long-established construct with controversial consequences, yet still poorly investigated

Study #1

- Direct relationship with **sleep quality** mediated by AR & PP (small effects)
- Weaker relationship with **sleep quantity** mediated by PP (small effects)
- **Limitations**: Cross-sectional, self-report
- **Future steps**: Data filtering (e.g., remote work, technologies), Chronotype as moderator

Study #2

- Meaningful fluctuations over time, but infrequent TASW
- Meaningful inter-individual correlations with **sleep quality & quantity** (WASO, SE)
- Weaker and counterintuitive intra-individual correlations
- **Limitations**: Small sample size, short protocol duration
- **Future steps**: Sleep-related HRV, Chronotype as moderator

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Practical implications

- Techno-invasion and technological pervasiveness in the digital transition era
- Ultimate challenge: Designing work to stay at work
- **Primary prevention**: Work-life balance policies (*right to disconnect*) + Managerial training
- **Secondary prevention**: Time management + Boundary control + Digital detox + Mindfullness
- Even more challenging: Convincing managers and employees that the potential benefits of TASW (performance, commitment) are not worth the **negative impact** on sleep, health, & work-life balance

Key references

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- Greenhaus, J. H., Collins, K. M., & Shaw, J. D. (2003). The relation between work–family balance and quality of life. *Journal of vocational behavior, 63*(3), 510-531.
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- Ragu-Nathan, T. S., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. *Information systems research, 19*(4), 417-433.

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Luca Menghini, Merylin Monaro, Luciano Gamberini

HTLab, HIT Research Centre, Dep. General Psychology

University of Padova

Ministero dell'Università e della Ricerca | Italiadomani | PNC Piano nazionale per gli investimenti complementari al PNRR | DARE DIGITAL LIFELONG PREVENTION

Luca Menghini

luca.menghini@unipd.it

profile/Luca-Menghini @LuMenPsy in/menghiniluca Luca-Menghini

R code available from https://luca-menghini.github.io/pResentations

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