Fatigue, Cognitive Performance & Sleep of Pilots and Operational Technicians within an International Aviation Context

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Context

- **The vast majority of rules governing hours of work for pilots were developed from data, experience and negotiations related to scheduled commercial aviation**

- **However, other sectors of the aviation industry have different fatigue-related risk exposures such as:**

  - **Offshore Oil & Gas platform flights are short, frequent and demanding**

  - **Emergency services require stand-by followed by high-tempo work**

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Context

- **However, limited data previously existed to contribute to discussions regarding regulations in such industry sectors**

- **Therefore, Babcock International Group, a diversified multi-national company headquartered in the UK, with substantial aviation operations, decided to build a relevant dataset**

- **This has also been seen as a priority in order to create data-driven ways to improve safety, compliance and operational flexibility in its business**

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- **In addition, the improvement of employees' health, wellbeing and job satisfaction is also seen as being linked to risk-based and data-driven fatigue management**

- **Fatigue management project elements not reported on today include crew training, operational procedures, safety reporting & investigation as well as risk analysis workshops**
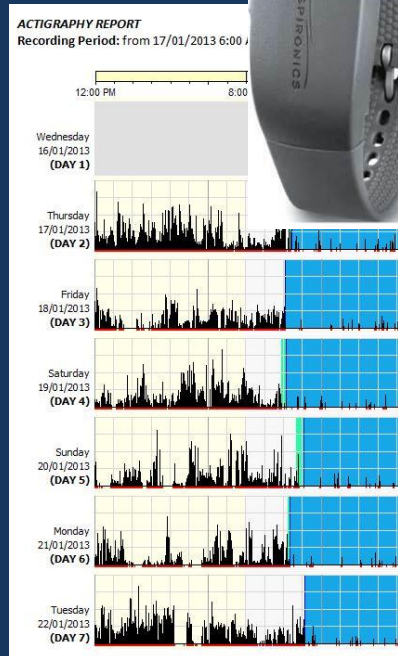
Approach

- **The project has expanded to now include focus on:**

  - **Rotary & fixed-wing operations**

  - **Pilots & Technicians**

  - **Peak (Summer) & Low (Winter) seasons**

  - **Multiple countries/jurisdictions: UK, Sweden, Finland, Italy, France, Portugal**

  - **12h, 12h+, 14h+ and 24h+ rosters**

  - **Days working and days off work**

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Approach

- Volunteers were asked to participate for a 21d data collection period (work & non-work days)

- Objective sleep (actigraphs), objective performance (PVT, 5-8x daily) and self-reported sleep (KSS, 5x daily or more)

- All flight & duty times (including stand-by on base, at hotels, at home, etc.) were recorded in an iPad app with PVT and KSS data

Approach

Activity	Data collected	Data analysed	Total datasets
Italy RW & FW Pilots	🟢	🟢	60
Italy Technicians	🟢	🟢	23
Sweden & Finland RW & FW Pilots	🟢	🟢	24
UK Onshore RW Pilots	🟢	🔴	~14
France, Portugal & UK Offshore RW Pilots	🔴	🔴	~60
Spain RW & FW Pilots, plus Technicians	🔴	🔴	~60
			~241

Initial Findings

1. In seasonal operations (e.g. emergency response) people get approximately one hour less sleep per 24h in Summer compared to Winter (from ~7h to ~6h)

2. It has also been identified that people generally sleep significantly less (≥1hr) in the 24h prior to the first work period (i.e. Day 1) in a block of work (down to ~4.5-6.5h)

3. Where they are worked, early morning duties (starting <0700h) and late night duties (starting >0000h) are also associated with less sleep in the 24h before they occur

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Initial Findings

4. PVT performance was usually significantly worse for early starts (<0700h) and late night starts (>0000h), but <u>not</u> consistently worse on day 1 duties despite less sleep being consistently obtained in the 24h prior to day 1
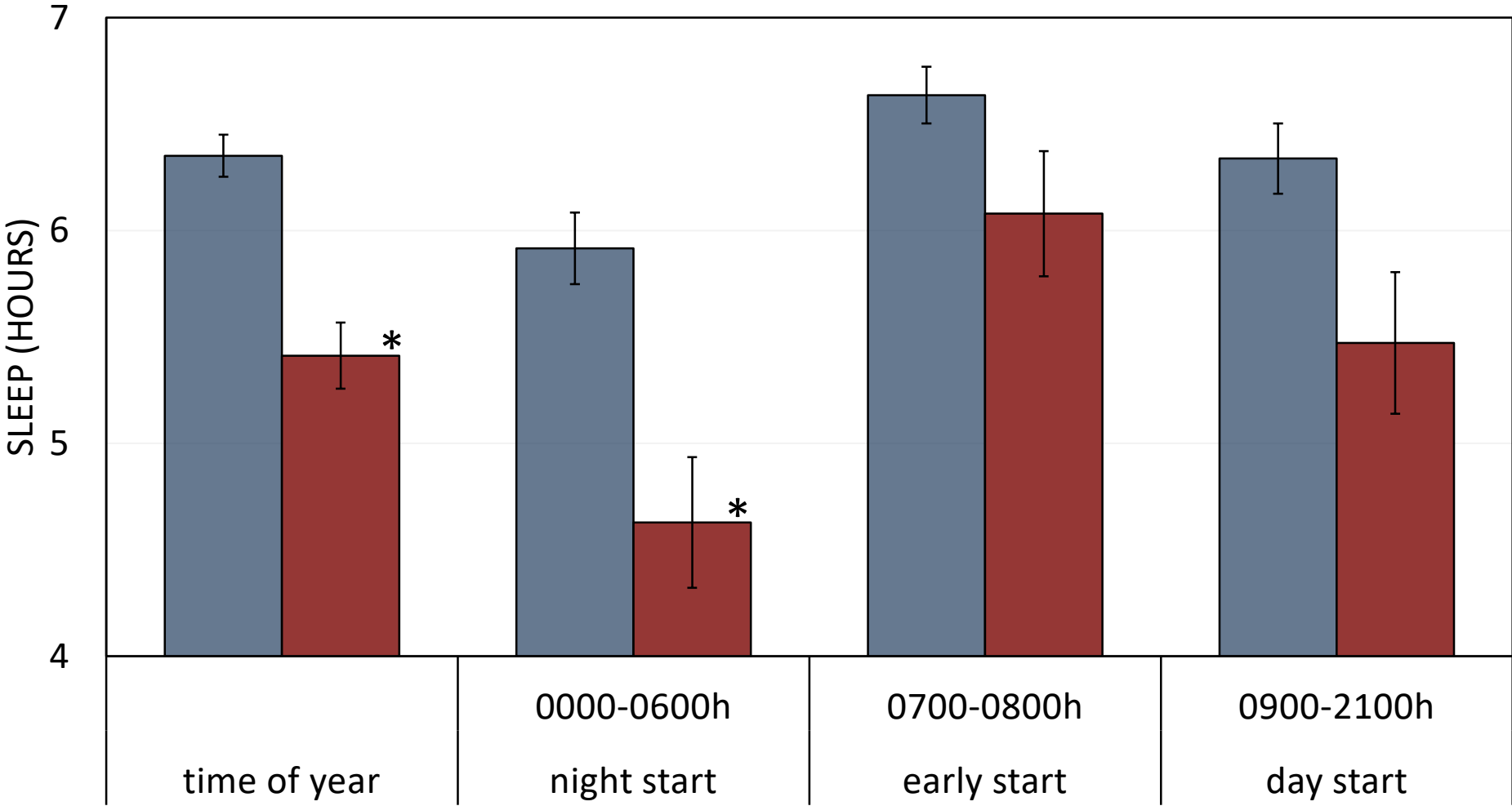
Example Results

Actigraphy-Measured Total Sleep Time in 24h Prior to Work
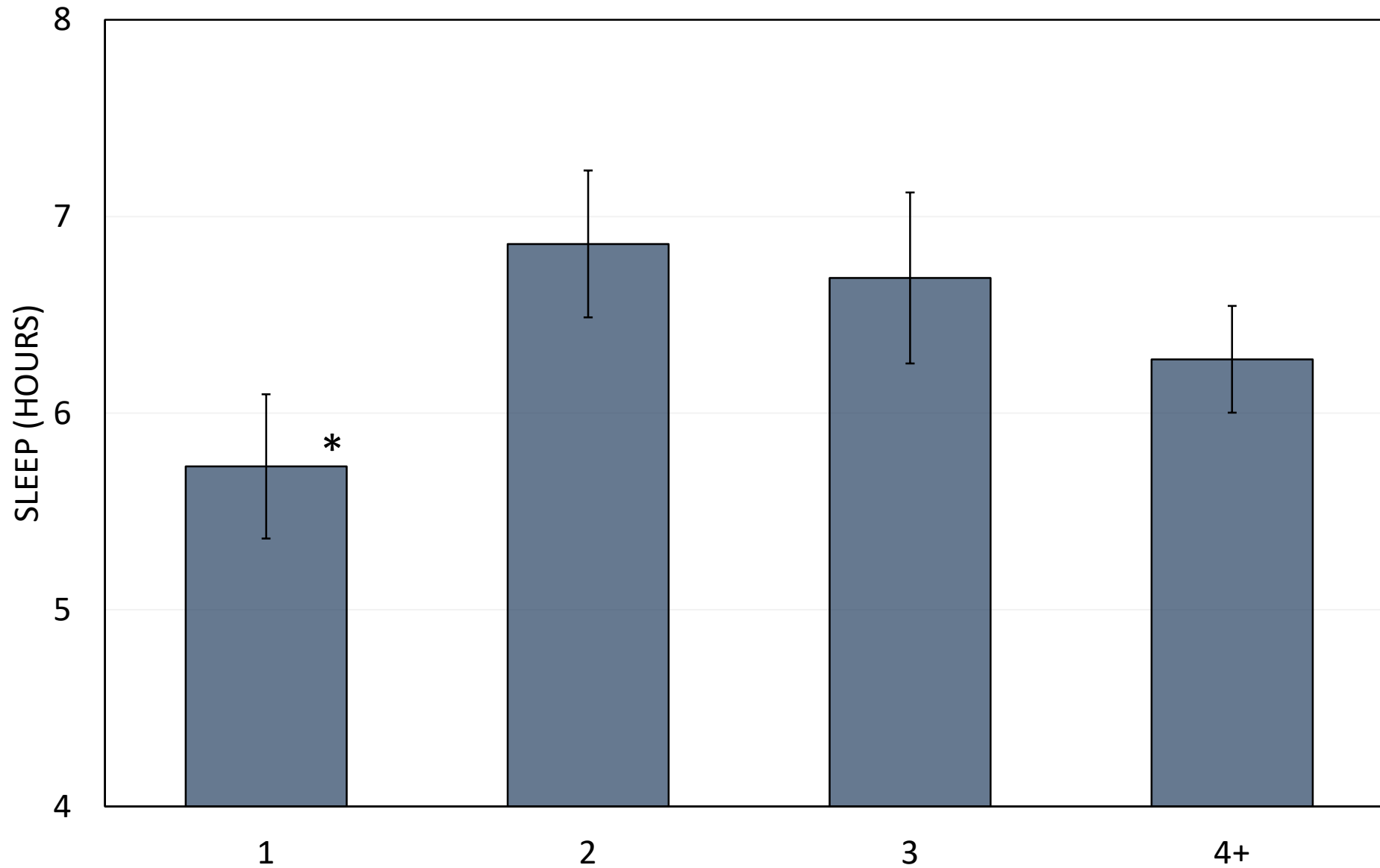Differences by collection phase and work period start time

■ nov-jan　■ june-july

SLEEP (HOURS)

* time of year
* 0000-0600h — night start
* 0700-0800h — early start
* 0900-2100h — day start

* p<0.05
N=40
Italy RW Pilots

Actigraphy-Measured Total Sleep Time in 24h Prior to Work
Differences by consecutive days

SLEEP (HOURS)

* p<0.05
N=23
Italy Technicians

Actigraphy-Measured Total Sleep Time in 24h Prior to Work Period
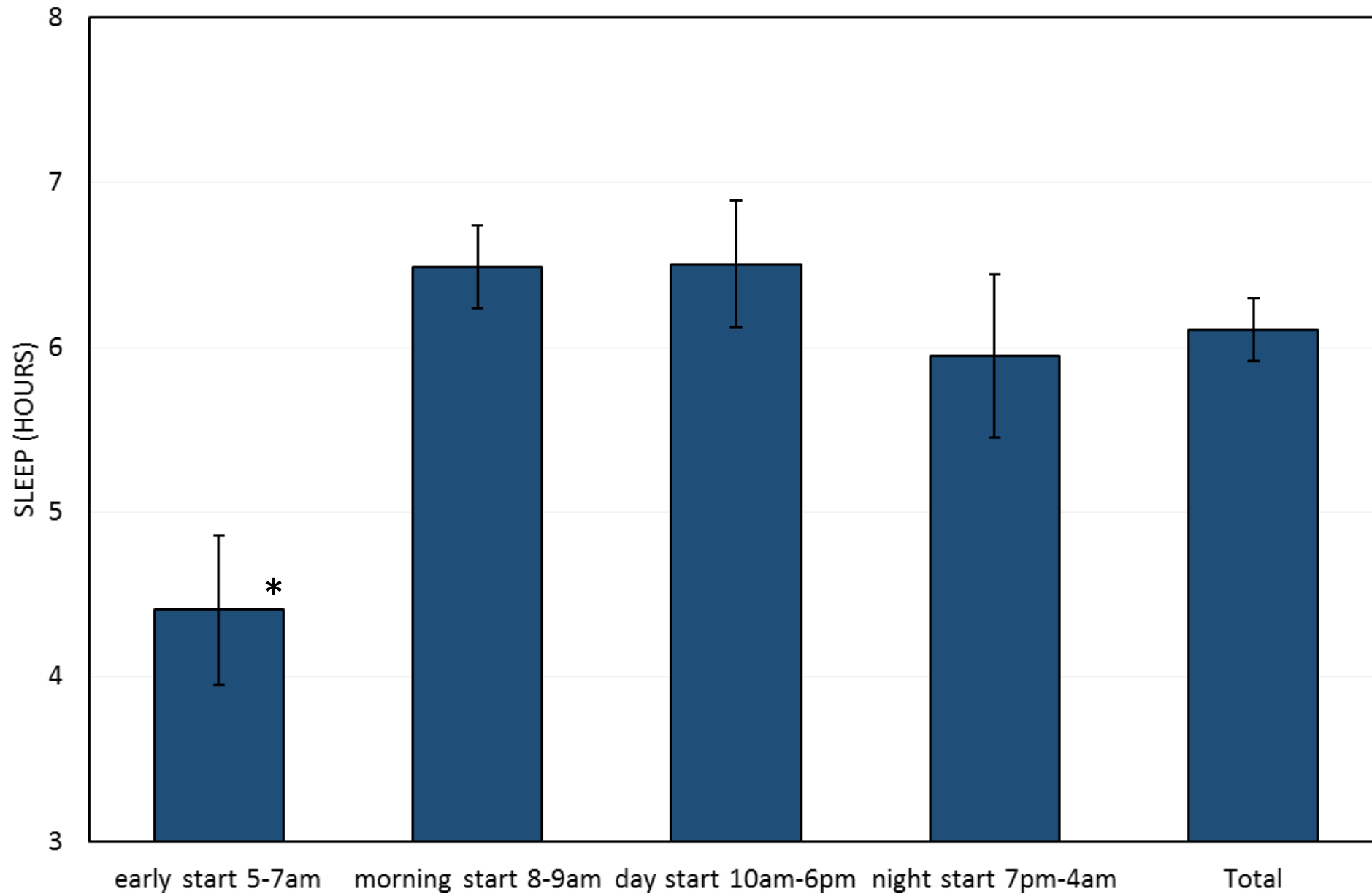
* p<0.05
N=24
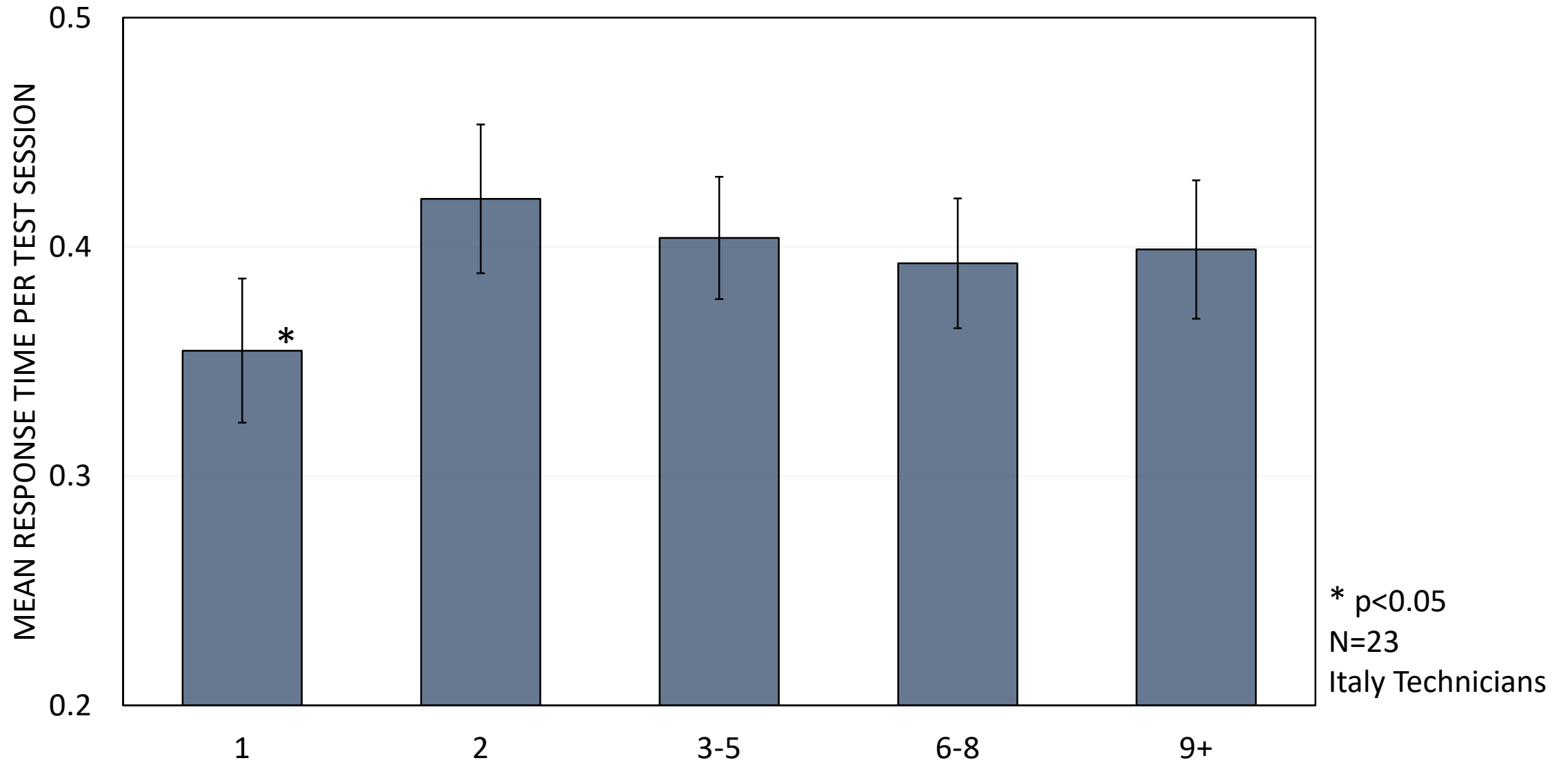Swedish & Finnish
RW & FW Pilots

Average Psychomotor Vigilance Task (PVT) Response Times
Differences by collection phase and work period start time
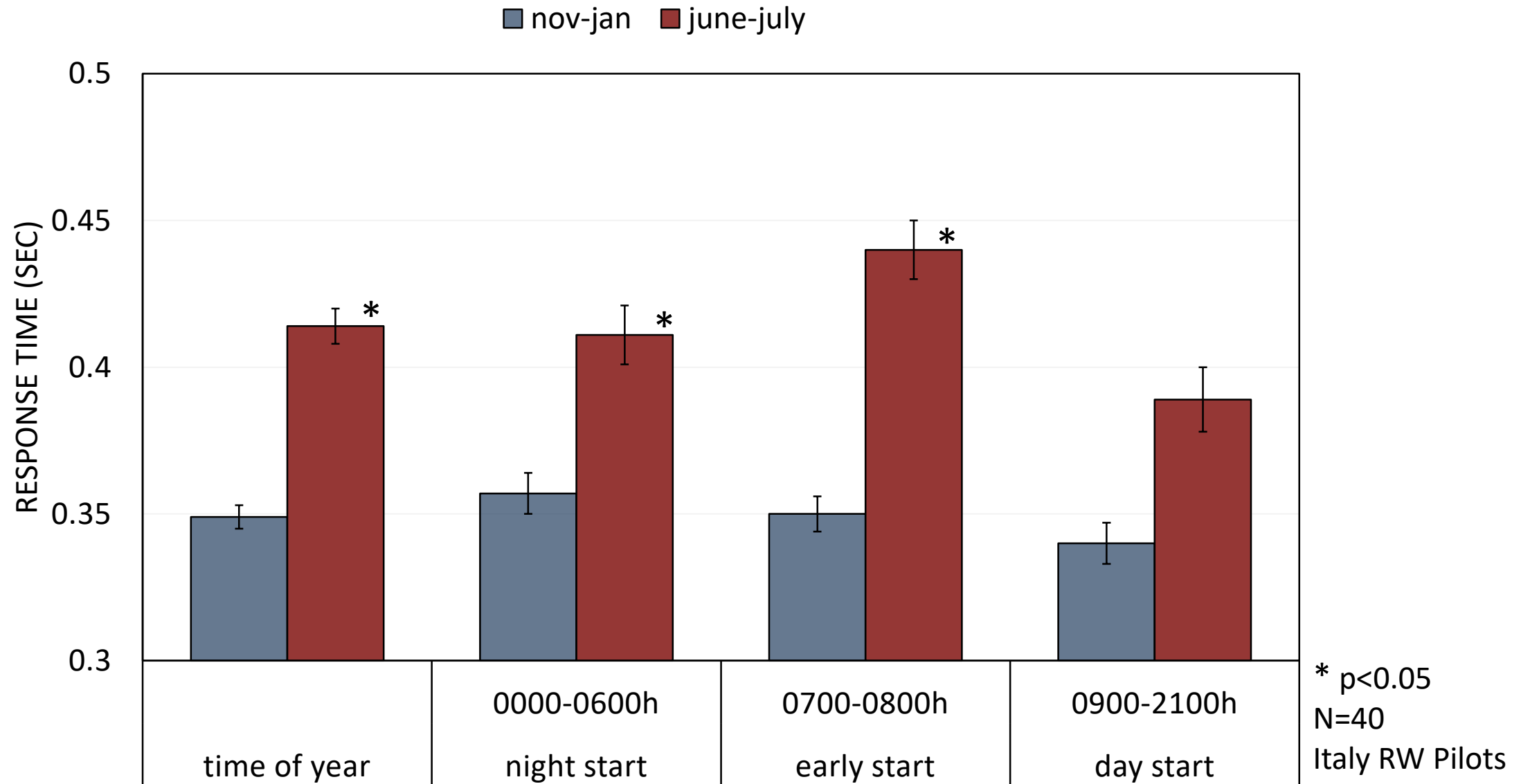
Mean Response Times by Duty Period
Differences by consecutive days

Closing statements

- Firstly, these results are preliminary, so caution is needed to not make any general conclusions just yet

- The length of work blocks do not generally seem to be an issue in sleep or PVT measures, even after 9+ consecutive work days (but there are exceptions)

- The biggest issue appears to be sleep obtained in the 24h prior to day 1 (but this is not statistically reflected in PVT results for some datasets)

- All study data has been approved for scientific publication

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