Highlights from

Mental Workload at Transitions between Multiple Devices in Personal Information Management

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Personal information, Multiple devices

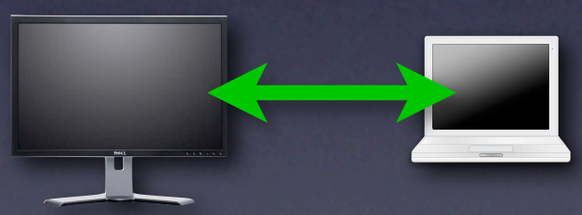
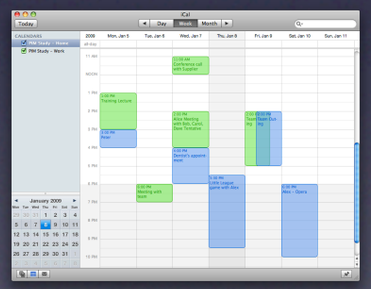
Problem Domain

- Is there a difference in mental workload when users perform tasks using multiple devices?
- Increased perception of task difficulty?
- Does switching to alternate strategies result in lower workload?

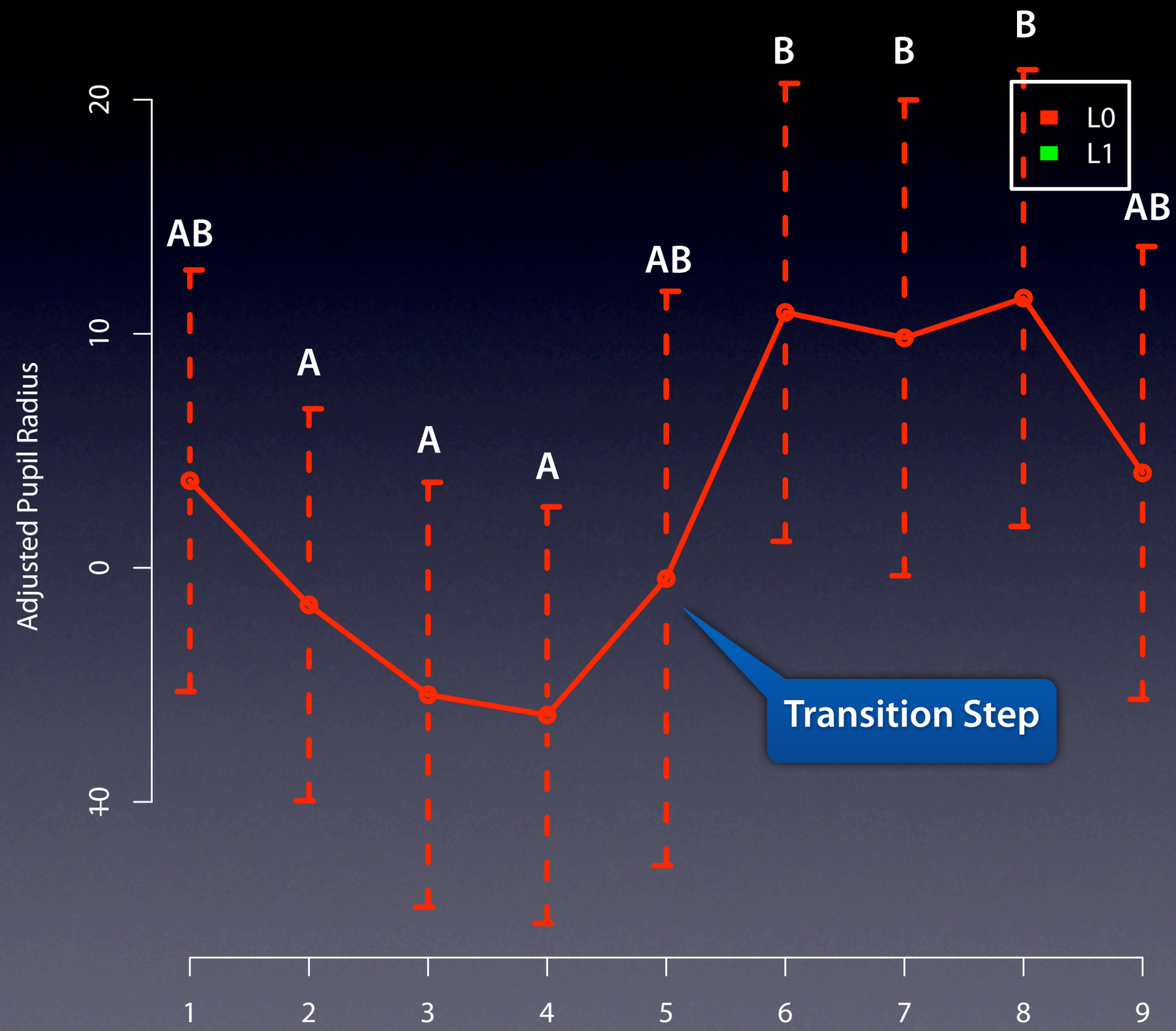
Mental workload

- *[...] "that portion of operator information processing capacity or resources that is actually required to meet system demands."* *[O'Donnell and Eggemeier, 1986]*
- Subjective measure: NASA Task Load Index (TLX)
- Physiological measure: Task-Evoked Pupillary Response (TEPR)

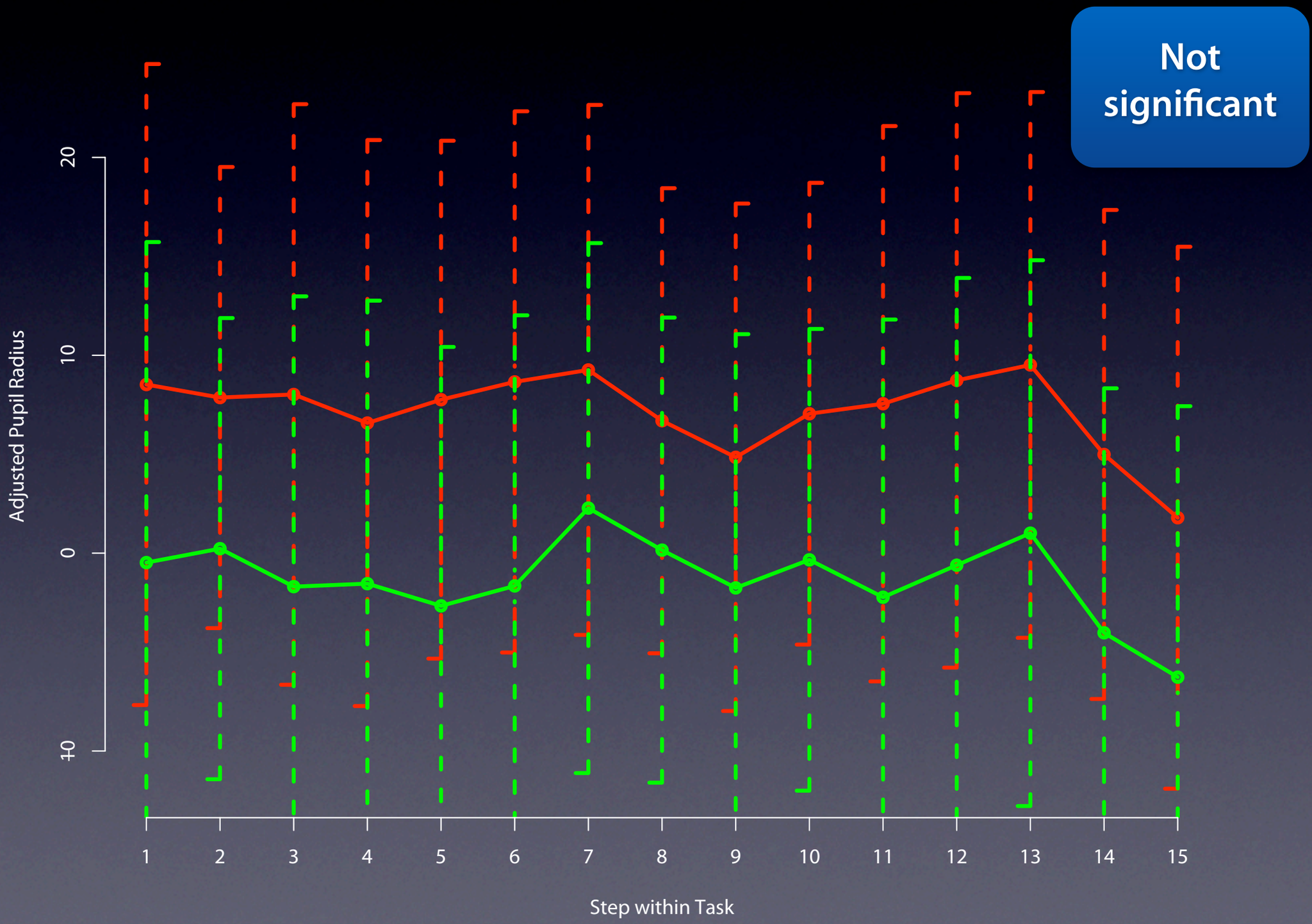
Experiment design

	Files	Calendar	Contacts
Level 0	 No support for file migration	 Multiple paper calendars	 No support for synchronization
Level 1	 System supports file migration	 Online calendars	 Devices support synchronization

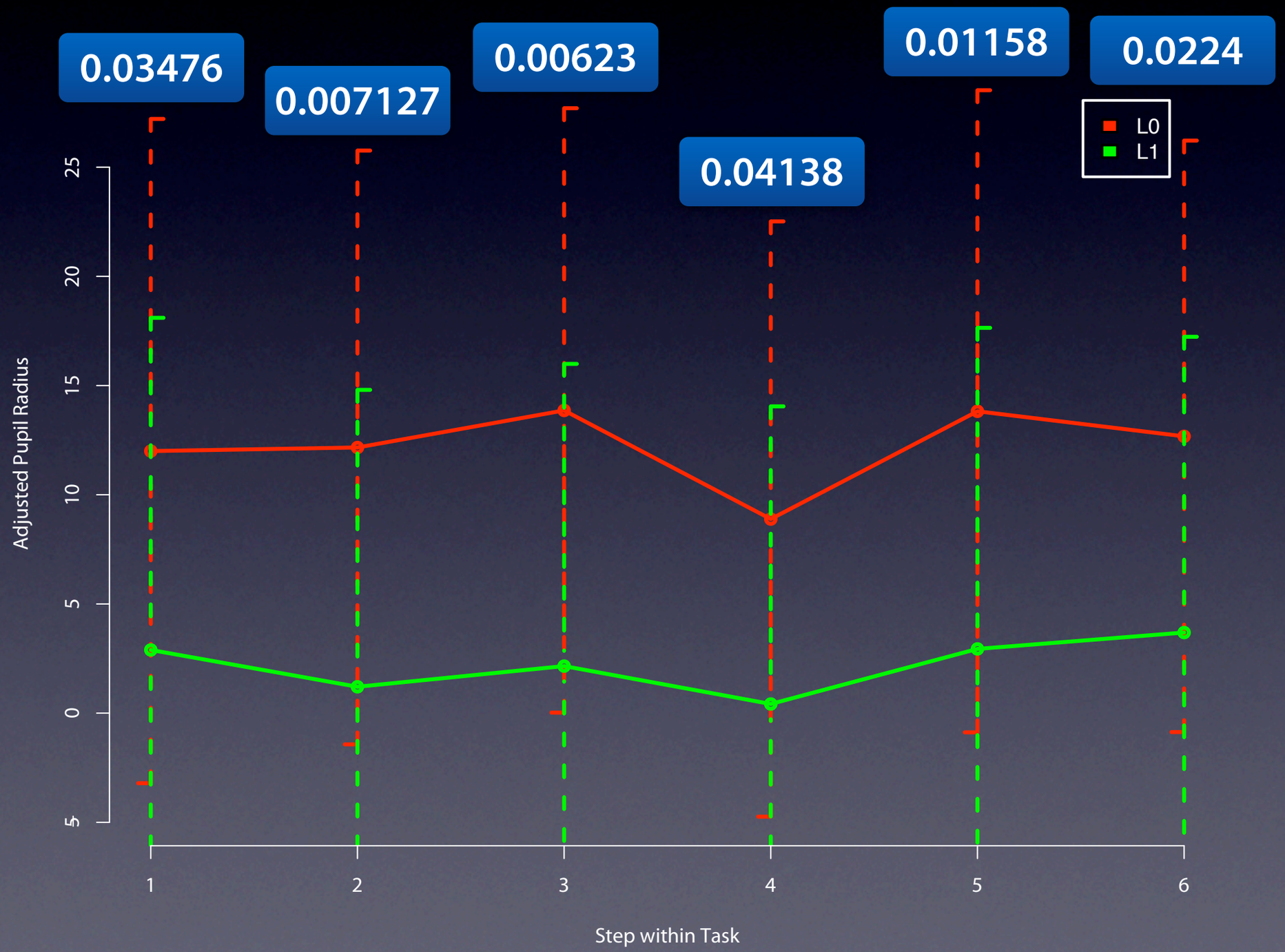
Files task, L0 — TEPR



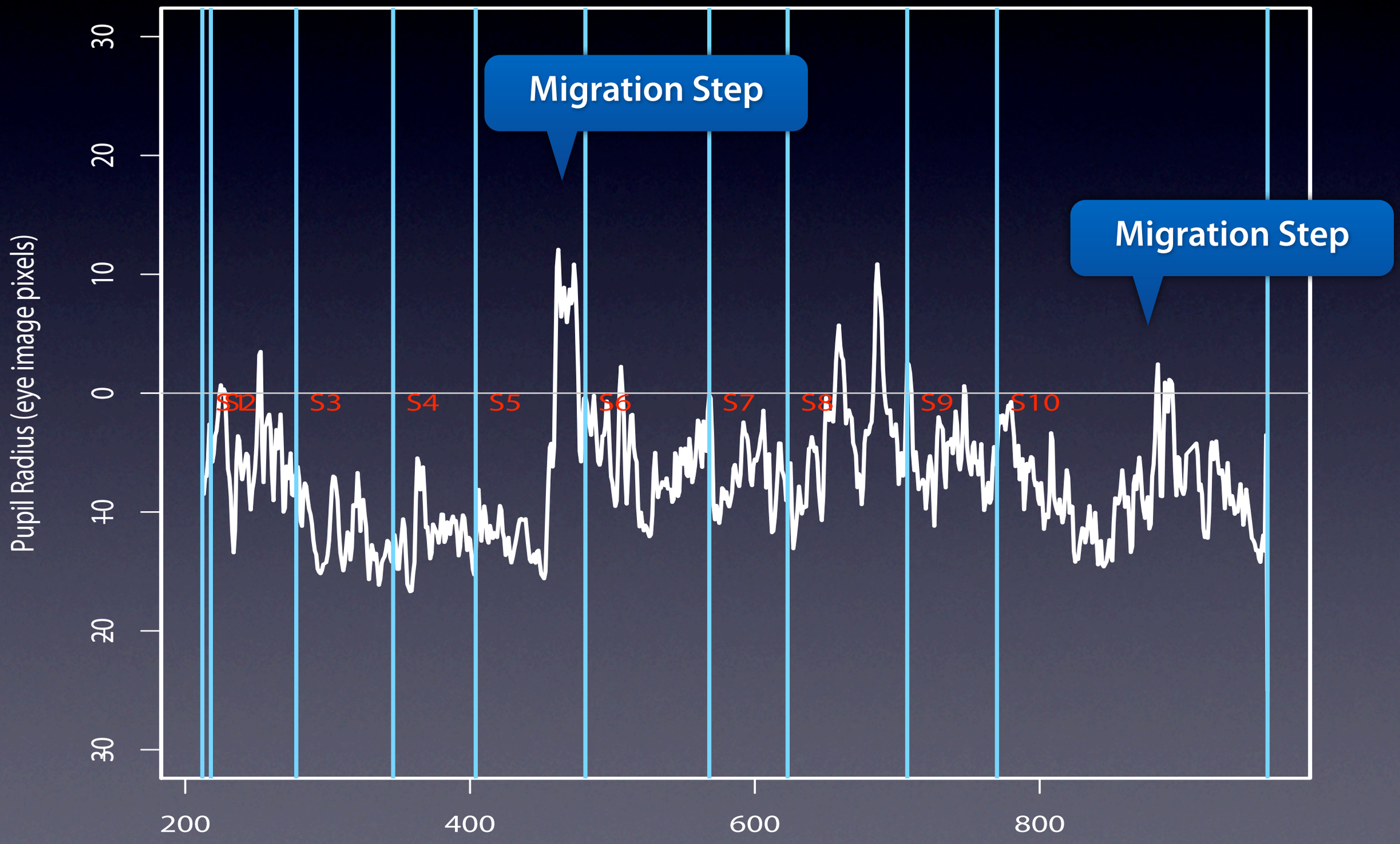
Calendar task — TEPR



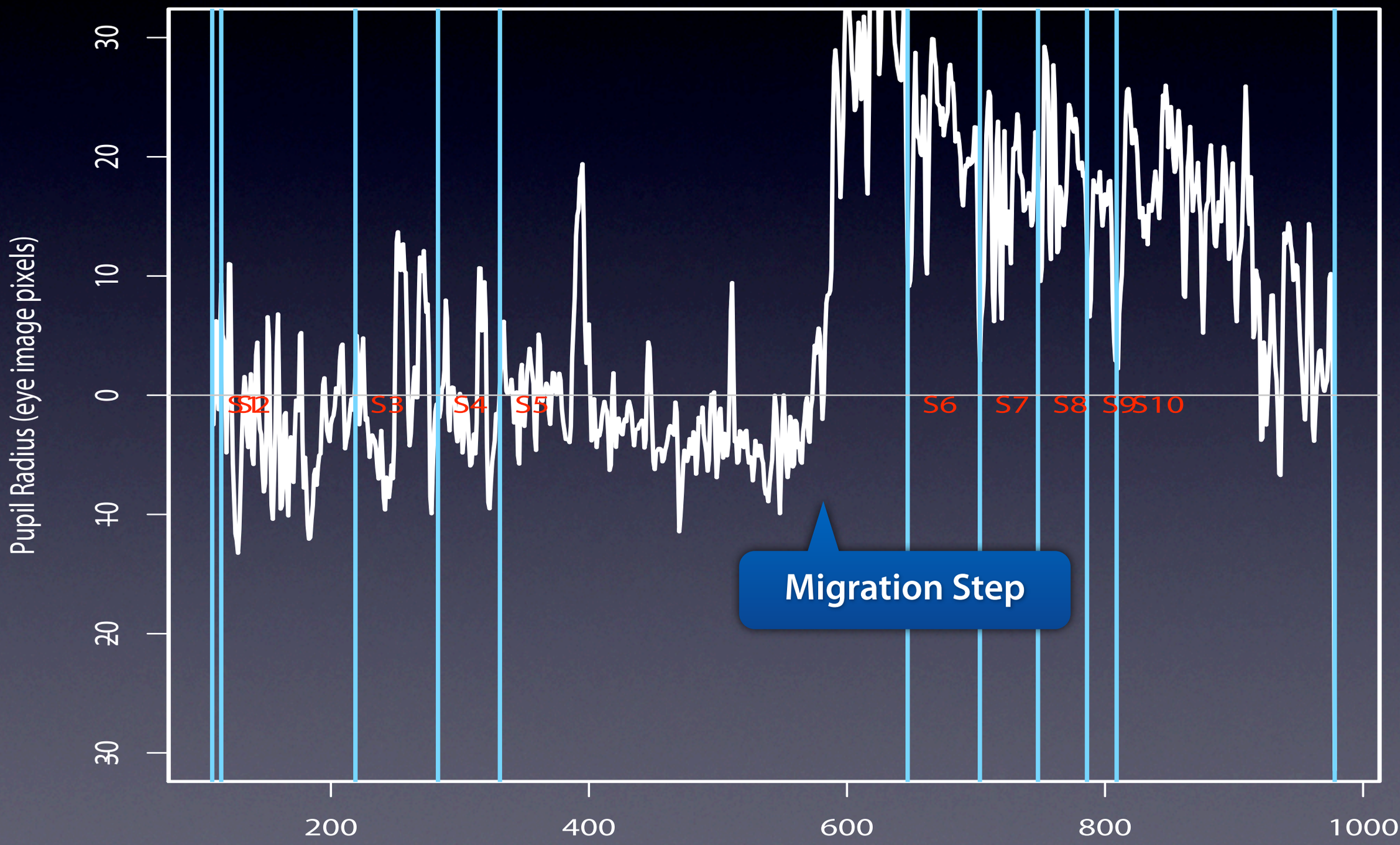
Contacts task — TEPR



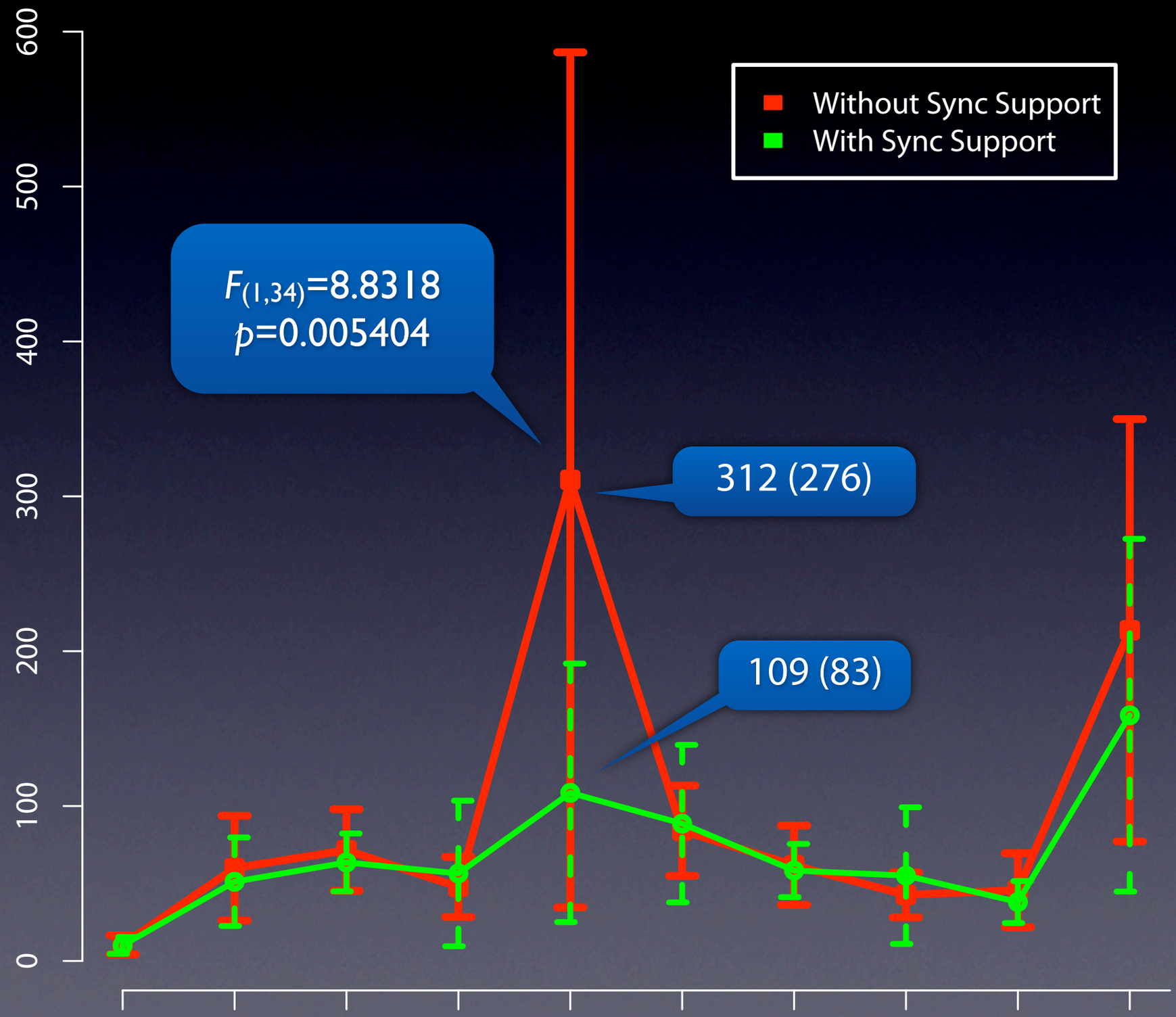
Files L0: Migration Step



Files L0: Migration Step



Files — Time

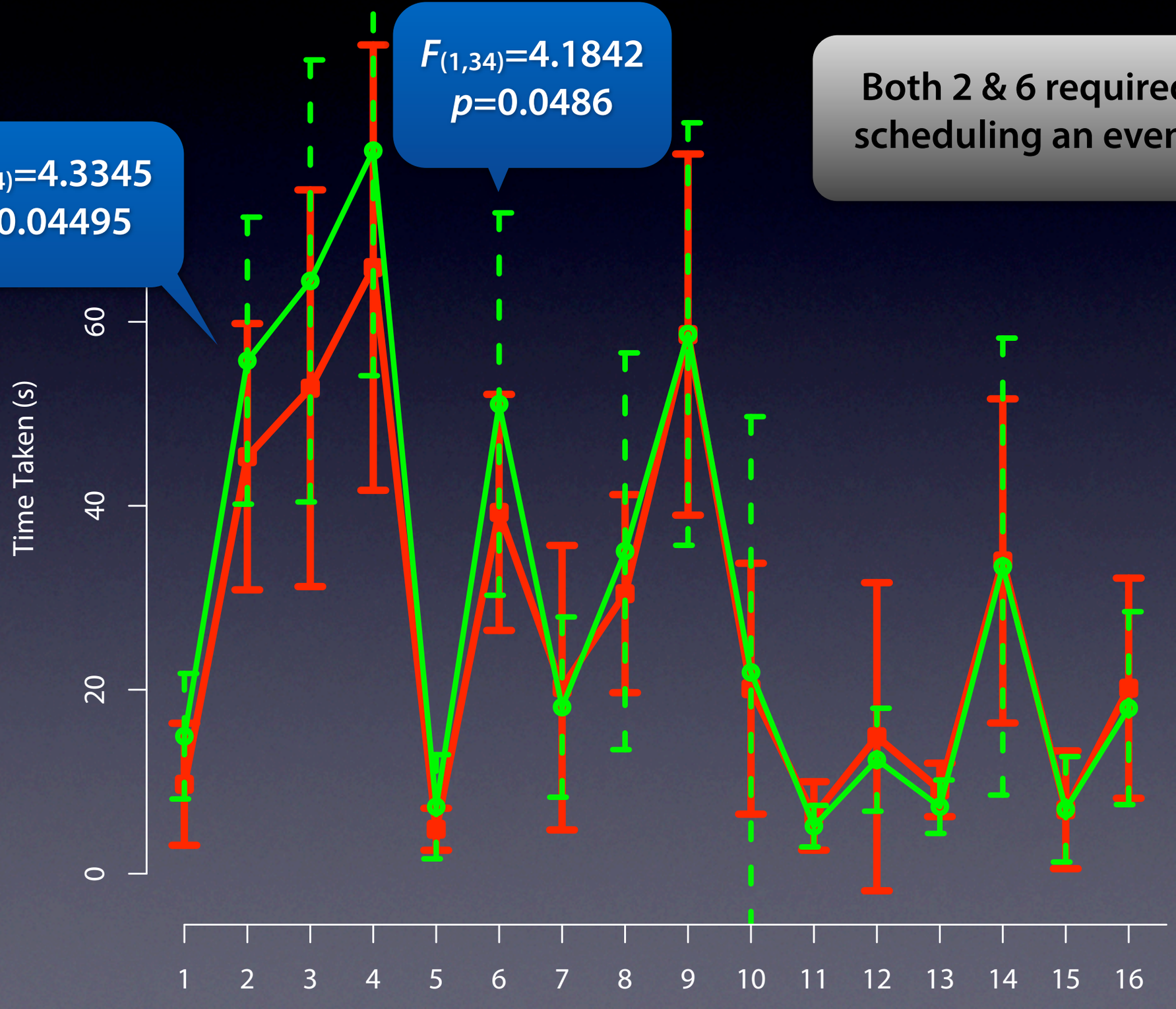

600
500
400
300
200
100
0
Without Sync Support
With Sync Support
$F_{(1,34)}$=8.8318
p=0.005404
312 (276)
109 (83)

Calendar task — Time

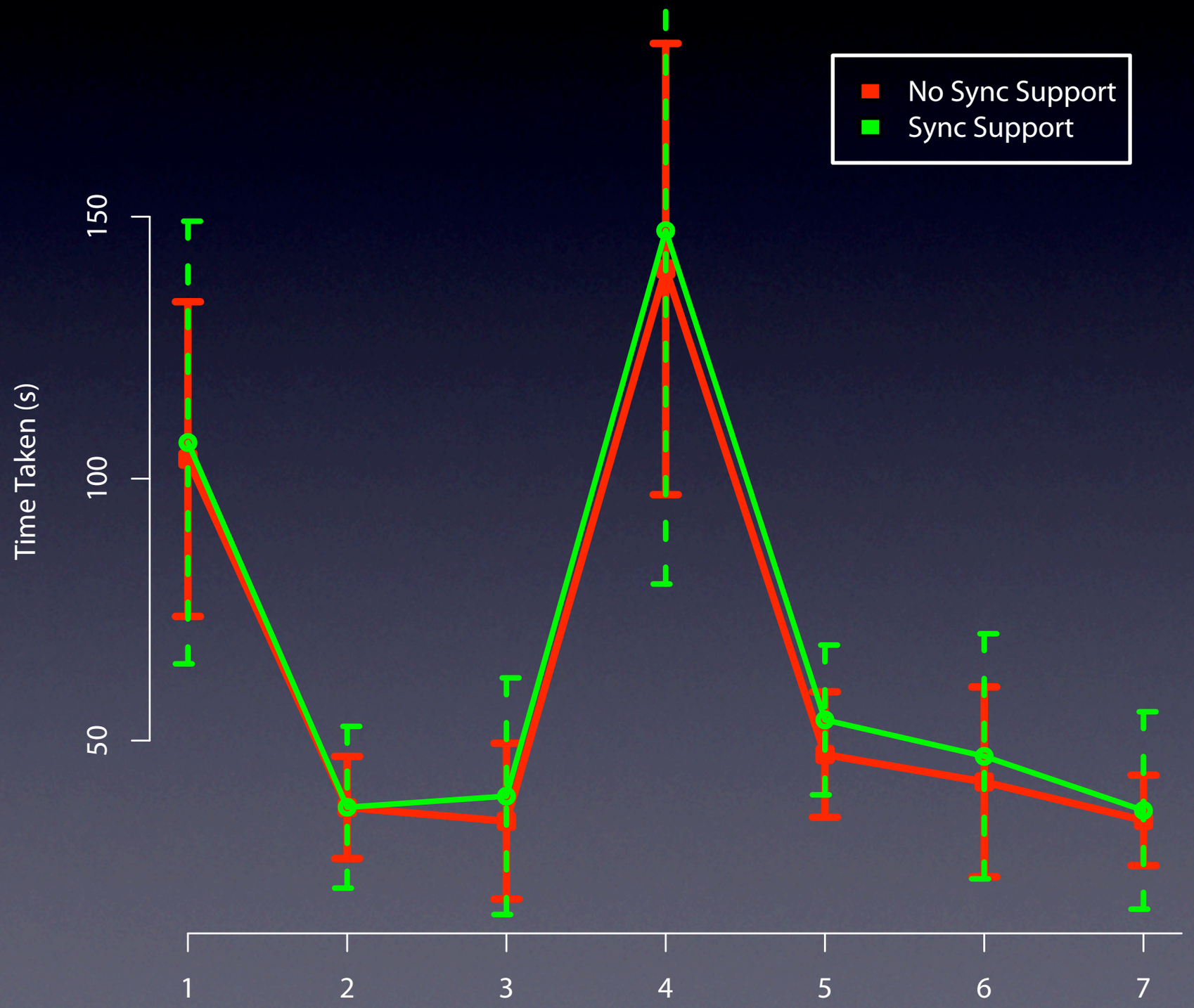
$F_{(1,34)}$=4.3345
p=0.04495

$F_{(1,34)}$=4.1842
p=0.0486

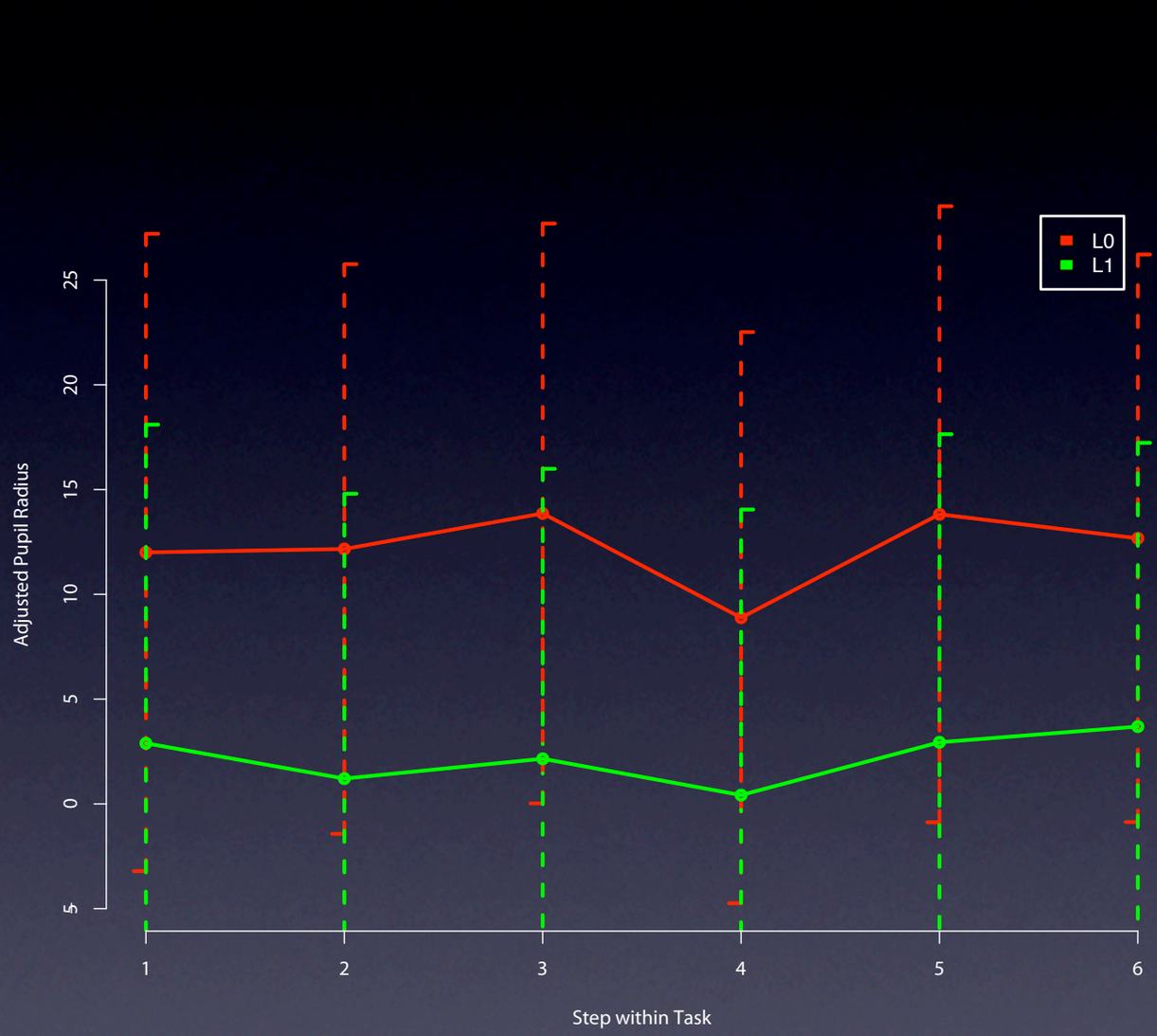
Both 2 & 6 required scheduling an event

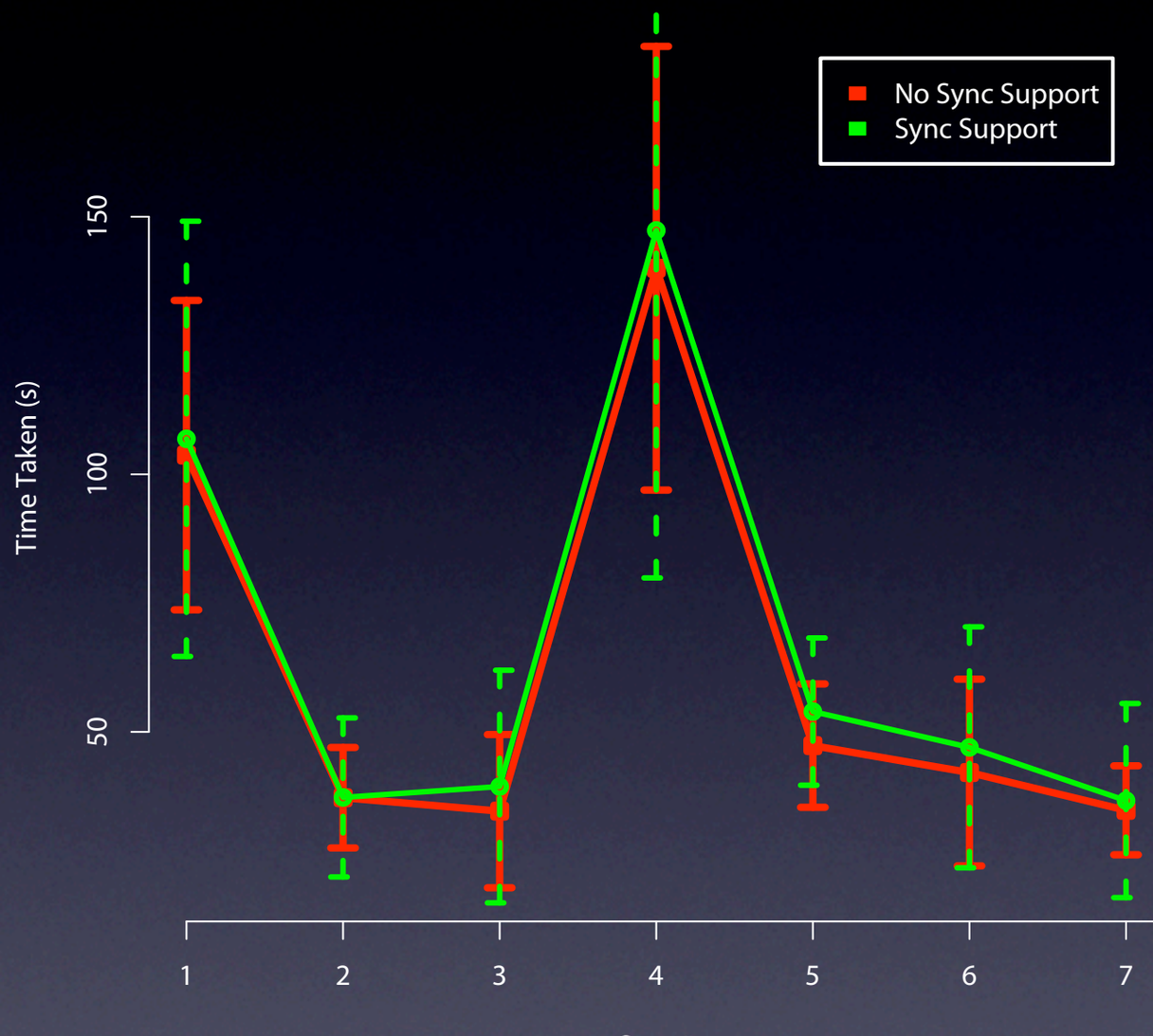


Contacts task — Time



Calendar task — TEPR, Time



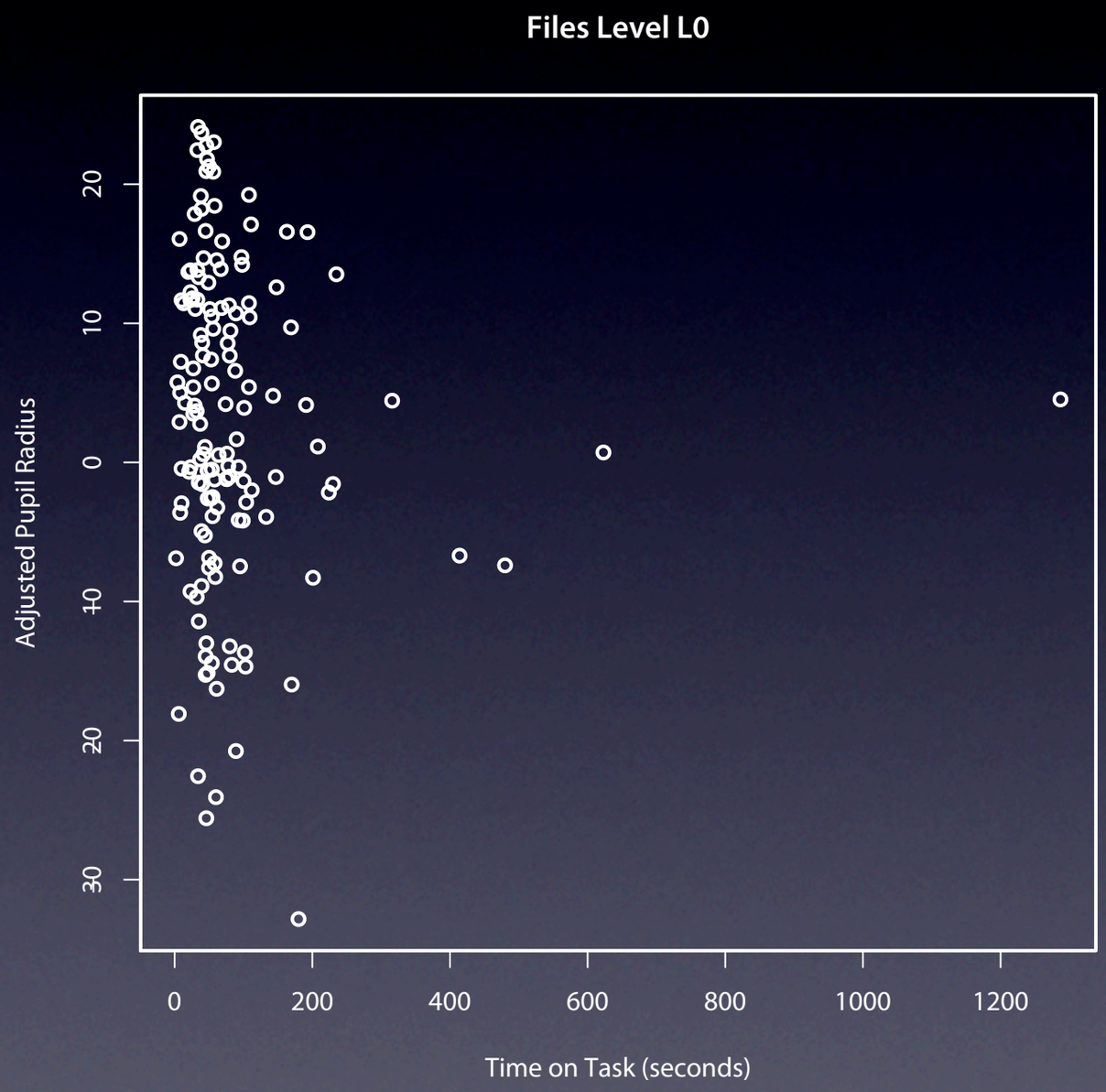


Same time, but higher workload in L0:
More mental workload for same performance

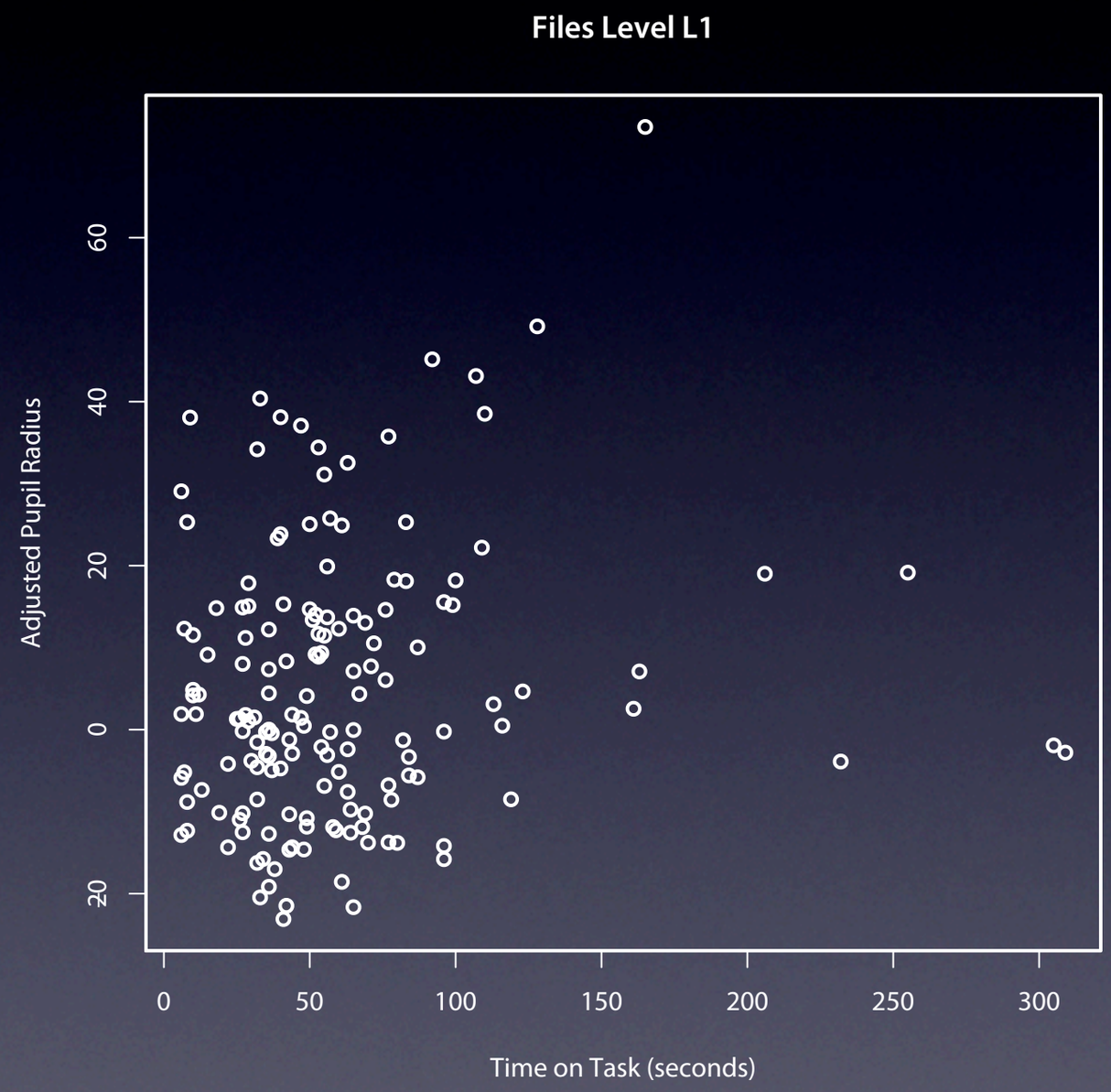
Workload — Time

- TLX correlation significant only for Files
- No significant correlation between TEPR and time.
- Sensitivity of tasks?

TEPR: Files

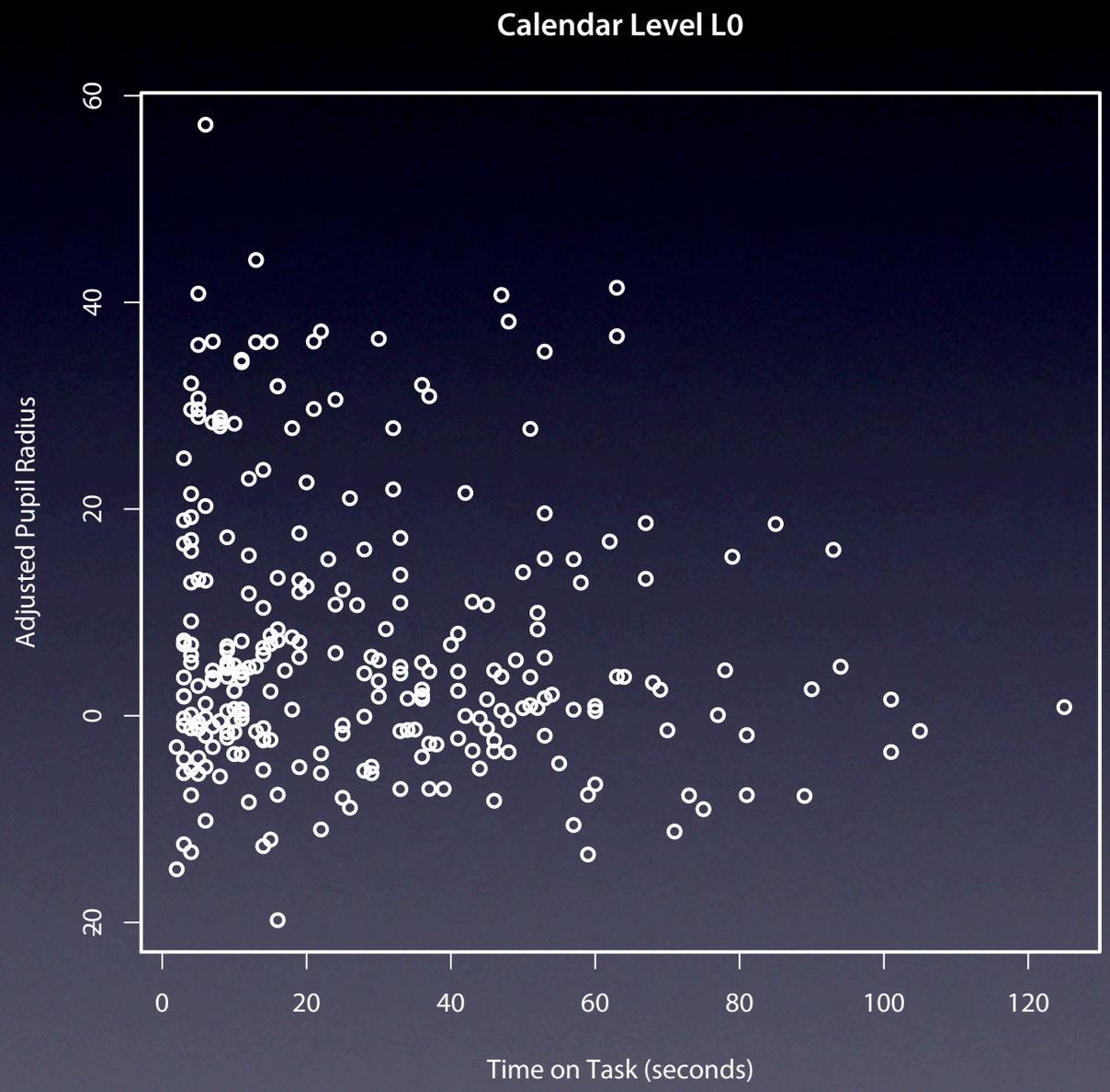


r=-0.062, p=0.46

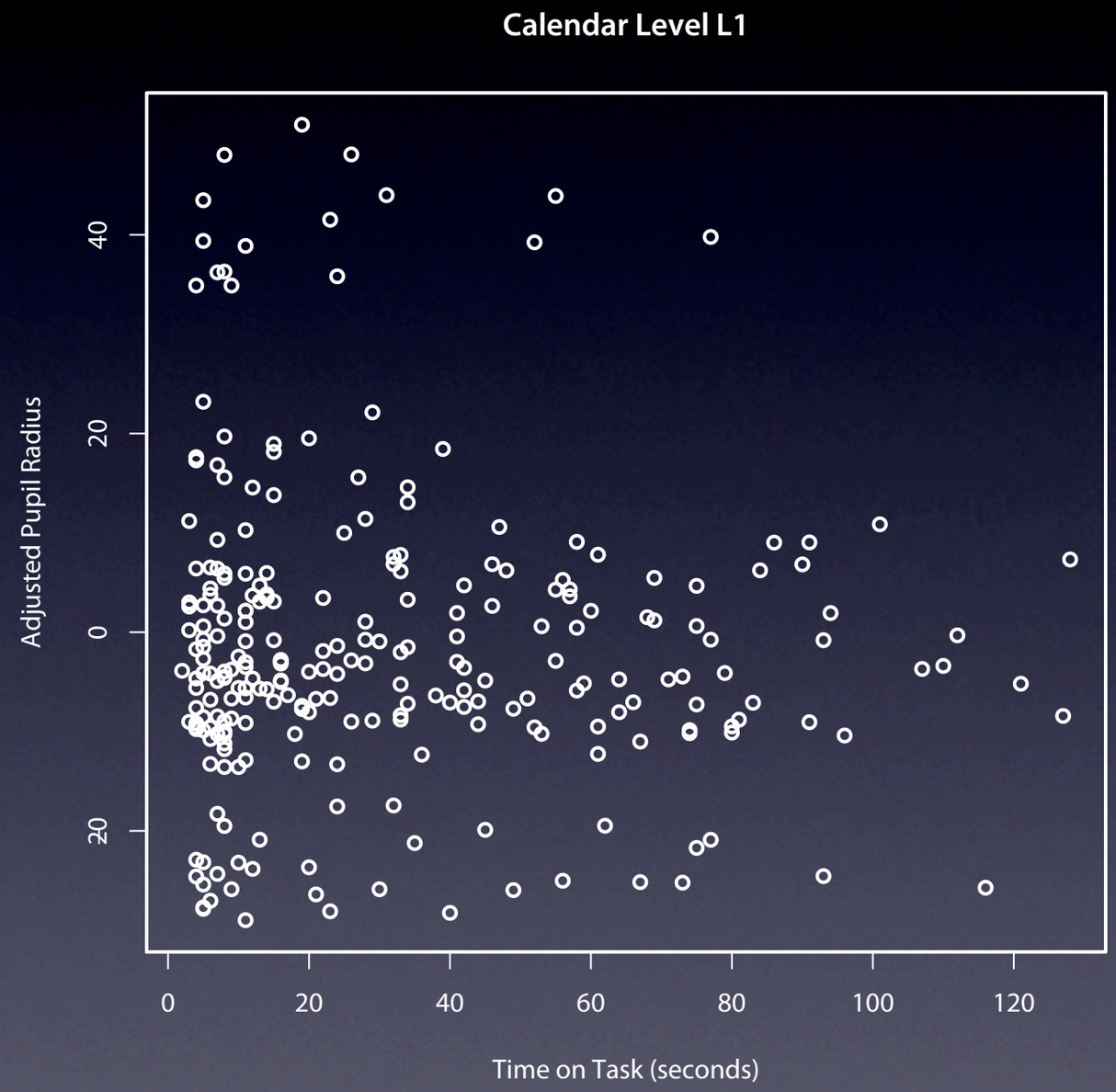


r=0.15, p=0.06

TEPR: Calendar

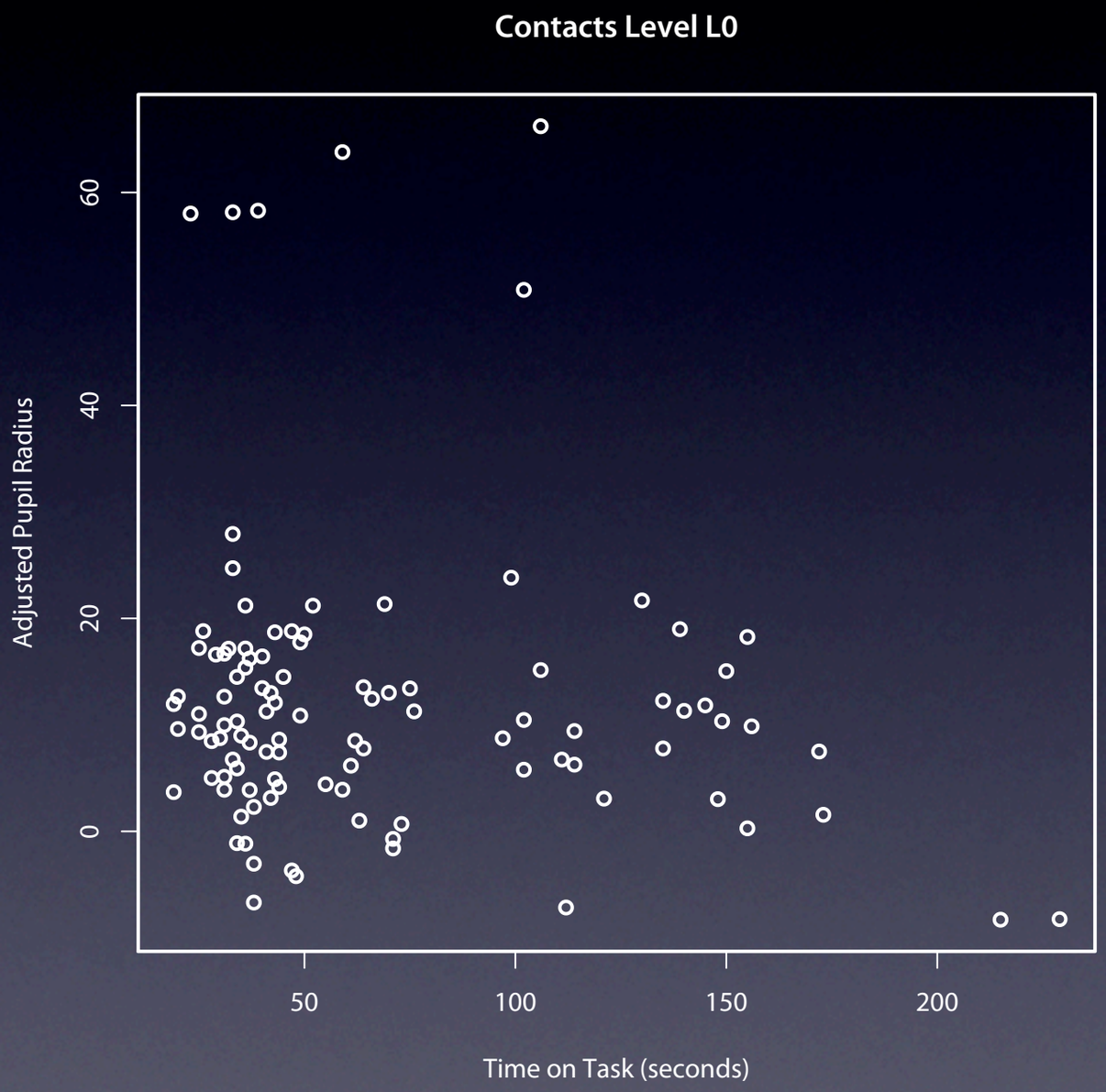


r=–-0.11, p=0.08

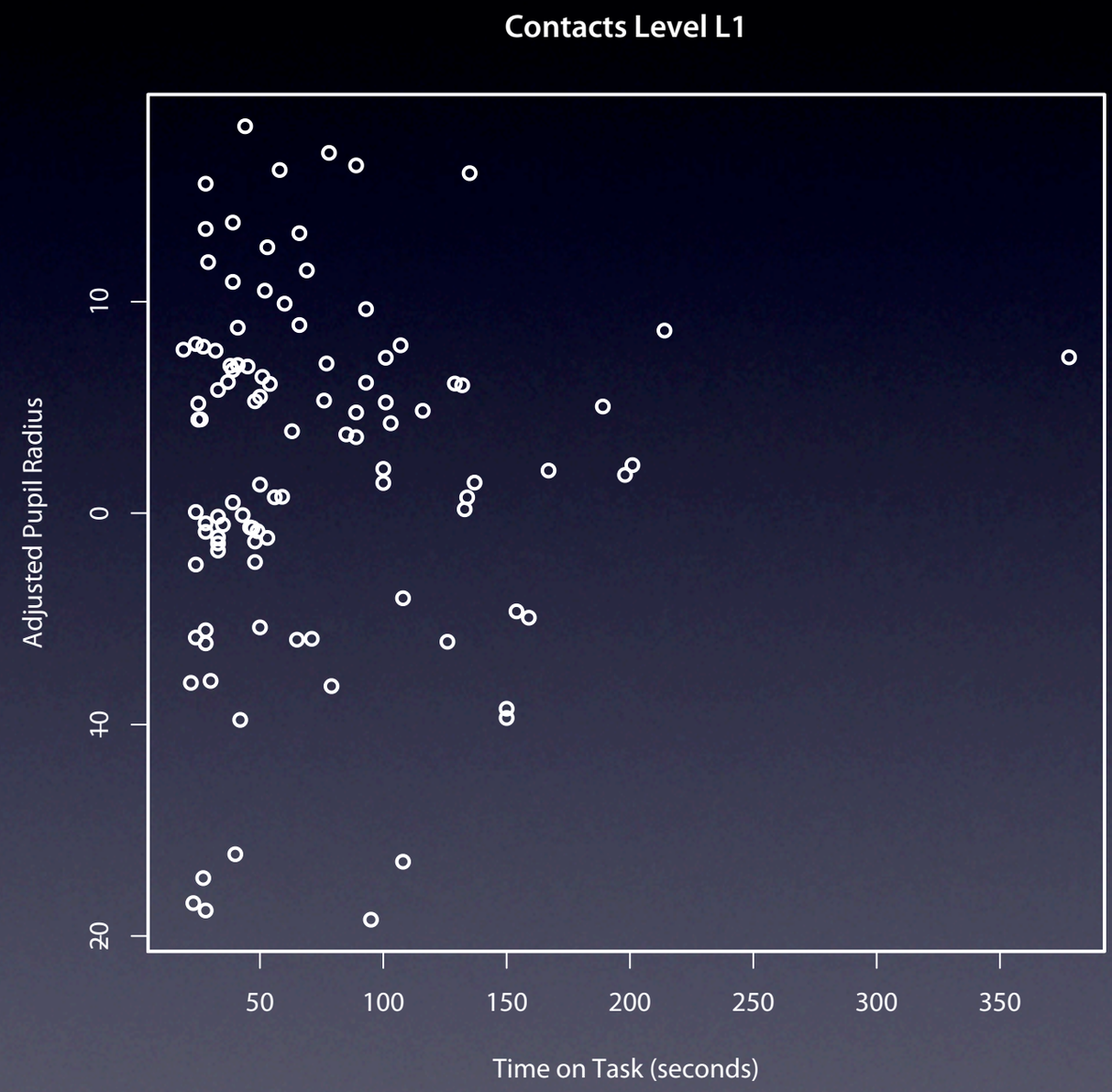


r=–0.067, p=0.28

TEPR: Contacts



r=–0.013, p=0.18



r=0.415, p=0.68

Mental Workload in PIM

- Workload is a useful metric to understand PIM at a sub-task level.
- Provides alternative to performance measurement (e.g. same performance but high workload.)
- Continuous measure of workload provides important information about sub-tasks that subjective measures could not capture

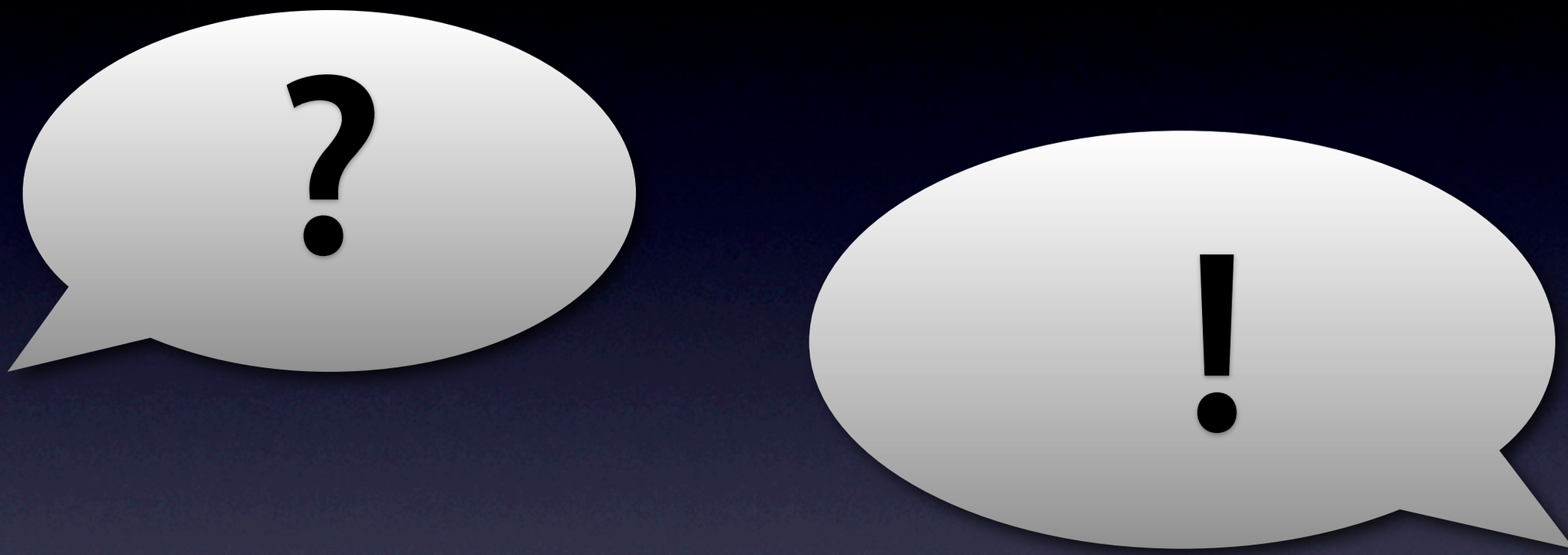
Holistic Usability

- Traditional usability: effectiveness, efficiency and satisfaction (ISO definition)
- Computing is situated, cognition is distributed
- ∴ Must evaluate tools & tasks *in situ*.
- Device transitions are not designed well.

Future work: Hot Cognition

- Emotion, pleasure, frustration, likability
- Maslow's hierarchy applied to interaction:
  - 1: Function, 2: Usability, 3: Pleasure.
- Usability is necessary, but not sufficient.
- Quality of life, Perceived ease of use/ usability metrics, happiness.

Questions & comments



Thank you!