Socio-Technical Work-Rate Increase Associates With Changes in Work Patterns in Online Projects

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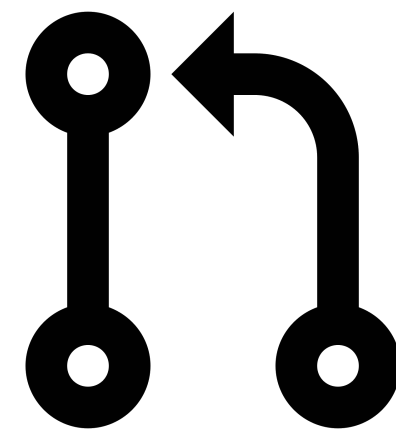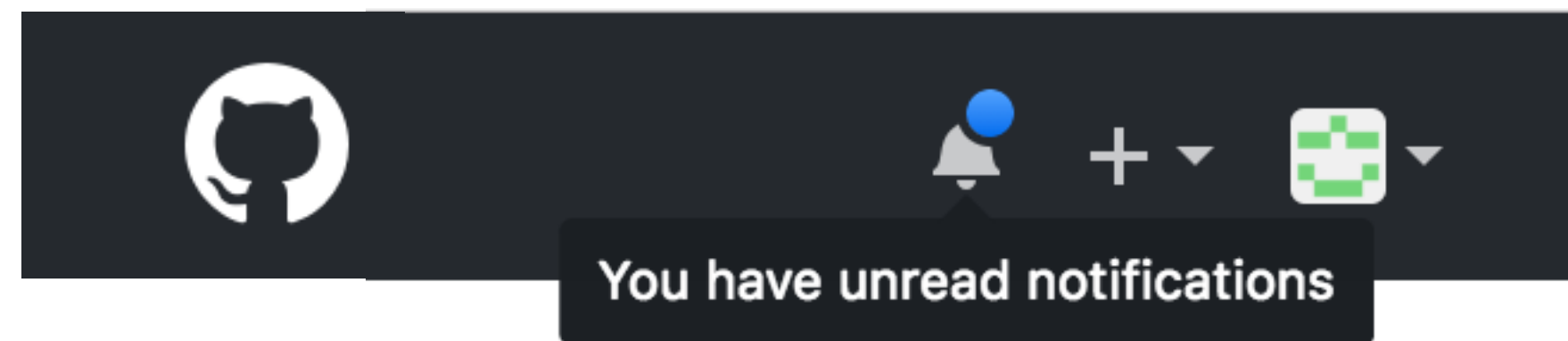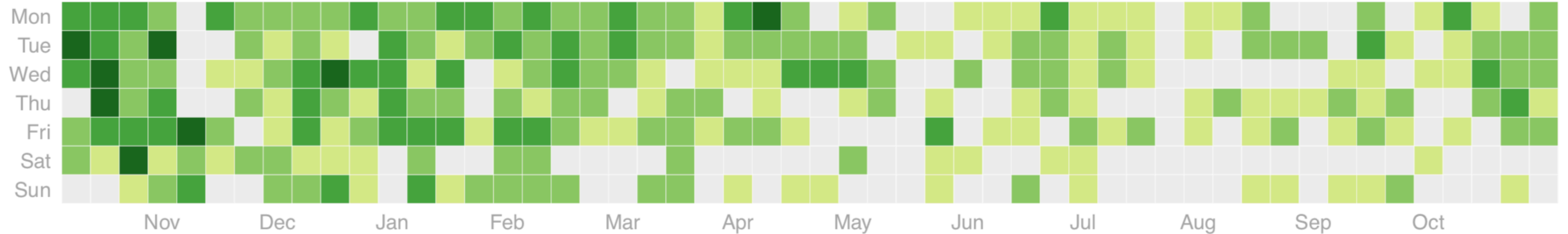Vladimir Filkov
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High workload

ONE GITHUB DEVELOPER: Number of repos (2013–11–25 : 2014–11–23) 0 1 3 5 8

High work-rate, high stress

- ❖ GitHub is like being onstage
  (Dabbish et al. 2012), (Marlow et al. 2013)

- ❖ Communication overload causes stress and
  reduces productivity
  (Reinke and Chamorro-Premuzic 2014), (Kalman
  and Rafaeli 2011), (Reinecke et al. 2017)

- ❖ Social pressure to respond quickly is associated
  with burnout and anxiety
  (Reinecke et al. 2017)

- ❖ Multi-tasking common, causes stress
  (Vasilescu et al., 2016), (Mark et al., 2008)
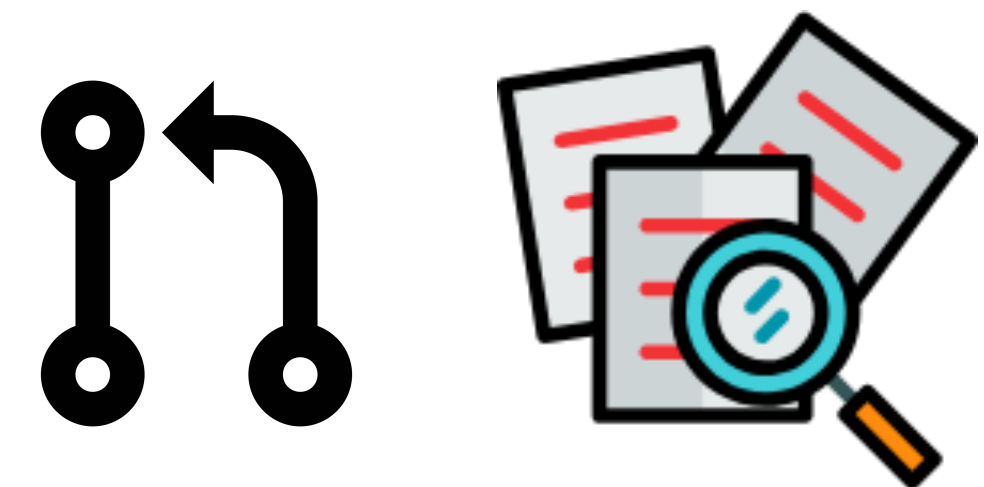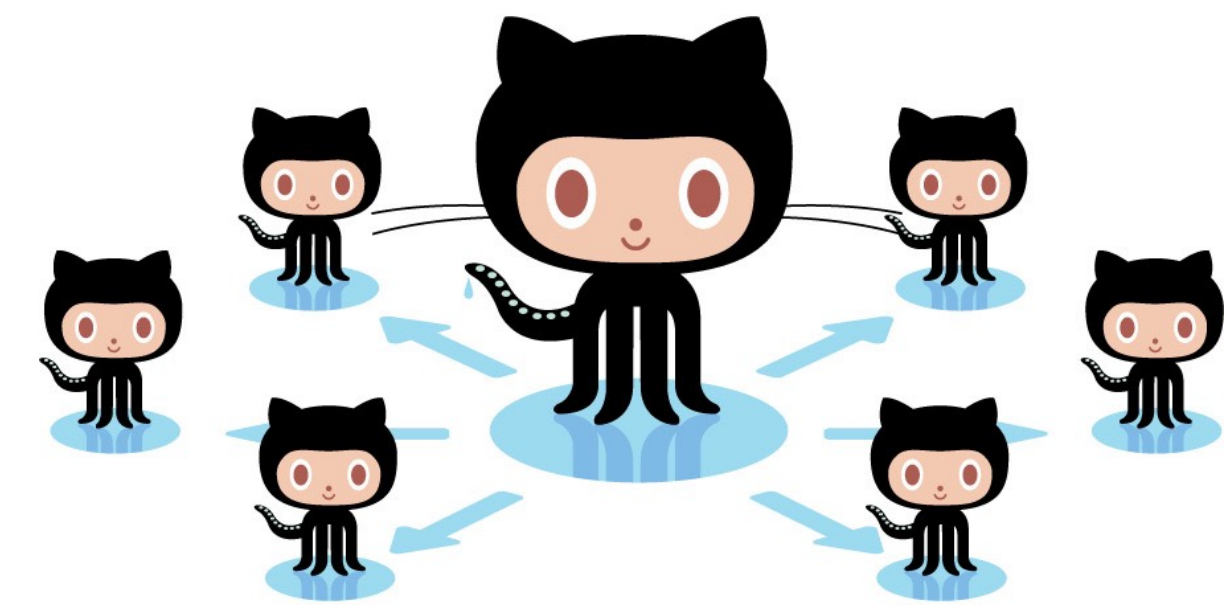
Social workload

? Prevalence of high work-rates

? Perceived Causes and Impacts of Stress

? Effects of increased workload on developers' work patterns

Data mining + **Developer Survey**

Sample:
- 57K+ developers
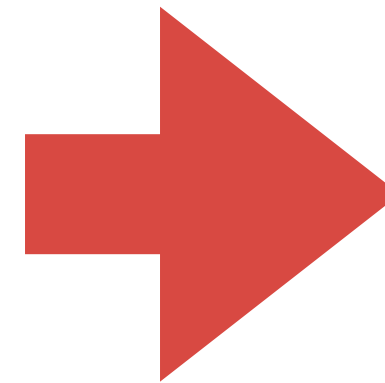- 10+ years of activity
- 150K+ repositories

Developer survey

Pilot Survey

45 Responses (13%)

Open-ended Questions

Survey

465 Responses (23%)

Likert-scale questions

What causes you work-related stress?

_____

_____

deadlines

_____

_____

My work-related stress is caused by deadlines.

☐ Strongly disagree

☐ Somewhat disagree

☐ Neither agree nor disagree

☐ Somewhat agree

☐ Strongly agree

Findings

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Abstract—Software developers work on a variety of tasks ranging from the technical, e.g., writing code, to the social, e.g., participating in issue resolution discussions. The amount of work developers perform per week (their work-rate) also varies and depends on project needs and developer schedules. Prior work has shown that while moderate levels of increased technical work and multitasking lead to higher productivity, beyond a certain threshold, they can lead to lowered performance.

Here, we study how increases in the short-term work-rate along both the technical and social dimensions are associated with changes in developers' work patterns, in particular communication sentiment, technical productivity, and social productivity. We surveyed active and prolific developers on GitHub to understand the causes and impacts of increased work-rates. Guided by the responses, we developed regression models to study how communication and committing patterns change with increased work-rates and fit those models to large-scale data gathered from traces left by thousands of GitHub developers. From our survey and models, we find that most developers do experience work-rate-increase-related changes in behavior. Most notably
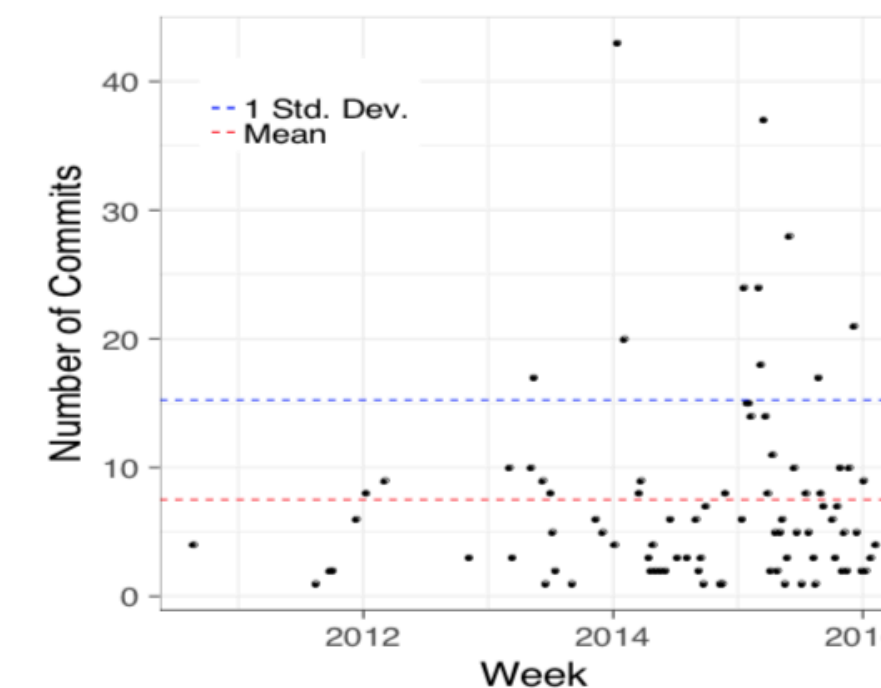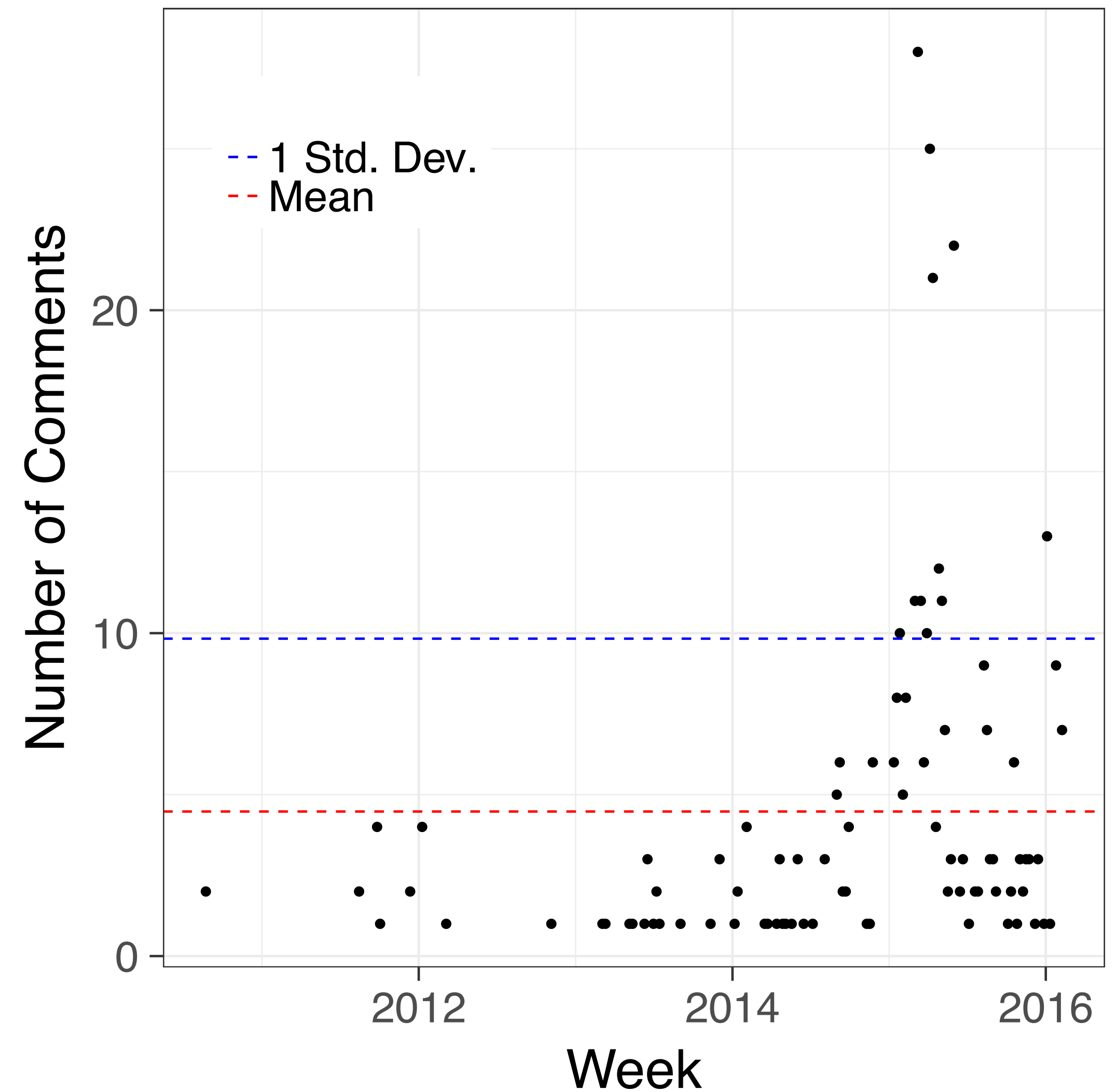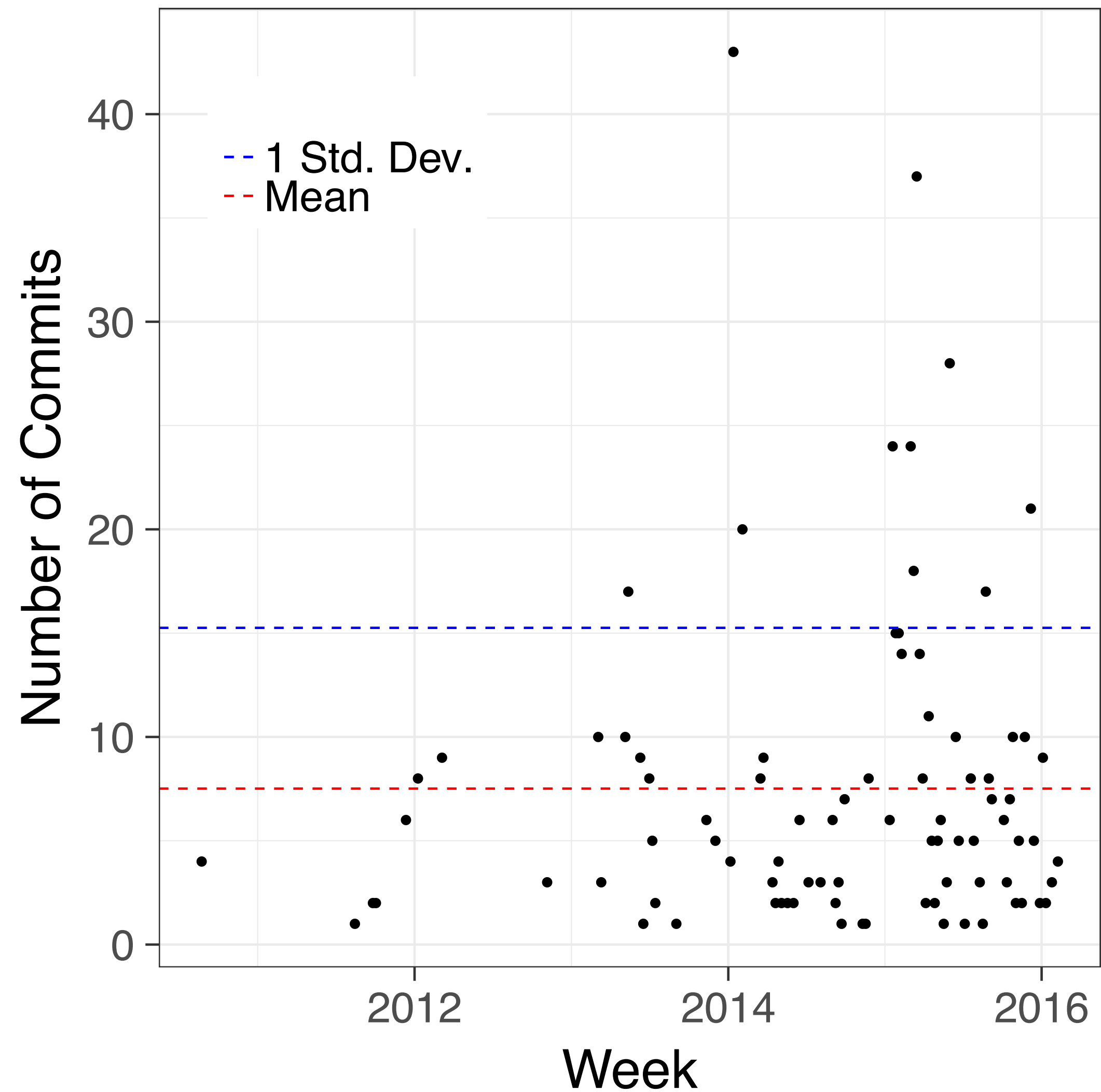
Fig. 1. Example number of commits per week for a prolific developer.

Traditional lines-per-day measures of work aggregate, to an extent, the work-rate of technical tasks. While coordination tasks figure in there too by association, it is not simple to
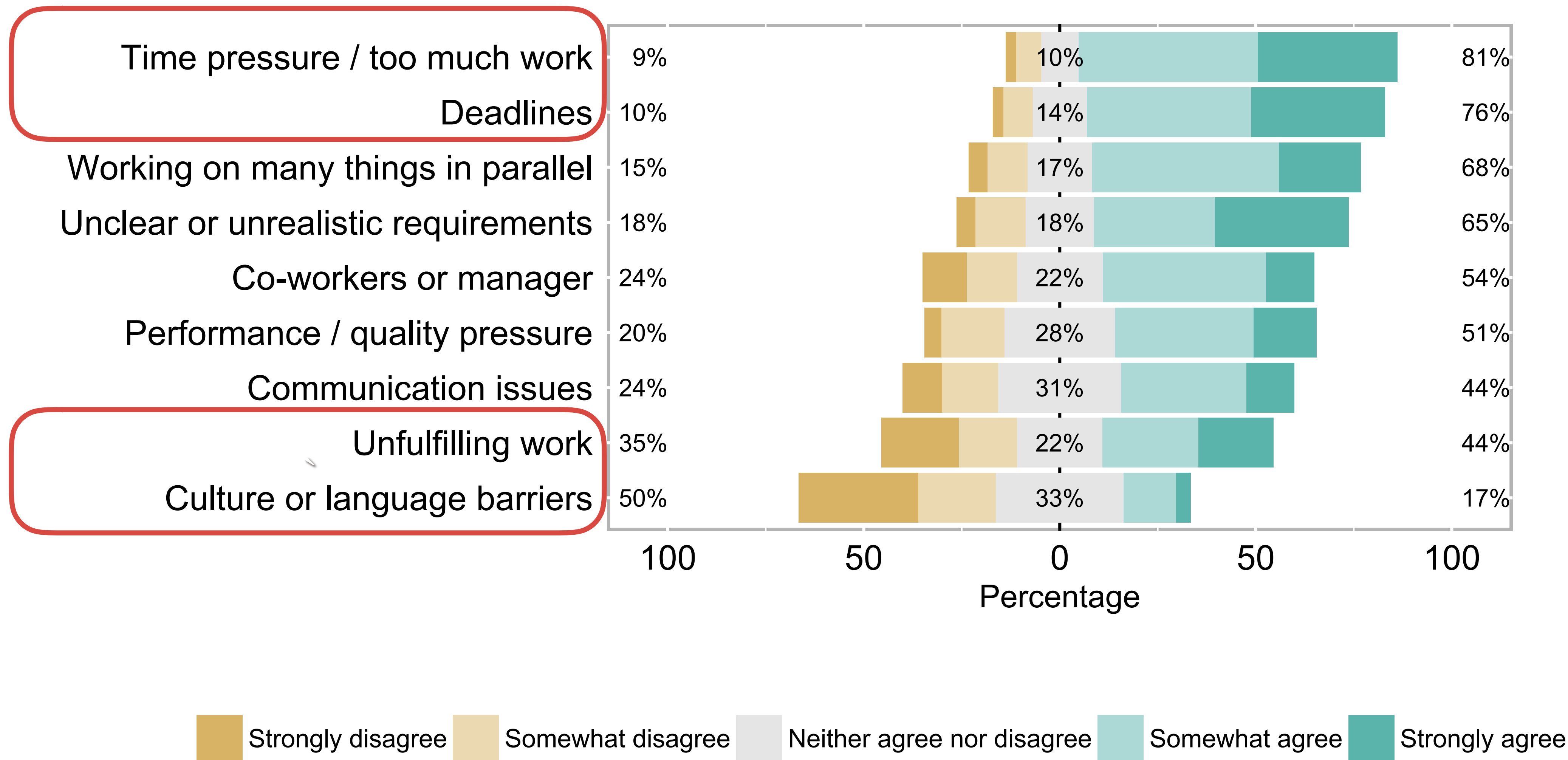
High work-rates common

Causes of workplace stress

Time pressure / too much work — 9% | 10% | 81%
Deadlines — 10% | 14% | 76%
Working on many things in parallel — 15% | 17% | 68%
Unclear or unrealistic requirements — 18% | 10% | 85%
Co-workers or manager — 10% | 24% | 14% | 76%
Performance / quality pressure — 15% | 20% | 17% | 68%
Communication issues — 18% | 24% | 18% | 65%
Unfulfilling work — 20% | 28% | 51%
Culture or language barriers — 24% | 31% | 44%
— 35% | 22% | 17%
— 50% | 33% | 17%

Percentage

Strongly disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Strongly agree

Impacts of stress

I work outside of my normal business hours — 11% — 19% — 70%

the number of hours I work is — 15% — 17% — 68%

my communications are terse — 10% — 19% — 64% / 70%

my communications are negative — 15% — 17% — 56% / 68%

I stop working on the project — 10% — 26% — 32% / 64%

I am productive — 5% — 39% — 16% / 56%

I communicate — 30% — 38% — 15% / 32%

I produce high quality work — 52% — 32% — 5% / 16%

— 25% — 45% — 15%

— 50% — 45% — 5%

Percentage
0   50   100

Much less   Somewhat less   About the same   Somewhat more   Much more
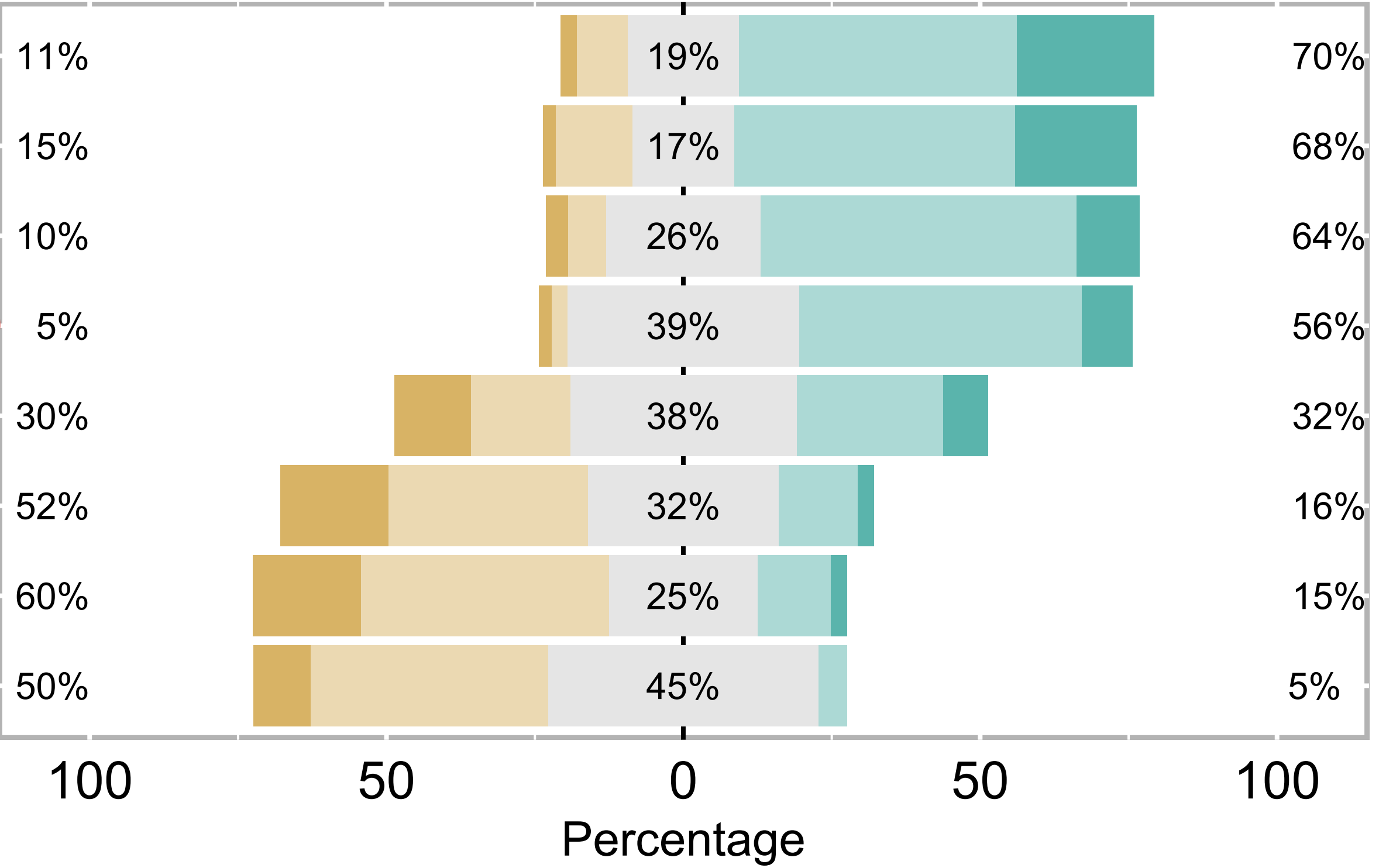
Senti4SD
(Cafelato et al., 2018)

Empirical Study

Multitasking dimensions

Working sequentially   vs.   Within-day multi-tasking
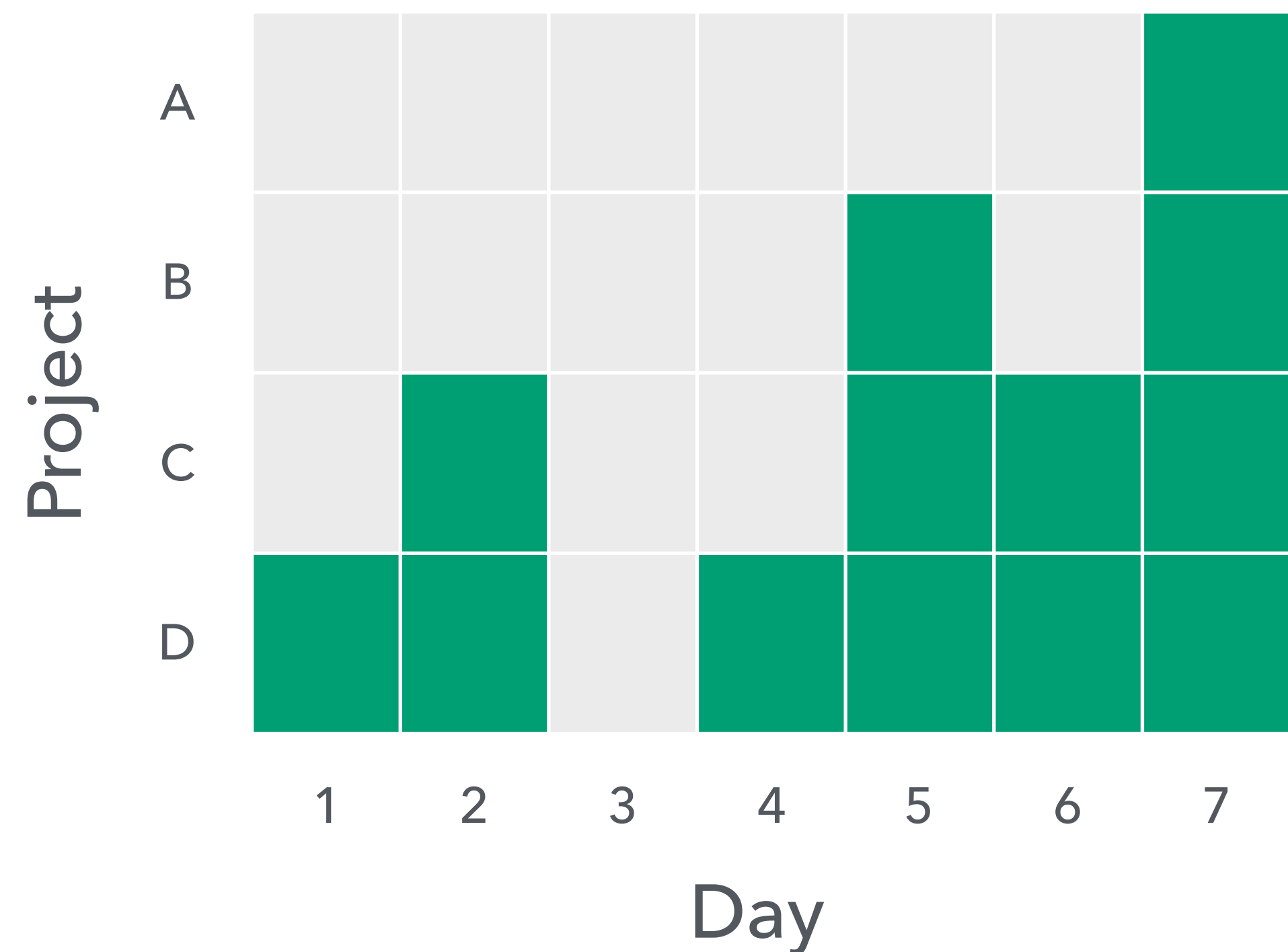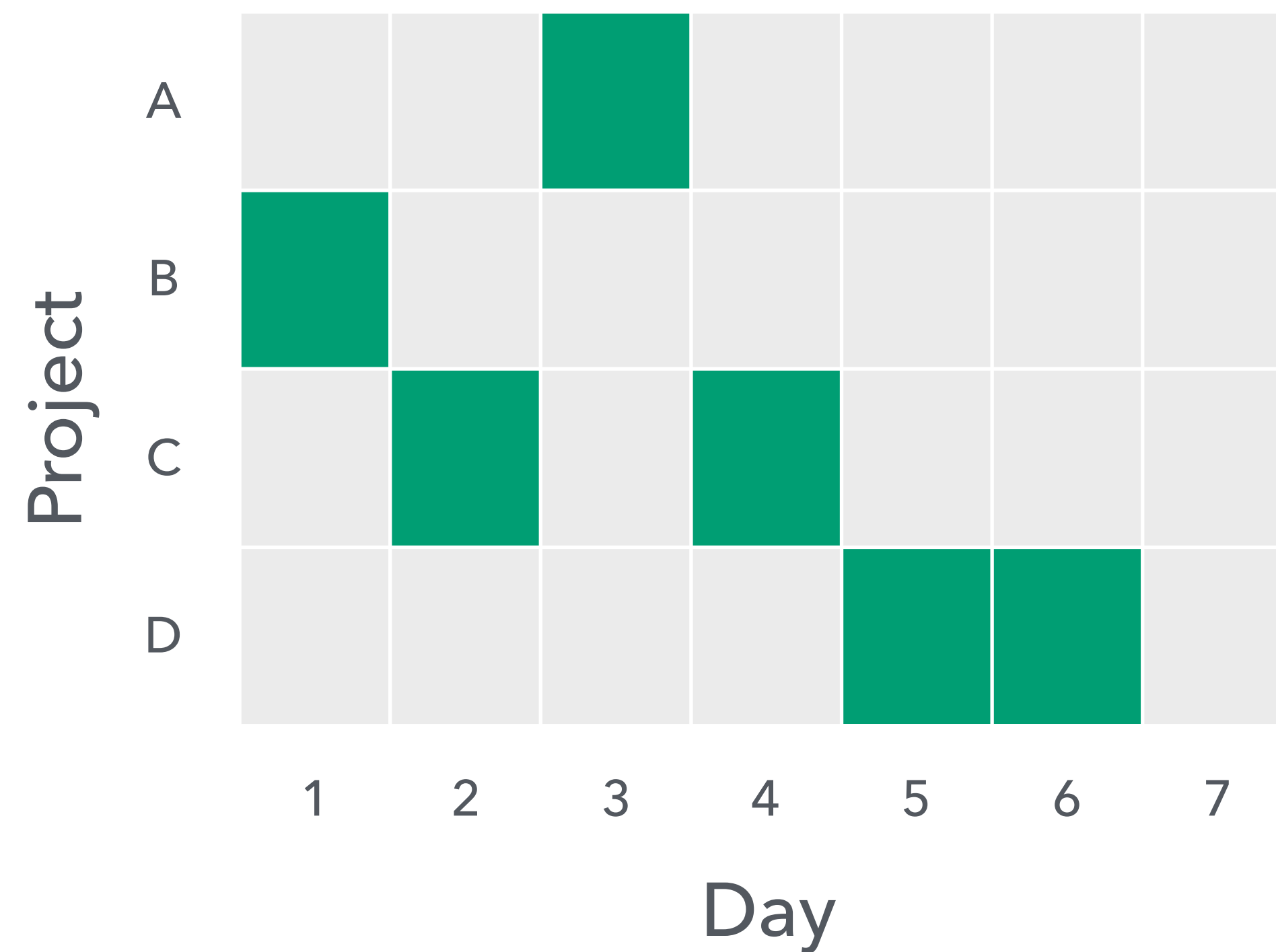
(Vasilescu et al., 2016)

Multitasking dimensions

Mostly on one project   vs.   Evenly on all projects
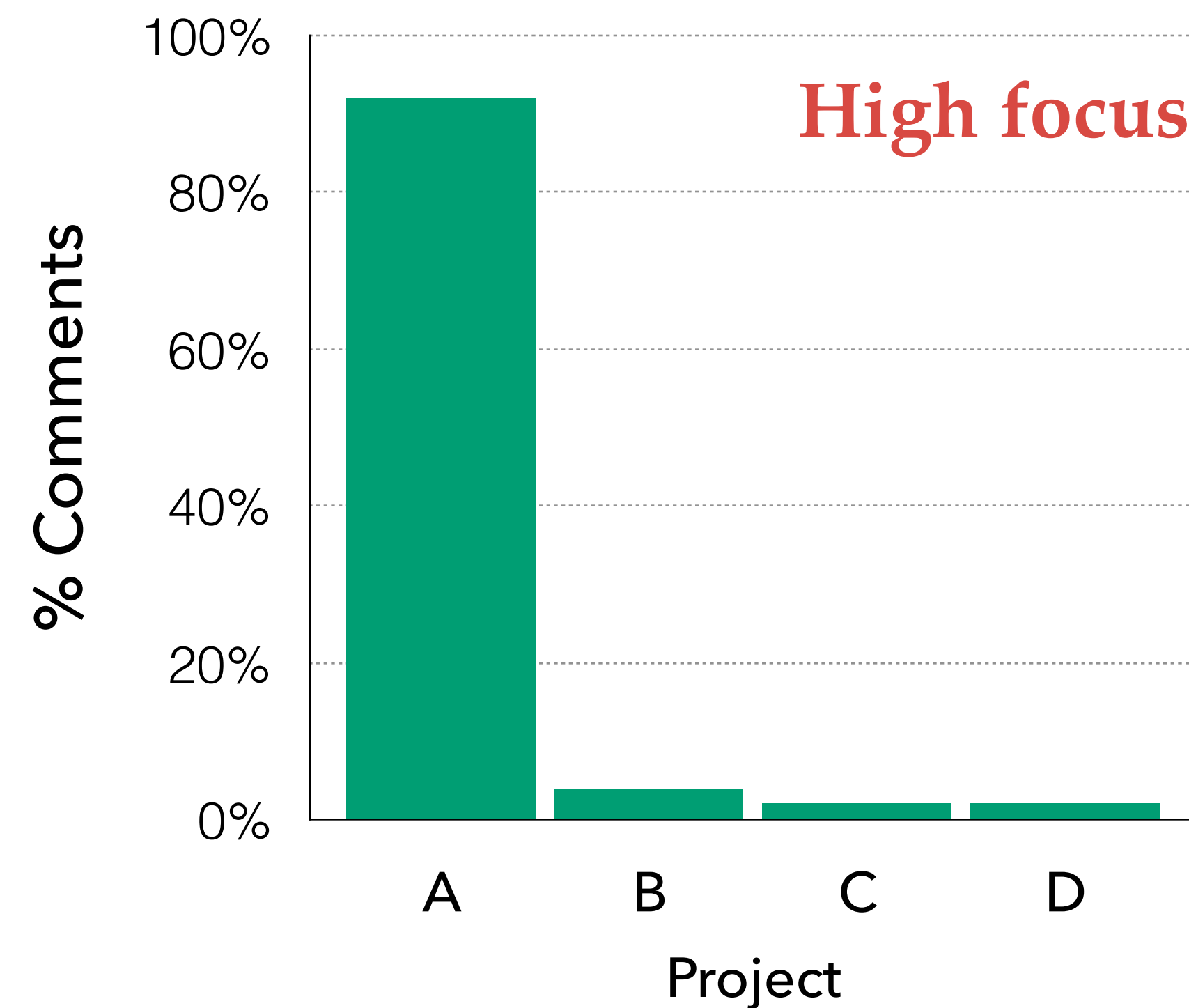
(Vasilescu et al., 2016)
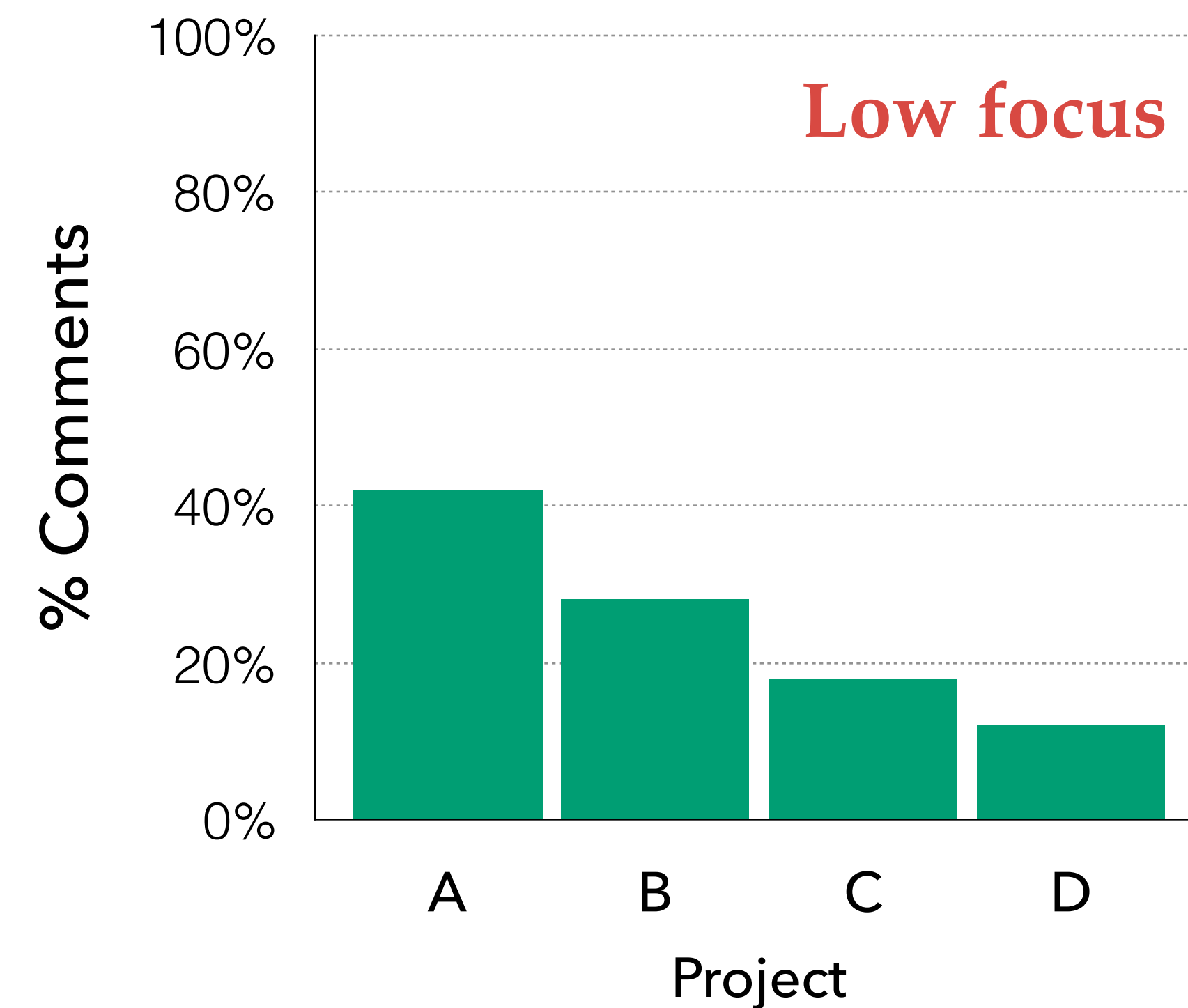
Multitasking Dimensions

Repetitive day-to-day   vs.   Changing focus each day

(Vasilescu et al., 2016),(Xuan et al., 2014)
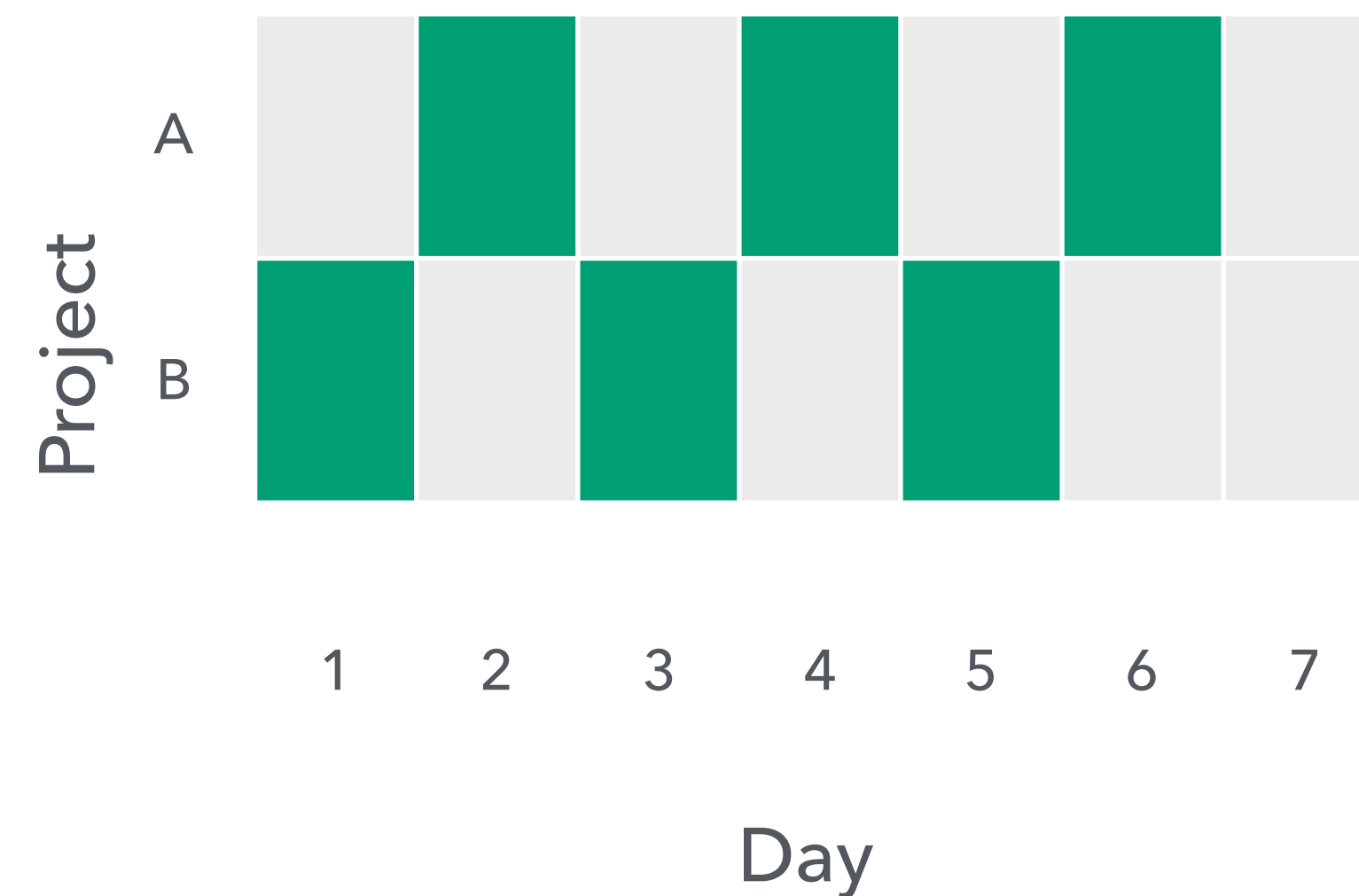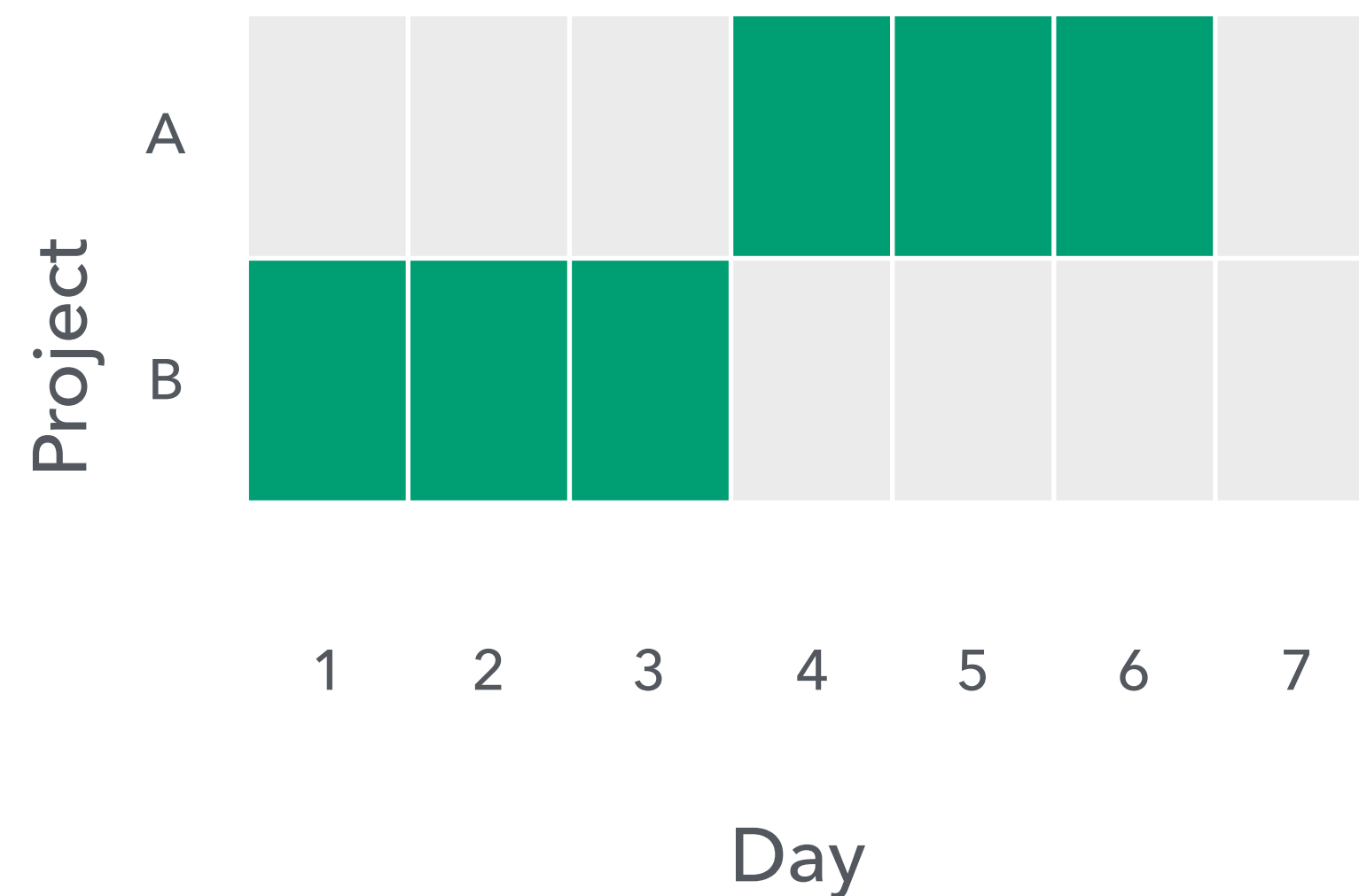
Statistical Analysis

Responses
- Lines of code added
- Comments
- Sentiment

Controls
- Total projects
- Time since first commit
- Company affiliation
- …

Multi-tasking Predictors
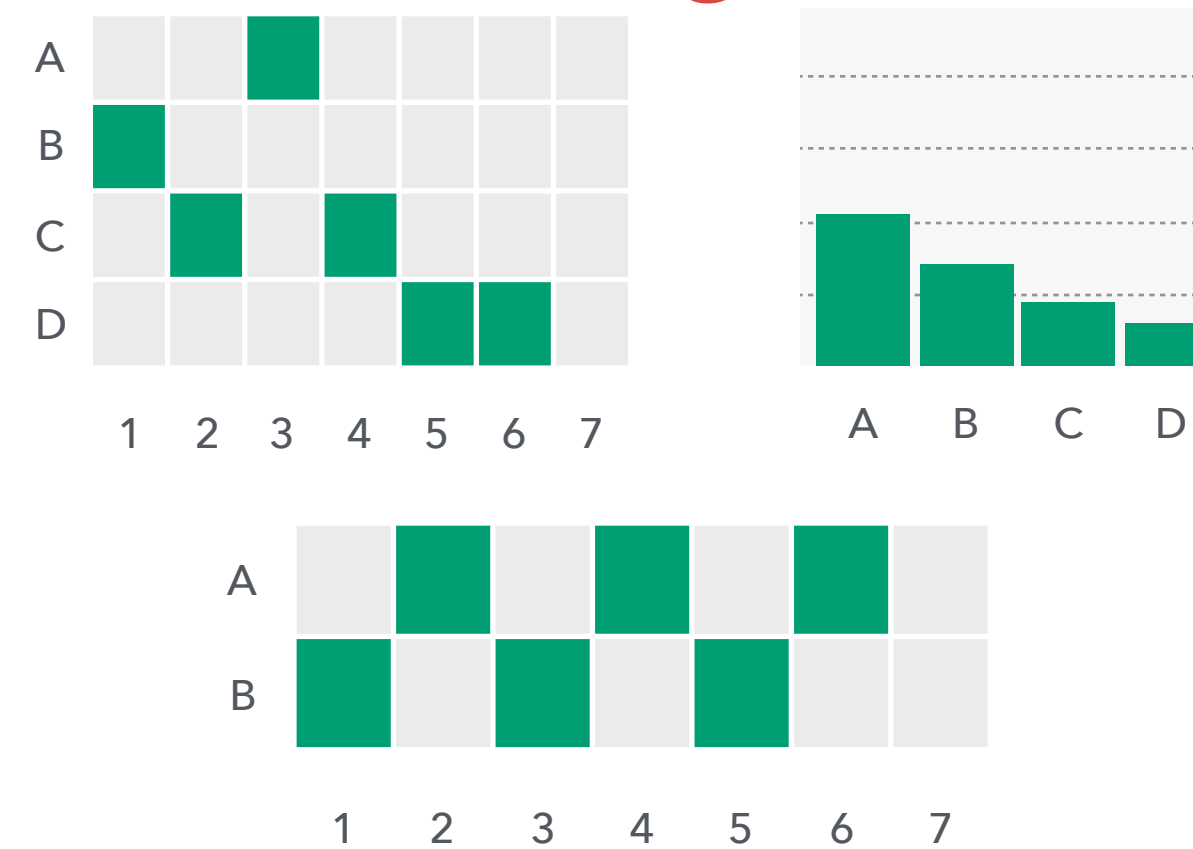
Sample:
- 57K+ developers
- 10+ years of activity
- 150K+ repositories

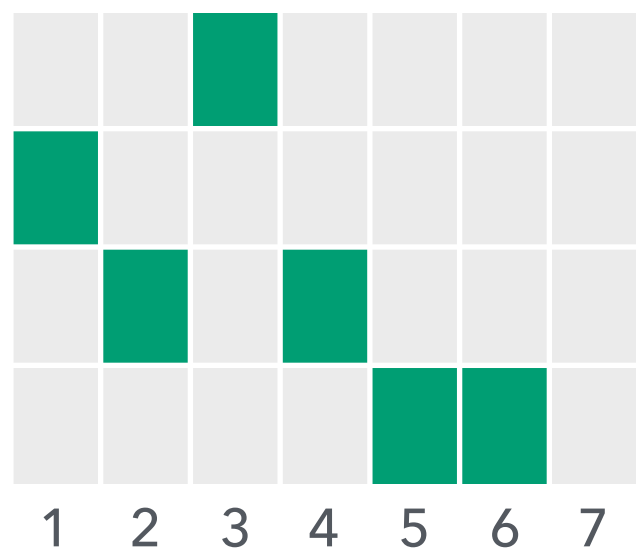# Effects: Weekly comments

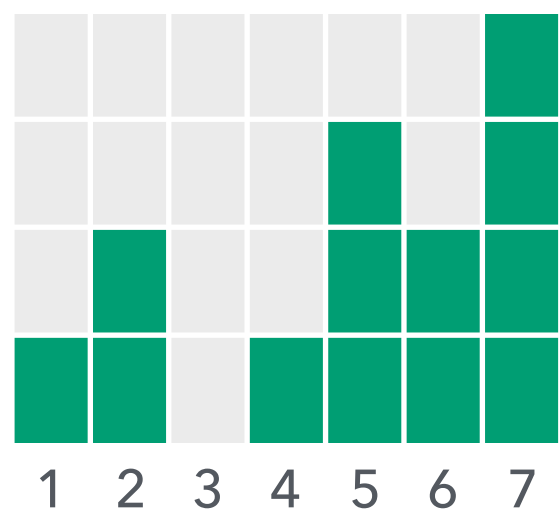**Company affiliation**
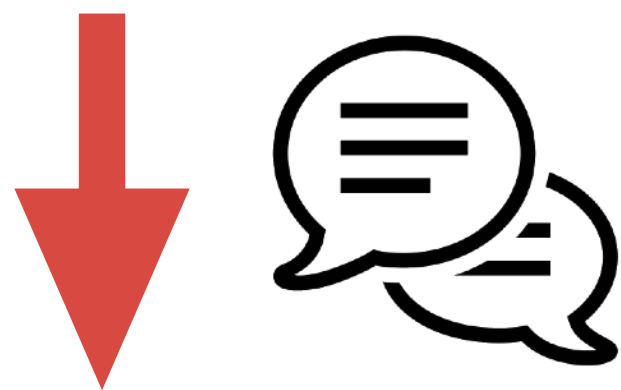
Day-to-day focus (less predictable)
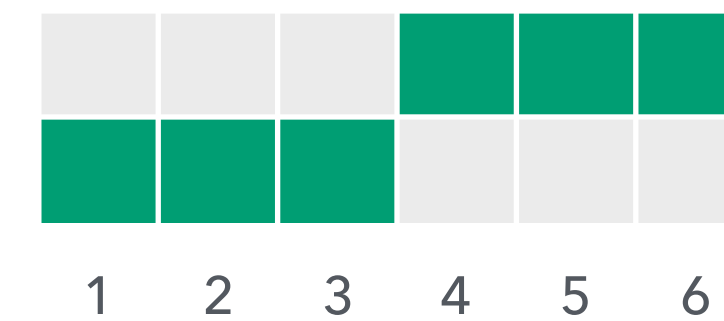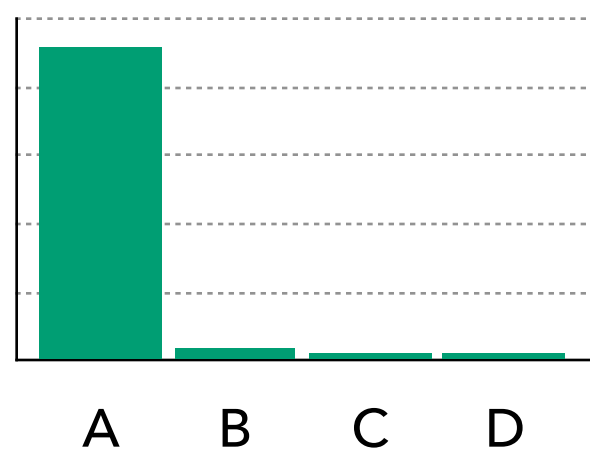
vs.
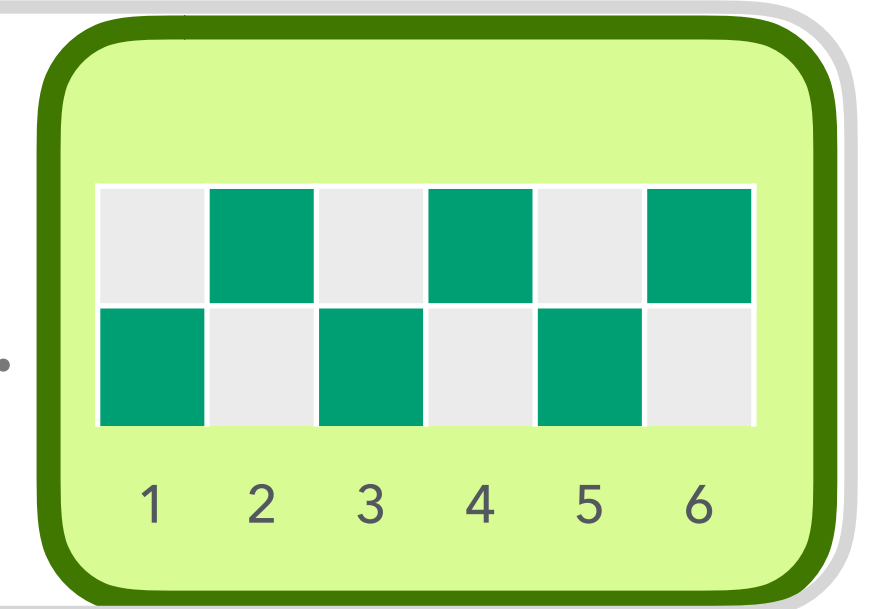
Effects: Lines of Code added

Effects: Negative sentiment

- Higher than normal levels of commenting

- Commenting on many more projects than usual
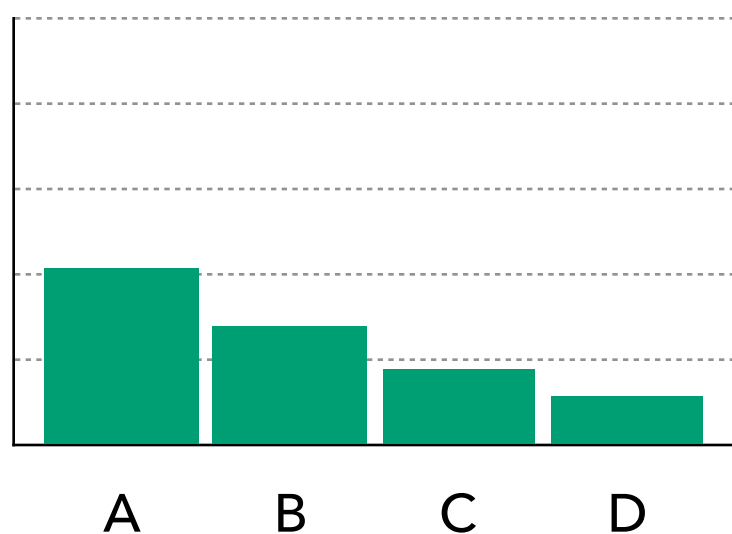
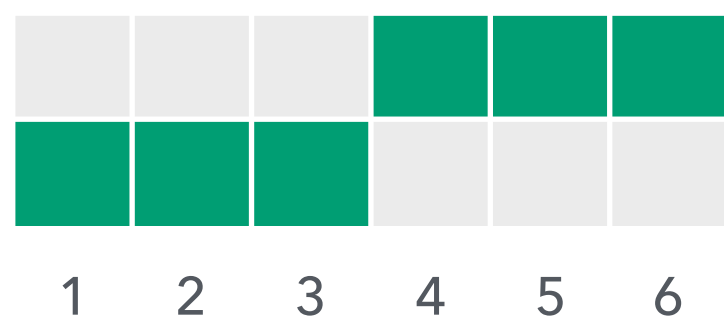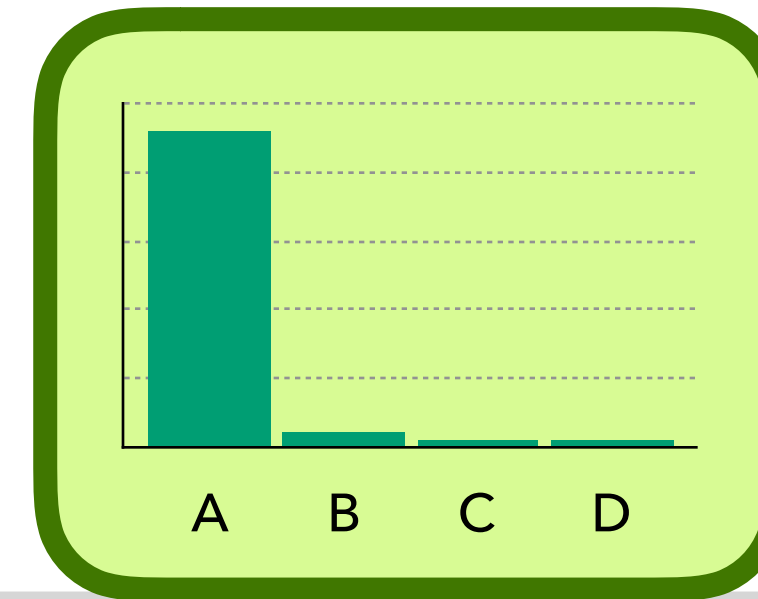- Committing on many more days per week than usual

Focused commenting

vs.
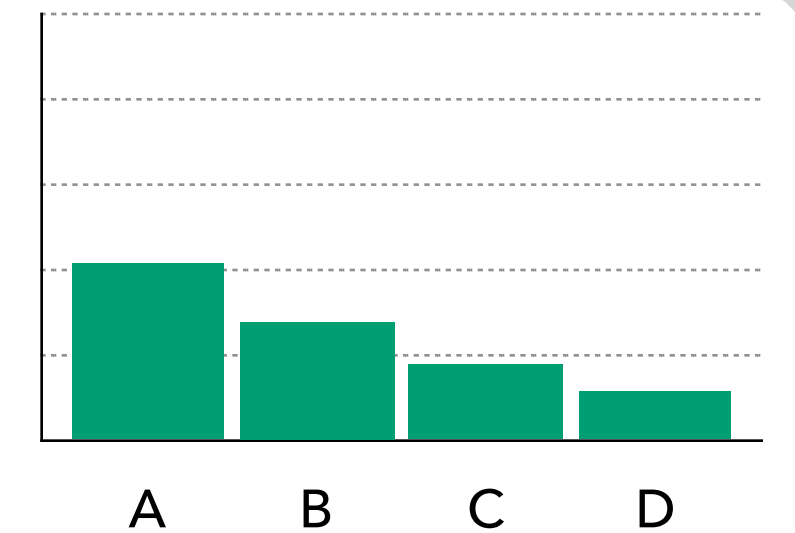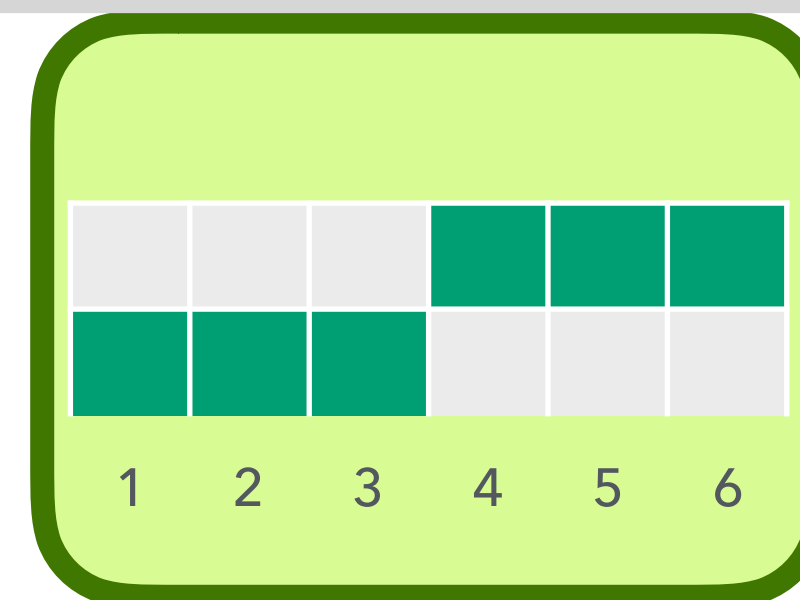
Day-to-day focus (repeatability)

vs.

Effects: Negative sentiment

- High levels of commenting

- Commenting on many more projects than usual

- Committing on many more days per week than usual
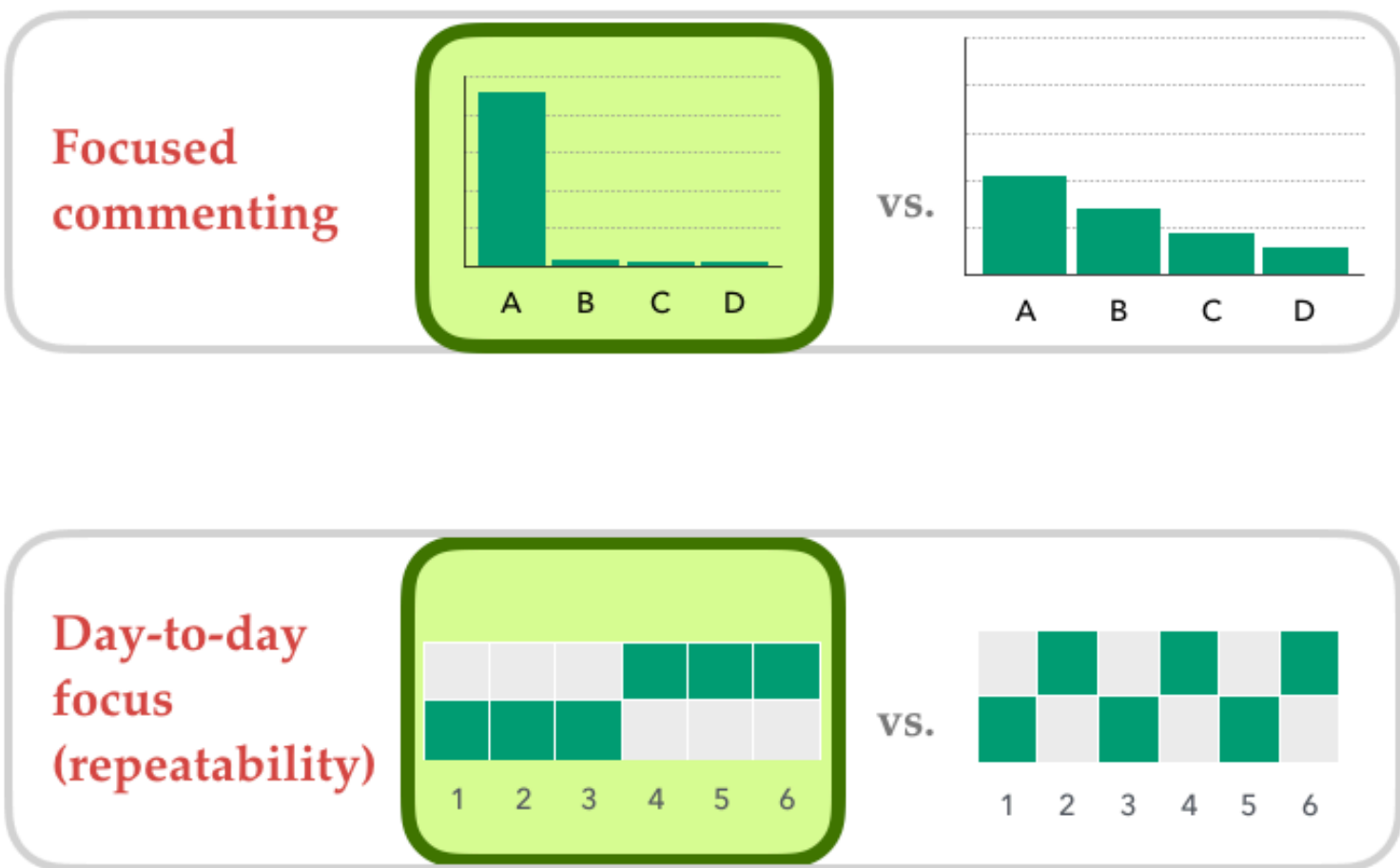
Focused commenting

vs.

Day-to-day focus (repeatability)

vs.

Thanks!

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Image source: http://clipart-library.com/cartoon-pulling-hair-out.html

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