



# Within-person fluctuations in stressful life events, sleep, and anxiety and depression symptoms in a year-long adolescent study

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## BACKGROUND

- Adolescence is characterized by greater exposure to stressful life events (SLEs) and the onset of internalizing disorders like anxiety and depression<sup>1</sup>
- Stress exposure is a well-established risk factor for anxiety and depression<sup>2,3</sup>, but the mechanisms remain unknown; sleep might mediate this relationship
- Sleep is suboptimal in adolescence<sup>4</sup>, is disturbed by SLEs<sup>5</sup>, and has been identified as an early risk factor for internalizing disorders<sup>6</sup>
- However, prior work has relied on self-reported sleep, clinical and adult populations, cross-sectional designs, and/or brief study periods, precluding finer-grained investigation of the directionality of sleep-internalizing relationships within individuals over extended periods of time

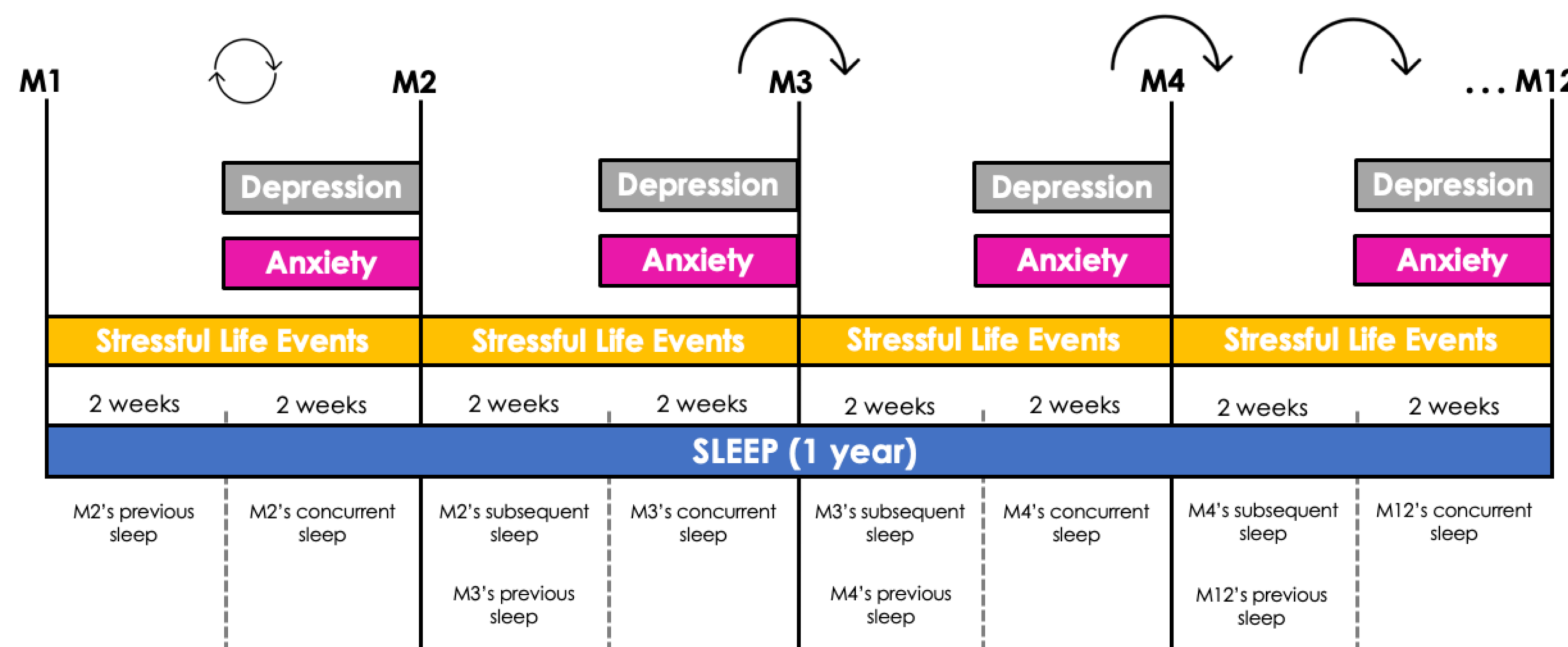
### Research questions

- How do adolescents' sleep, SLEs, and anxiety and depression symptoms fluctuate over extended periods of time?
- How do within-person changes in sleep, SLEs, and internalizing symptoms relate to one another longitudinally?
- Does sleep mediate the longitudinal association of SLEs with internalizing symptoms?

## METHODS

30 females aged 15-17 completed year-long longitudinal study with 12 monthly assessments of stressful life events, anxiety and depression symptoms, and continuous monitoring of sleep with actigraphy

Do SLEs predict **concurrent** sleep and internalizing symptoms? Do SLEs predict **subsequent** sleep and internalizing symptoms? Does sleep predict **subsequent** SLEs and internalizing symptoms?



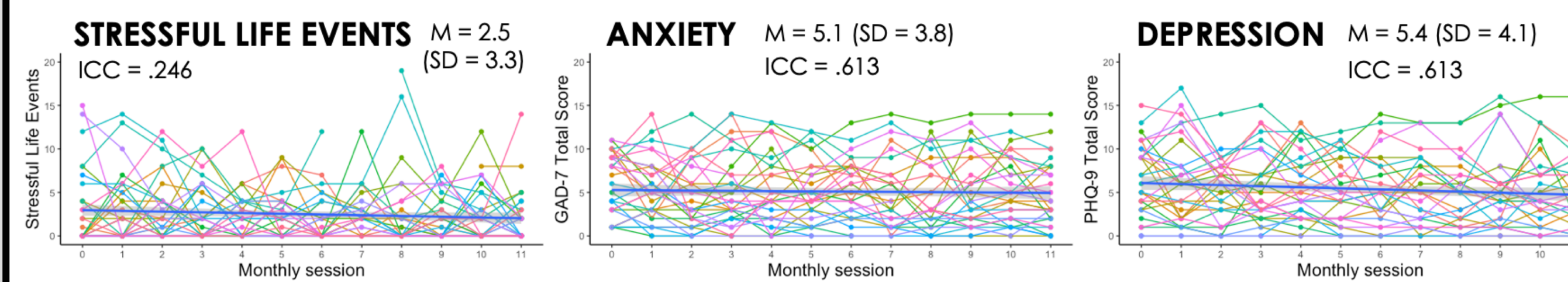
At each monthly visit:

Actigraphy wristband worn continuously over the year:

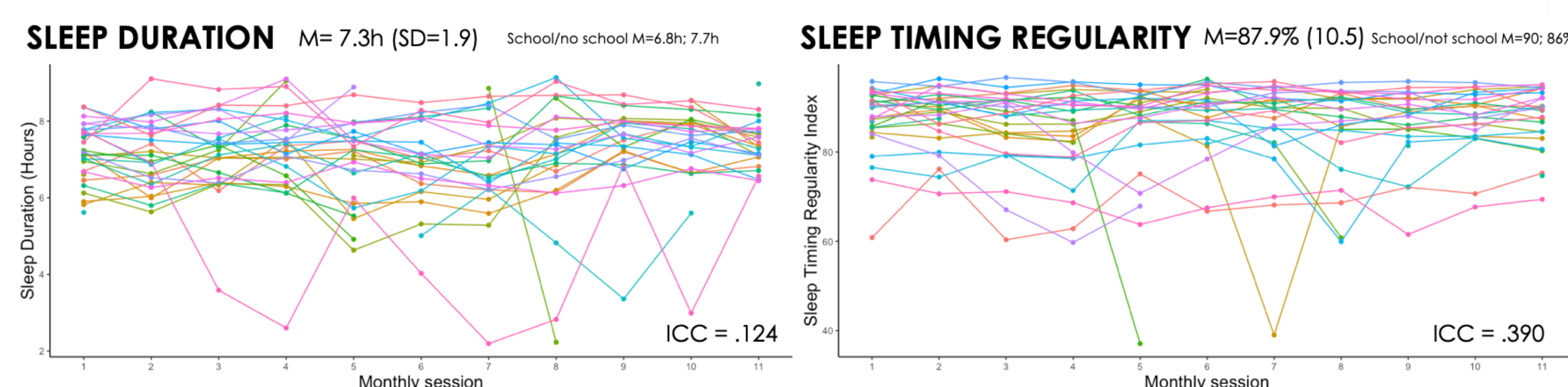
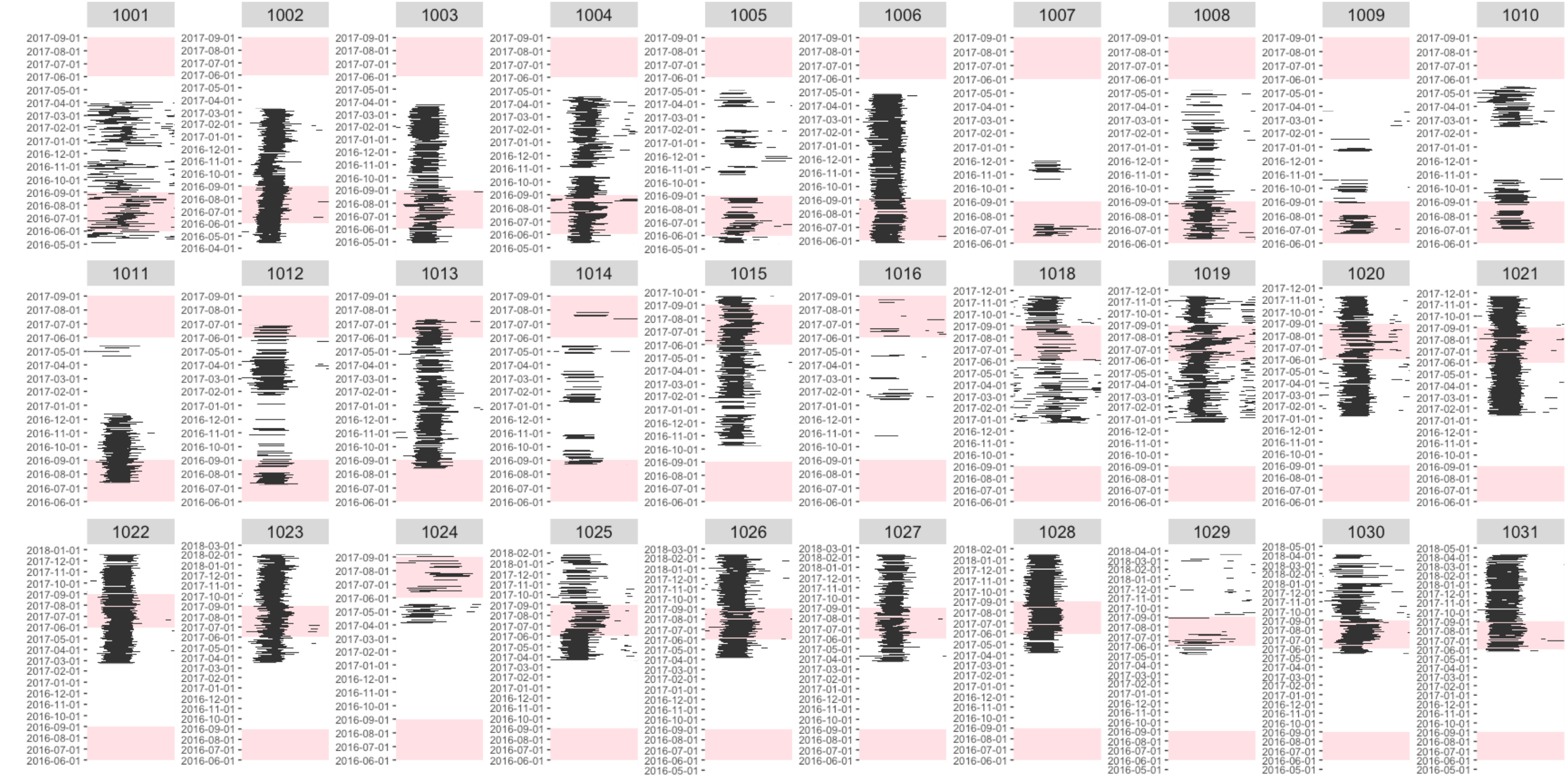
- SLEs:** UCLA Life Stress Interview; interviewer-coded total scores reflect number and severity of stressors reported (reports about previous month)
  - Anxiety:** GAD-7 total score (reports about previous two weeks)
  - Depression:** PHQ-9 total score (reports about previous two weeks)
  - Sleep duration:** Total hours of sleep (includes naps; does not include restless, awake time)
  - Sleep timing regularity index:** Assesses deviations from each individual's average sleep schedule (higher score = more regular)
- Daily sleep data were aggregated over two-week periods (or a month) to match data at monthly visits; mean and variability (standard deviation) of sleep variables were used for analyses

## RESULTS

### 1 Adolescents show substantial between- and within-person variability in sleep, SLEs, and internalizing symptoms over time

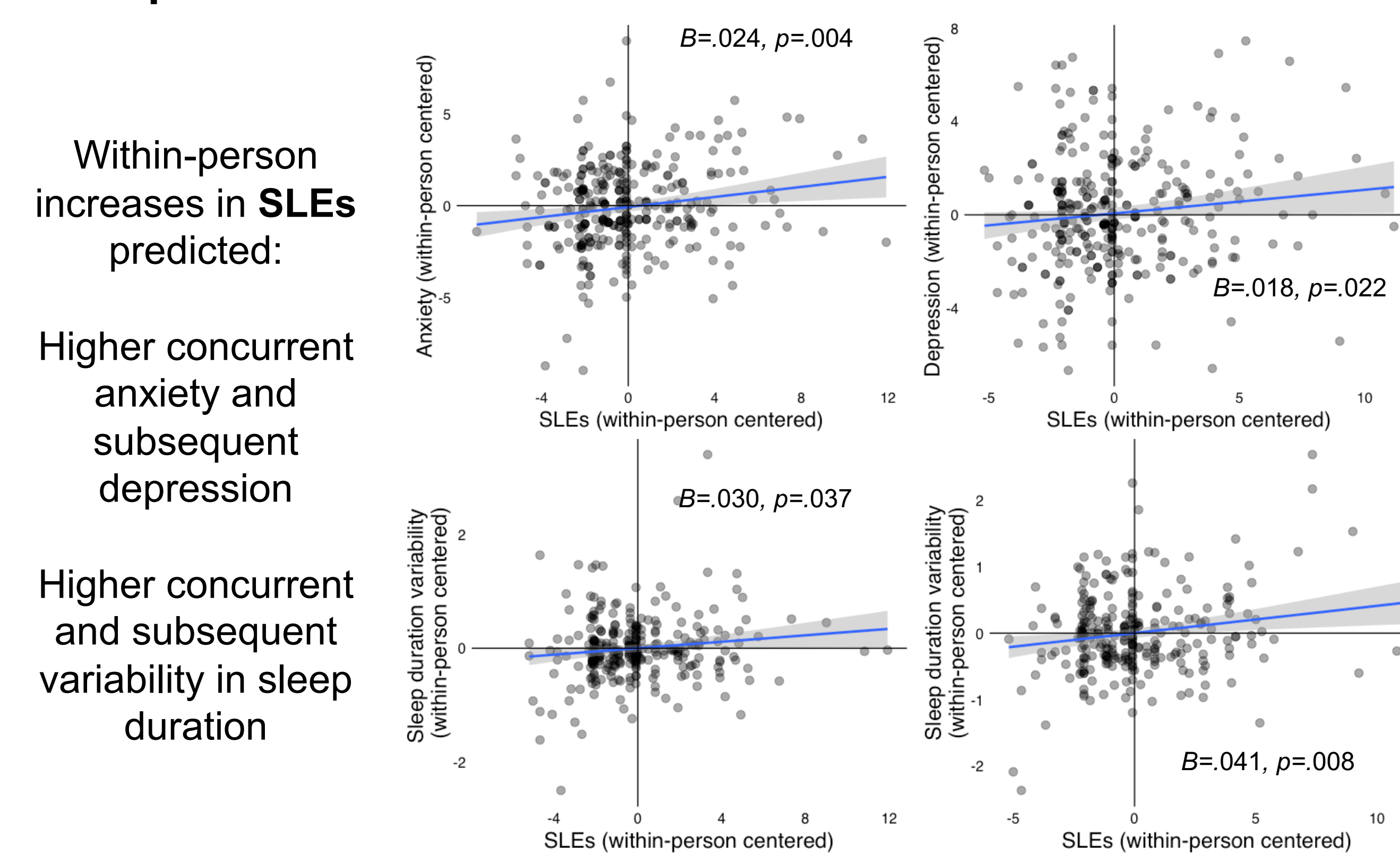


Minute-by-minute sleep over the course of a year (Light red shading indicates summer months)

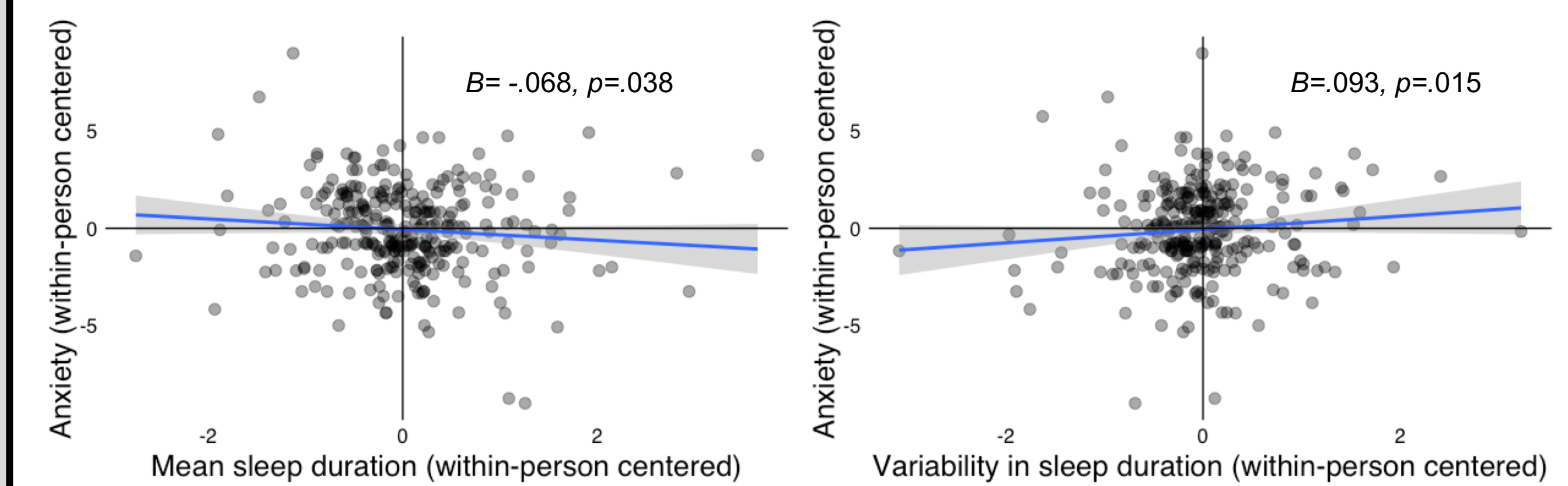


### 2 Complex relationships between sleep, SLEs, and anxiety and depression over time

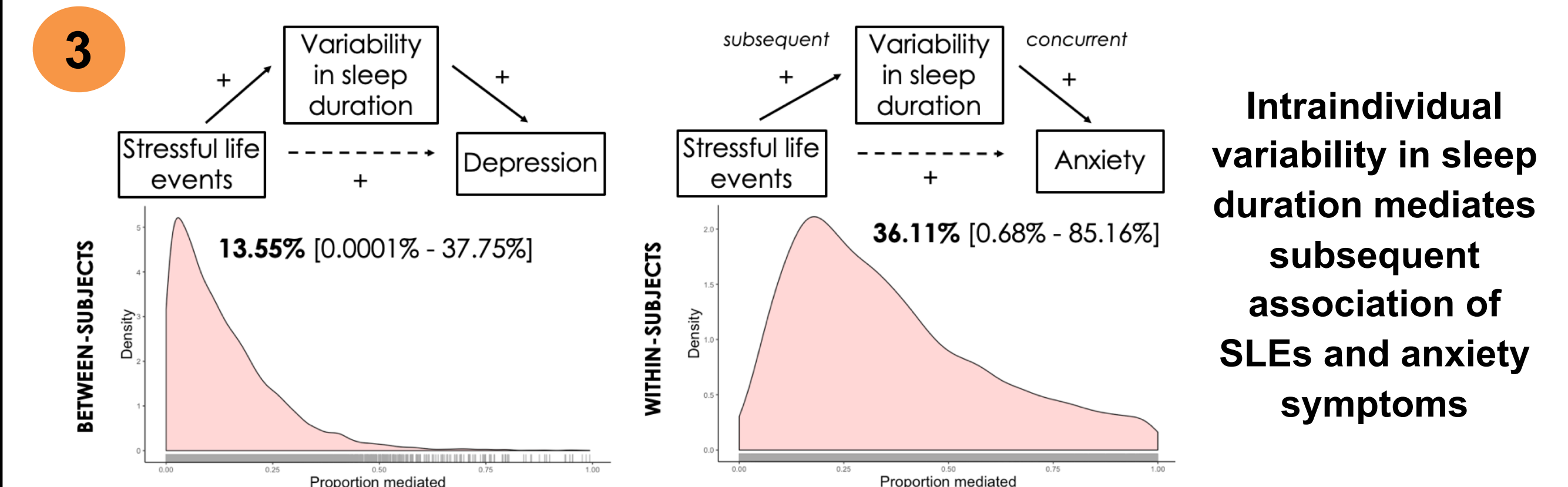
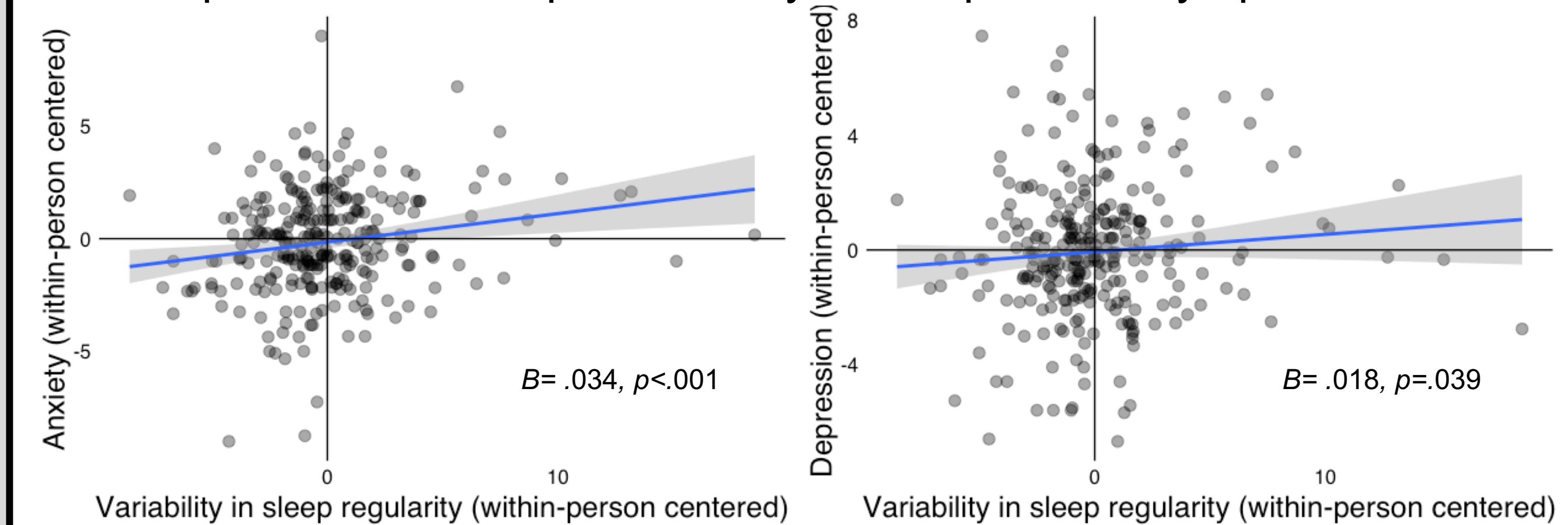
Multilevel models dissociating between- / within-person effects



### Within-person increases in mean, and decreases in variability in sleep duration predicted higher concurrent anxiety



### Within-person increases in variability in sleep timing regularity predicted subsequent anxiety and depression symptoms



Intraindividual variability in sleep duration mediates subsequent association of SLEs and anxiety symptoms

## DISCUSSION

Large intraindividual variability in sleep, SLEs, and internalizing symptoms

- Variability was more important predictor than relative means in our models
- Importance of intensive longitudinal research

Complex relationships between sleep, stress, internalizing symptoms

- Within-person relationships strongest for sleep duration and anxiety
- Directionality: Stress predicts sleep duration, sleep duration predicts anxiety
- Sleep duration as a mediator between SLEs and anxiety symptoms

Limitations: Observational study, missing actigraphy data, small effects

- More research is needed

### Future directions

- Replicating in larger, developmental sample
- Investigating other aspects of sleep (e.g. chronotype, sleep fragmentation)
- More granular temporal analyses (e.g. school vs out of school effects; day-to-day fluctuations with ecological momentary assessment data)
- Exploring changing sleep-stress-anxiety relationships between-subjects, and within-subjects over time (e.g. clustering, hidden markov models)

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