

Real-Time Monitoring of Adolescent Smartphone Social Communication Dynamics and the Emergence of Depression

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Introduction

- Most cases of adolescent MDD are not detected or treated within a year of onset.
- Passive smartphone data may help monitor symptoms and detect MDD earlier.
 - Cross-sectional findings indicate that, compared to HCs, smartphone communication (e.g., texts, social media posts) of those with MDD contains more:
 - Negative sentiment (e.g., ratio of negative vs. positive words)
 - First-person singular pronouns (e.g., 'I')
 - Absolutist words (e.g., 'all')
 - Could monitoring these features over long periods detect *when* someone has MDD?

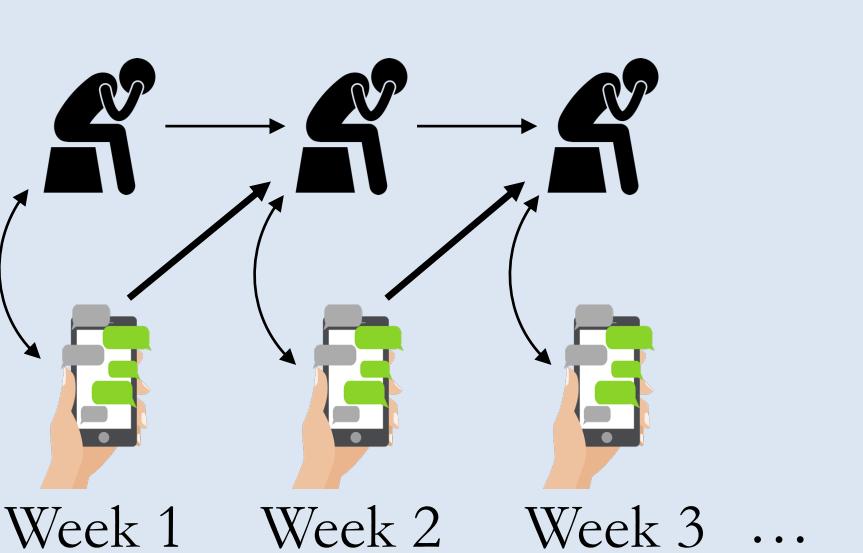
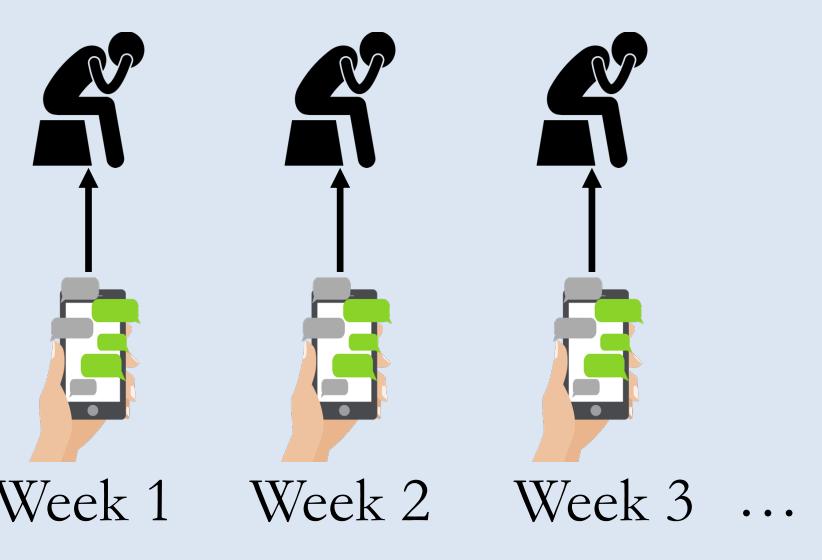
Aims

- Tested whether within-person variations in these linguistic features were associated with weekly MDD status over a yearlong period.
 - If weekly MDD risk was concurrently associated with a linguistic feature, was it also *prospectively* predicted by that feature?

Method

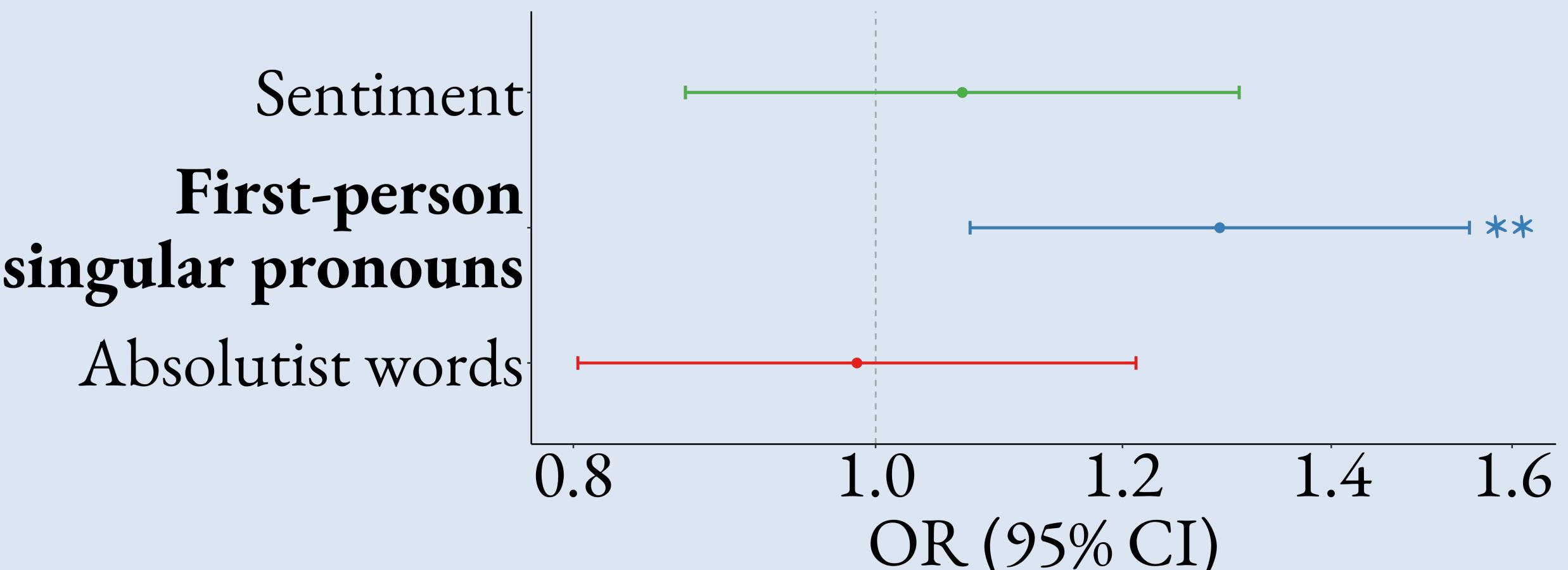
- N = 90 adolescents ($M_{age} = 16.6$) with a range of depressive severity
 - 19% had current MDD and 44% had remitted MDD at baseline
- 12-month follow-up period
 - Assessed MDD status in each week via retrospective interview (Adolescent Longitudinal Interval Follow-up Evaluation) at 6- and 12-months.
 - Used the EARS app to record naturalistic key inputs in smartphone communication apps (e.g., texting, social media) for 12 months.
 - Collected ~1.2 million messages containing ~6.5 million words.
 - Extracted linguistic features from each message and converted them to weekly aggregates time-locked to the weekly MDD ratings.

- Analyses
 - Multilevel logistic regressions tested within-person associations between each linguistic feature and concurrent weekly MDD status.
 - Random intercepts, fixed slopes
 - If the concurrent association was significant, we tested whether MDD risk was *prospectively* predicted by the feature in a prior week while adjusting for MDD status in the prior week (i.e., Granger causality).

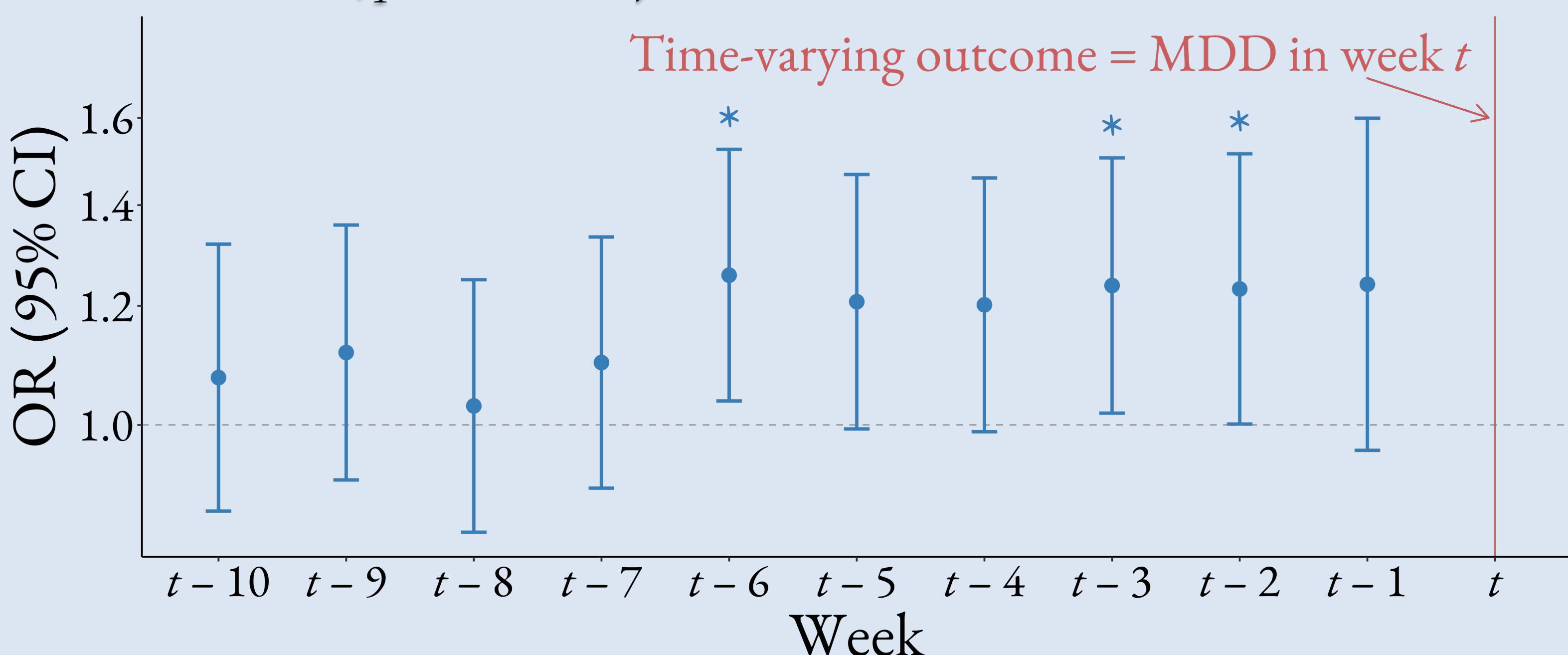


Results

- First, we validated the retrospective MDD ratings by showing MDD risk was higher in weeks with more negative concurrently-assessed mood ($OR = 1.31, p = .002$).
- MDD risk was higher in weeks with more first-person singular pronouns relative to one's own average ($OR = 1.29, p = .007$).
 - Unrelated to sentiment and absolutist words ($ORs = .99-1.07, ps > .539$).



- In Granger causality analyses, weekly MDD risk was significantly predicted by first-person singular pronouns 2, 3, and 6 weeks prior ($ORs = 1.23-1.26, ps = .02-.05$).
 - Effects at lags of 1, 4, and 5 week(s) were comparable, but nonsignificant ($ORs = 1.20-1.24, ps = .06-.10$).



Discussion

- Monitoring adolescents' use of first-person singular pronouns in smartphone communication may help detect MDD earlier and facilitate timely intervention.
 - May prospectively predict MDD onsets (facilitating prevention), but more research is needed.
- Previously observed between-person effects of sentiment and absolutist words (mostly in adults) may not generalize to within-person effects in adolescents.
- Limitations*
 - Retrospective weekly MDD ratings may have been imprecise or subject to biases.
 - Did not consider other linguistic features, data streams, or disorders.