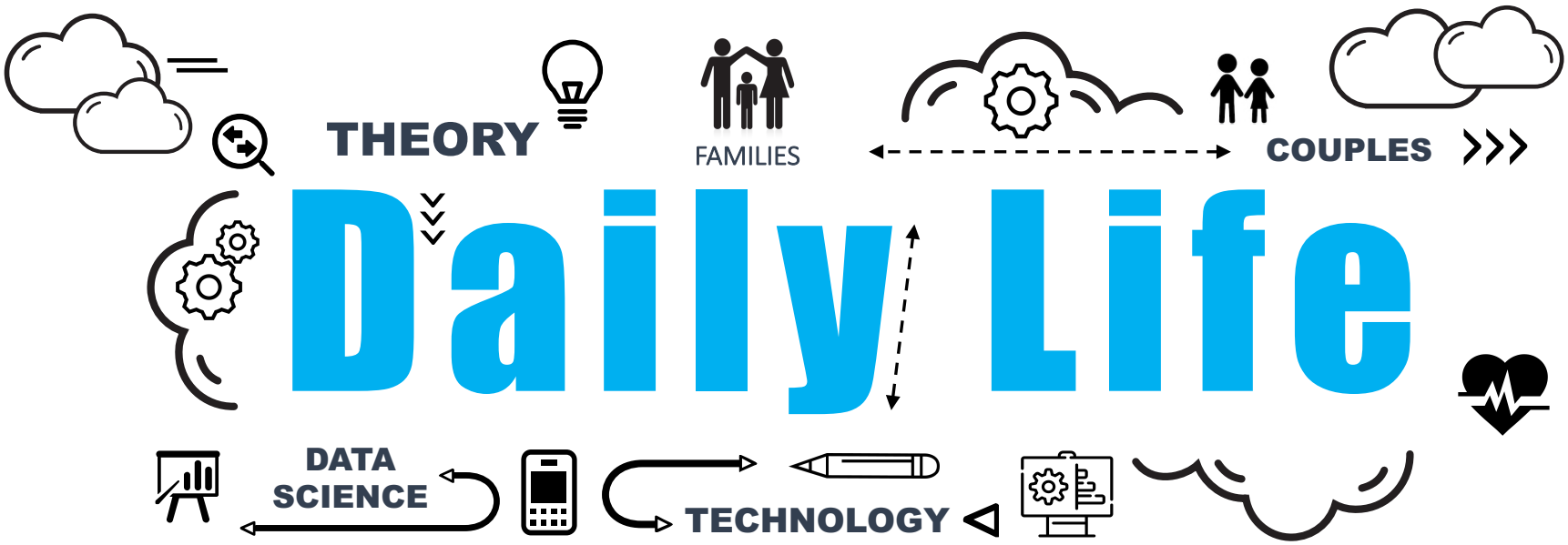
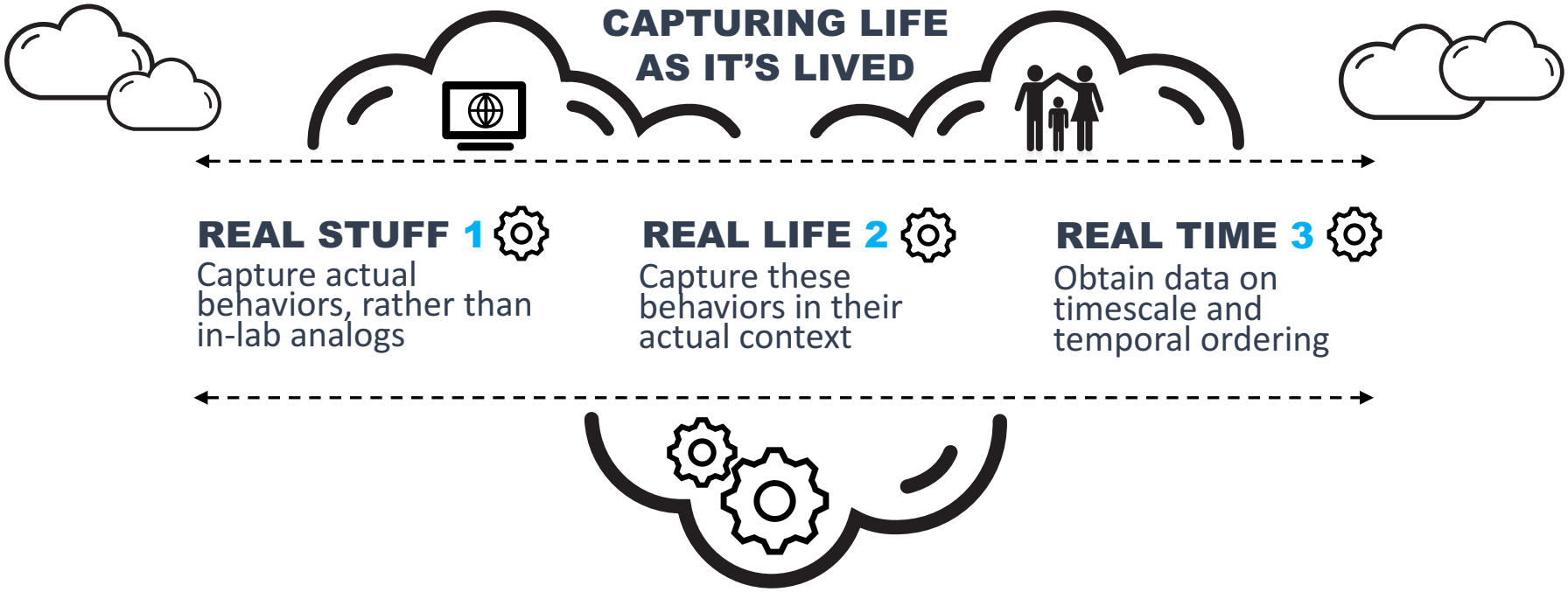


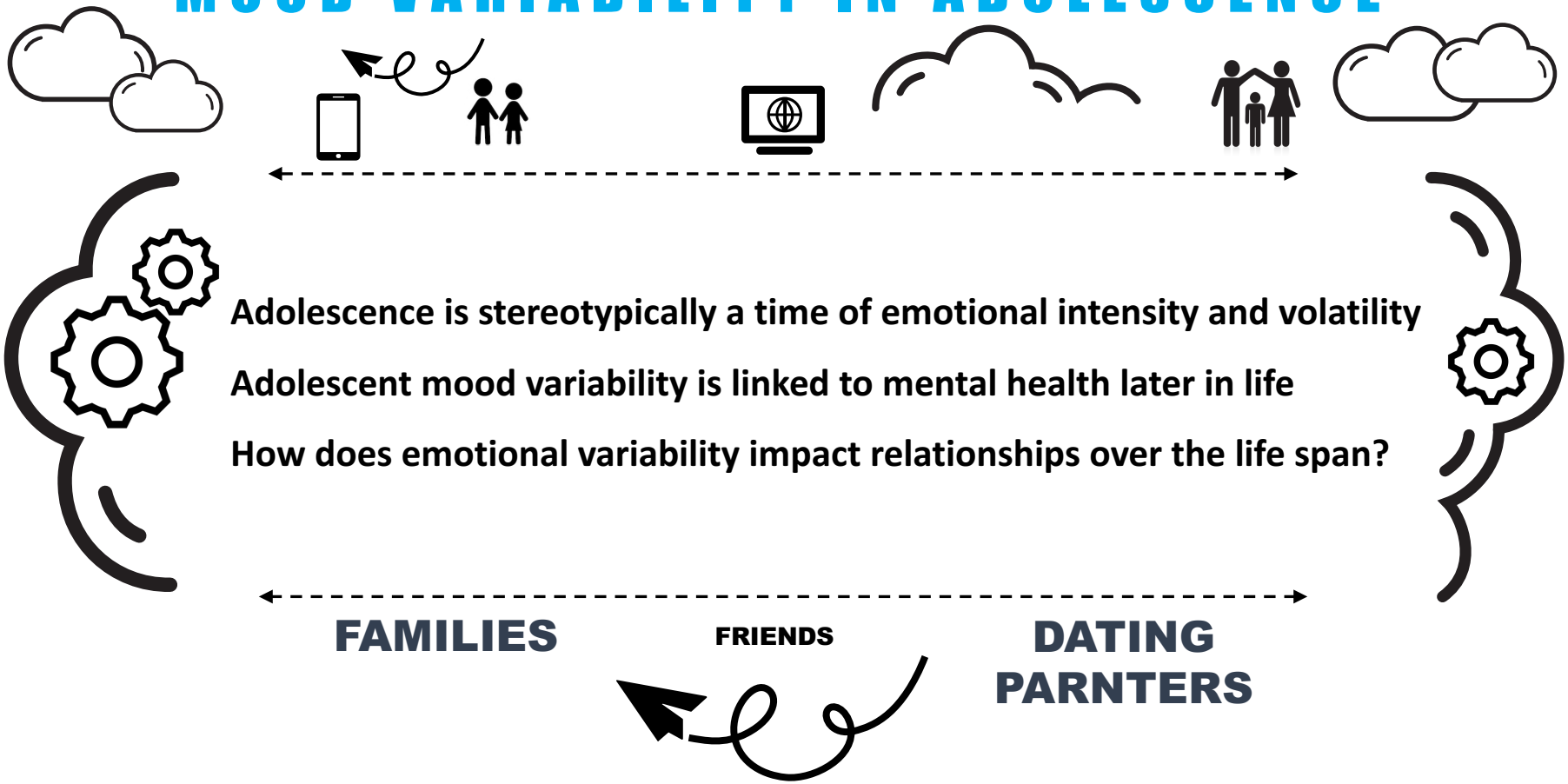
Developmental links between adolescent mood variability and later relationships: Considerations for ambulatory assessment

ADELA C. TIMMONS, LAUREN S. SHAPIRO, COREY PETTIT, SARAH BARRETT, THEODORA CHASPARI, SOHYUN C. HAN, YEHSONG KIM, MANOJ KUMAR, SHRIKANTH S. NARAYANAN, & GAYLA MARGOLIN

WHY AMBULATORY ASSESSMENT?



EXAMPLE APPLICATION:
MOOD VARIABILITY IN ADOLESCENCE



Hall, 1904; Larson, 2013; O'Donnell et al., 2018; Santangelo, 2017; Timm et al., 2017

PRESENT STUDY

EVOLVING METHODOLOGIES

MICRO-PROCESS **1**

Capture mood variability in mid-adolescence using daily diary data

LONGITUDINAL **2**

Assess conflict with family, peers, and dating partners over a 7-year-period

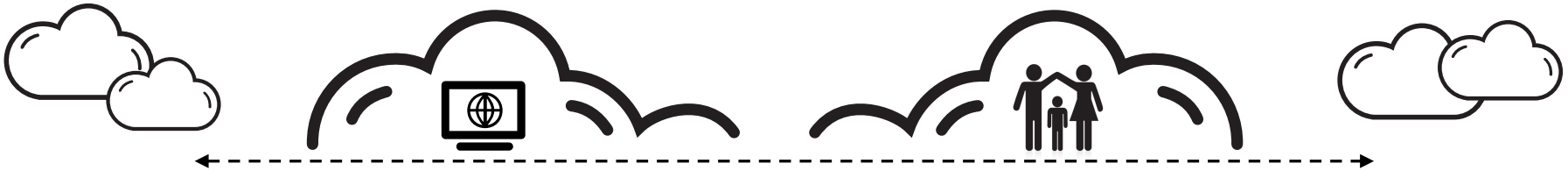
TECHNOLOGY **3**

Incorporate new ambulatory assessment technologies across 3 waves of data collection

MACRO-PROCESS **4**

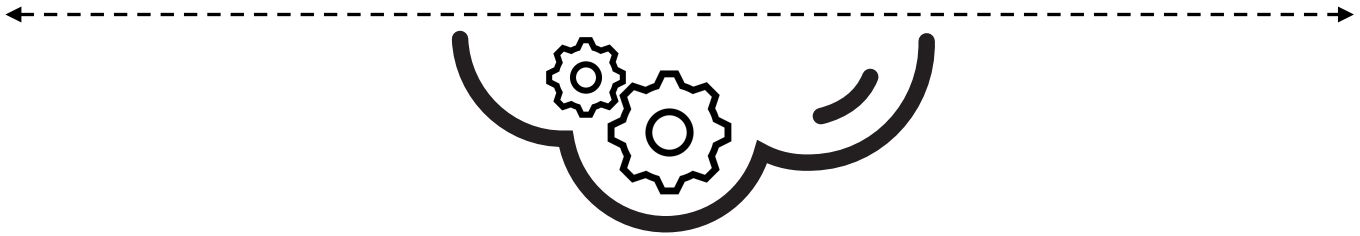
Determine how mood variability impacts relationships over the lifespan

HYPOTHESES



HO1: mood variability will be associated with increased conflict with family members, peers, and dating partners in mid-adolescence, late adolescence, and young adulthood

HO2: mood variability in mid-adolescence will be linked to multimodal indicators of emotional intensity in early adulthood, as measured by increased physiological arousal, intensity of vocal pitch, and frequency of anger words captured in daily life



PARTICIPANTS

MID ADOLESCENCE TO EARLY ADULTHOOD

WAVE 1: MID-ADOLESCENCE

126 mid-adolescents (49.3% female)

Average age = 15.4 years

Ethnically and racially diverse

Mid to low income

WAVE 2: LATE ADOLESCENCE

75 late adolescents

Average age = 17.9 years old

WAVE 3: EARLY ADULTHOOD

23 young adults and their romantic partners

Average age = 22.6 years

Average relationship length = 35.9 months

PROCEDURES & MEASURES

MID ADOLESCENCE TO EARLY ADULTHOOD

WAVE 1: MID-ADOLESCENCE

Adolescents completed 14 days of data 1 time per day via paper questionnaires

Assessed daily mood and conflict with family members

Also obtained questionnaire data on emotion regulation

WAVE 2: LATE ADOLESCENCE

3 years later, adolescents completed 3 days of data 3 times per day via online surveys

Assessed daily mood and conflict with peers

Provided daily cortisol samples 5 times per day (not examined here)

WAVE 3: EARLY ADULTHOOD

4 years after that, young adults completed hourly reports for 1 day via a smartphone app

Assessed daily mood and conflict with dating partners

Wore biosensors to measure electrodermal activity (EDA) and heart rate (HR)

Collected audio recordings used to extract data on vocal pitch and speech content

OVERVIEW OF ANALYSES

WAVE 1: MID-ADOLESCENCE

Computed Root Mean Square of Successive Differences (RMSSD) for positive and negative mood

Concurrent link: W1 mood variability and W1 family conflict

WAVE 2: LATE ADOLESCENCE

Concurrent and longitudinal links: W1 and W2 mood variability and W2 peer conflict

WAVE 3: EARLY ADULTHOOD

Concurrent and longitudinal links: W1, W2, and W3 mood variability and W3 dating conflict

Longitudinal link: W1 mood variability and W3 multimodal emotional arousal

OTHER DETAILS

Used multilevel models with observations nested in people

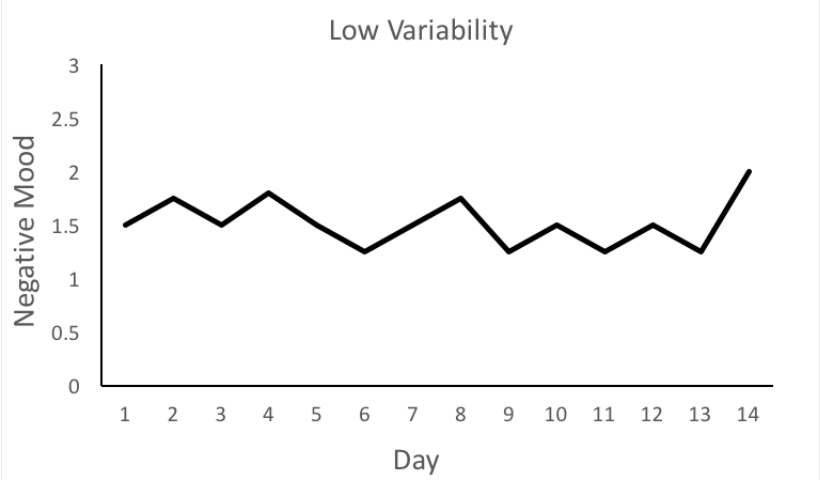
Statistically adjusted for gender, age, and general mood

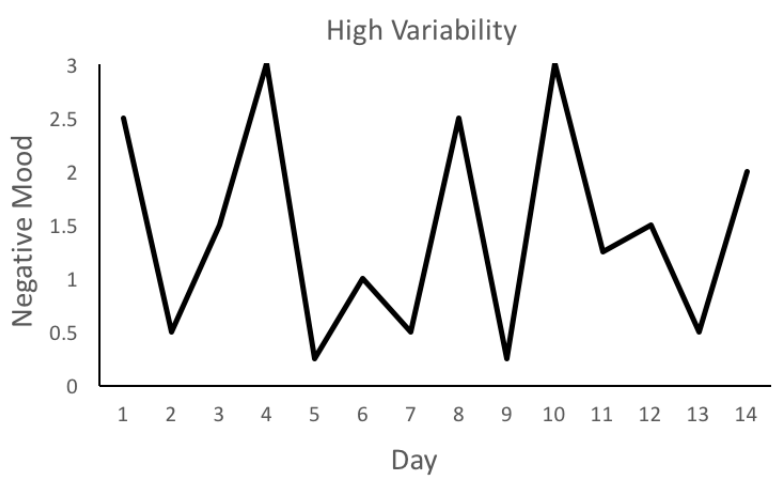
No significant differences between those who dropped out versus not

MOOD VARIABILITY

Rather than using a questionnaire, we calculated mood variability from daily data:

$$\text{RMSSD} = \sqrt{(\frac{1}{n-1})(\Sigma(\text{Negative Mood}_i - \text{Negative Mood}_{i-1})^2)}$$





DESCRIPTIVE STATISTICS

	M (SD) *Min-Max*	1.	2.	3.	4.	5.	6.	7.	8.
1. W1 Positive Mood RMSSD	0.67 (0.31) 0-1.68	—							
2. W1 Negative Mood RMSSD	0.31 (0.21) 0-0.98	.26*							
3. W1 Family Conflict	0.18 (0.20) 0-0.96	.07	.27*						
4. W2 Peer Conflict	0.18 (0.40) 0-2.00	-.03	.36*	-.18					
5. W3 Dating Conflict	0.18 (0.17) 0-0.56	-.39	.07	.00	.29				
6. W3 HR	71.34 (7.46) 55.29-85.22	-.16	.26	.31	.05	.20			
7. W3 EDA	6.34 (7.71) 0.16-27.10	-.01	-.21	-.05	-.20	-.05	-.21		
8. W3 Vocal Pitch	354.99 (261.30) 42.46-608.04	-.07	.48*	-.35	.04	.12	.19	-.58**	
9. W3 Anger Words	1.05 (0.85) 0.23-3.37	-.05	-.38	-.05	-.08	.21	-.20	.27	.13

RMSSD significantly associated across waves

Mood significantly associated with RMSSD

HYPOTHESIS 1a

MOOD VARIABILITY AND FAMILY CONFLICT

W1 Family Conflict	*B (SE)*
W1 Negative Mood RMSSD	0.22 (0.11)*
General Mood	-0.09 (0.01)***

W1 Family Conflict	*B (SE)*
W1 Positive Mood RMSSD	0.13 (0.07)
General Mood	-0.09 (0.01)***

HYPOTHESIS 1b

MOOD VARIABILITY AND PEER CONFLICT

W2 Peer Conflict	*B (SE)*
W2 Negative Mood RMSSD	0.08 (0.15)
General Mood	-0.11 (0.08)

W2 Peer Conflict	*B (SE)*
W2 Positive Mood RMSSD	-0.01 (0.14)
General Mood	-0.12 (0.08)

W2 Peer Conflict	*B (SE)*
W1 Negative Mood RMSSD	0.72 (0.29)*
General Mood	-0.02 (0.09)

W2 Peer Conflict	*B (SE)*
W1 Positive Mood RMSSD	0.01 (0.18)
General Mood	-0.12 (0.08)

HYPOTHESIS 1c

MOOD VARIABILITY AND DATING CONFLICT

W3 Dating Partner Conflict	*B (SE)*
W3 Negative Mood RMSSD	0.10 (0.05)*
General Mood	0.03 (0.06)

W3 Dating Partner Conflict	*B (SE)*
W3 Positive Mood RMSSD	0.00 (0.00)
General Mood	0.04 (0.07)

W3 Dating Partner Conflict	*B (SE)*
W2 Negative Mood RMSSD	0.05 (0.16)
General Mood	-0.01 (0.10)

W3 Dating Partner Conflict	*B (SE)*
W2 Positive Mood RMSSD	-0.11 (0.11)
General Mood	-0.01 (0.10)

W3 Dating Partner Conflict	*B (SE)*
W1 Negative Mood RMSSD	-0.09 (0.18)
General Mood	0.05 (0.07)

W3 Dating Partner Conflict	*B (SE)*
W1 Positive Mood RMSSD	-0.10 (0.09)
General Mood	0.05 (0.06)

HYPOTHESIS 2

MULTIMODAL EMOTIONAL AROUSAL

W3 EDA	*B (SE)*
W1 Negative Mood RMSSD	-0.29 (0.65)
General Mood	-1.59 (0.56)*

W3 EDA	*B (SE)*
W1 Positive Mood RMSSD	-0.35 (0.43)
General Mood	-0.31 (0.30)

W3 Vocal Pitch	*B (SE)*
W1 Negative Mood RMSSD	185.95 (52.69)**
General Mood	-70.39 (25.13)**

W3 Vocal Pitch	*B (SE)*
W1 Negative Mood RMSSD	6.72 (21.67)
General Mood	-86.17 (25.13)

W3 Anger Words	*B (SE)*
W1 Negative Mood RMSSD	-5.69 (2.00)*
General Mood	-0.60 (0.97)

W3 Anger Words	*B (SE)*
W1 Positive Mood RMSSD	0.22 (0.68)
General Mood	1.24 (0.60)

Emotion regulation was not significantly associated with RMSSD

No significant associations for HR

SUMMARY

MOOD VARIABILITY FINDINGS:

W1 mood variability associated with W1 family conflict

W1 mood variability associated with W2 peer conflict

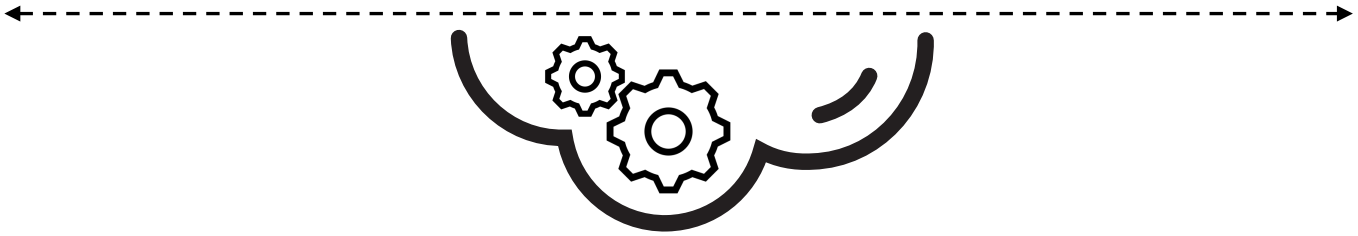
W3 mood variability associated with W3 dating conflict

W1 mood variability associated with W3 multimodal indicators of emotional arousal

ADDITIONAL CONSIDERATIONS:

RMSSD was not linked to questionnaire-based emotion regulation

Negative mood variability was a stronger predictor than was positive mood variability



STUDY CONCLUSIONS

LIMITATIONS AND FUTURE DIRECTIONS

Small sample size and high attrition at Wave 3

Technologies changing from one wave to the next

Early identification and implications for intervention

STRENGTHS

Longitudinal ambulatory assessment design spanning 7 years

Relationship functioning across salient developmental domains

Measurement of actual mood variability

Multimodal assessment of emotion using new technologies

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