



An Evaluation of Novel Methodologies for Capturing Couple Dynamics in the Home Environment

Adela C. Timmons, Tiantian Feng, Theodora Chaspari, Shrikanth Narayanan, and Gayla Margolin
University of Southern California



Introduction

- The use of ecological momentary assessment has increased in recent years
- Technologies for capturing these psychological data in daily life are progressing at a rapid pace, with the use of smartphones and wearable electronic devices becoming increasingly widespread
- These methods are valuable because they can capture microlevel dynamic processes, providing nuanced information about psychological phenomena
- They also capture psychological processes as they unfold in daily life
- Despite the advantages of these methodologies, there are several challenges (e.g., feasibility, reactivity, loss of experimental control, etc.)
- Few methodological studies have empirically examined the feasibility of these methods or assessed quality of data obtained through these methods
- This study used several novel ambulatory methodologies and examined their usefulness for research in psychology

Method

- 40 people (20 couples), ages 18 to 25, were lent smart phones for one day
- A smartphone application was developed in collaboration with engineers. The application alerted participants to complete surveys once an hour
- In addition, the application collected GPS coordinates and Bluetooth signal strength
- If the romantic couples were within 5 meters of each other (based on Bluetooth signal strength estimates), the phones also collected 2-minute audio recordings every 12 minutes
- Participants also wore two ambulatory physiological monitors (the Q sensor and Actiwave)
- The Actiwave collects heart rate, three dimensions of movement, sleep and wake times, and estimates of body position. It is applied to the chest using two electrodes and is worn under the shirt

- The Q sensor measures electrodermal activity, three dimensions of movement, and body temperature and is worn like a wristwatch
- Participants were instructed to go about their daily lives for 24 hours
- The next day, participants met the experimenters and returned the equipment
- The participants then completed a questionnaire assessing the degree to which the study procedures interfered with their daily lives and changed their behavior during the day of data collection

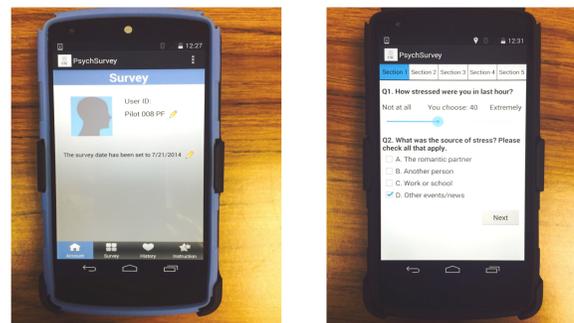


Figure 1. The phone application (top right and left), Q Sensor (bottom left) and Actiwave (bottom right)

Results

Time	Participant ID	Battery	Latitude	Longitude	Bluetooth Signal Strength
6:30:14 10:10	Pilot 002 F	92%	34.11061177	-118.3114402	-35
6:30:14 10:22	Pilot 002 F	91%	34.11057009	-118.3114556	-36
6:30:14 10:34	Pilot 002 F	91%	34.11056518	-118.3114643	-34
6:30:14 10:46	Pilot 002 F	90%	34.1105645	-118.3114676	-36
6:30:14 10:58	Pilot 002 F	90%	34.11056603	-118.3114736	-31
6:30:14 11:10	Pilot 002 F	89%	34.11057142	-118.3114734	-28
6:30:14 11:22	Pilot 002 F	88%	34.11057313	-118.3114768	-23
6:30:14 11:34	Pilot 002 F	87%	34.11057291	-118.3114782	-29
6:30:14 11:46	Pilot 002 F	87%	34.11057298	-118.3114808	-28
6:30:14 11:58	Pilot 002 F	86%	34.11057577	-118.3114807	-29
6:30:14 12:10	Pilot 002 F	86%	34.11057475	-118.311483	-31
6:30:14 12:22	Pilot 002 F	85%	34.11057892	-118.3114827	-27
6:30:14 12:34	Pilot 002 F	85%	34.11057834	-118.311482	-32
6:30:14 12:46	Pilot 002 F	84%	34.11058241	-118.3114819	-29
6:30:14 12:58	Pilot 002 F	84%	34.11058322	-118.3114844	-35
6:30:14 13:10	Pilot 002 F	83%	34.11058411	-118.3114823	-32
6:30:14 13:22	Pilot 002 F	82%	34.11058612	-118.3114837	-39
6:30:14 13:34	Pilot 002 F	82%	34.11058657	-118.3114855	-36
6:30:14 13:46	Pilot 002 F	81%	34.11058602	-118.3114861	-29
6:30:14 13:58	Pilot 002 F	81%	34.1105884	-118.3114857	-32

Table 1. Sample GPS and Bluetooth signal strength data

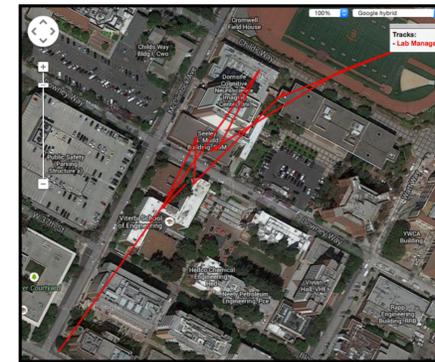


Figure 2. Example GPS data

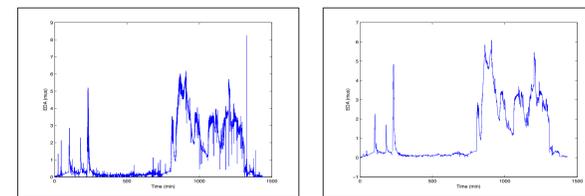


Figure 3. Example of electrodermal activity data cleaning procedures

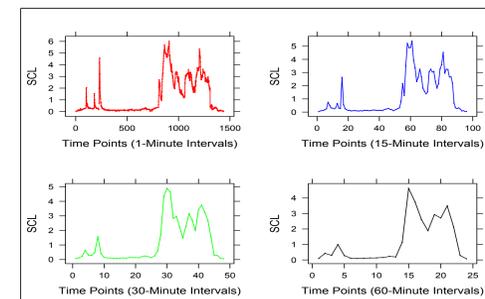


Figure 4. Example of electrodermal activity at different time intervals

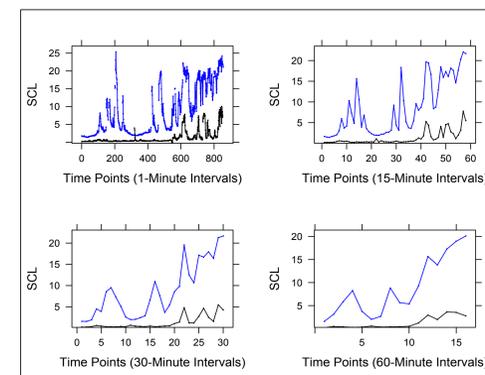


Figure 5. Example of electrodermal activity at different time intervals

- 93% of surveys completed; 83% of those within the first 15 minutes of the alert of the phone

Question (0 = not at all; 1 = a little; 2 = somewhat; 3 = a lot; 4 = extremely)	M	Min	Mode	SD
How typical was the day of data collection in terms of how you usually interact with your romantic partner?	3	3	3	.67
How much did filling out the hourly phone surveys change the way you interacted with your romantic partner?	1.22	1	1	1.08
How much did you change your behavior knowing that your conversations might be recorded?	.73	1	0	.84
How disruptive (i.e., interfered with your daily activities) was it to fill out the hourly phone surveys?	.63	0	0	.77
How disruptive (i.e., interfered with your daily activities) was it to wear the chest monitor?	.63	0	0	.88
How disruptive (i.e., interfered with your daily activities) was it to wear the wrist monitor?	.76	0	0	1.04
How uncomfortable was it to wear the chest monitor?	1.12	1	0	1.12
How uncomfortable was it to wear the wrist monitor?	1.17	1	0	1.14

Table 2. Self-reported reactivity to the procedures

Question	Response
In what ways did filling out the hourly phone surveys change the way you interacted with your romantic partner?	"It stopped the flow of conversation and reminded me that I was being recorded. In general, however, it did not impact the way we interacted."
"It made me conscious of my overall state of being, as well as how I was feeling towards my partner."	"Not at all really. We occasionally text throughout the day, and she typically calls me during her free time or on her way home from work. Everything was pretty normal for the most part."
"It became something that was somewhat comical and that we didn't exactly do together but it felt that way in a sense. I kept reminding him to take the phone with him and he would remind me to take my survey."	"It added as to something we had in common."
"We were both aware of it so we would joke around a lot about it."	"I had to take a look back at what happened in the hour. So there was a lot of reflection."
"Distractions from what we were doing for a minute or so each hour, but not too distracting."	"It felt a bit unnatural."
"I was more aware in how I responded to my partner. I began to explain why I was upset with him. I also learned how irritated I became throughout the day."	

Table 3. Responses regarding reactivity to completing the surveys

Question	Response
In what ways did your behavior change knowing that some of your conversations might be recorded?	"I'm not sure exactly, but I feel like I wasn't quite 100% natural all of the time. But I think I was natural or very close most of the time."
"Being aware that we might be being recorded, we sometimes laughed or joked (what if that's the only thing they recorded? haha)."	"I tried to not discuss more sensitive topics that we felt were private."
"I was more hesitant to talk about very personal things."	"I kept the conversations a little bit more appropriate but for the most part I forgot we were being recorded."
"I honestly had totally forgotten that it recorded our conversations until my partner reminded me it did. She felt a little embarrassed to talk about certain things knowing that. It made me laugh a little so I kind of said some things to make her feel a little uncomfortable knowing that it was being recorded."	"We sometimes spoke to the phone as if it was in the conversation. We also sometimes censored some words in our conversations slightly."
"My conversation changed slightly because I didn't want to say inappropriate words."	"The idea of it made me feel awkward at times."
"Trying to figure out what to discuss and what to respond when asked a question but eventually behavior wasn't changed at all."	

Table 4. Responses regarding reactivity to having conversations recorded

How long did it take you to complete the hourly phone surveys?	Less than 30 seconds	30 seconds to 1 minute	1 to 2 minutes	2 to 3 minutes	More than 5 minutes
	36.6%	48.8%	9.8%	0%	4.9%

Table 5. Time to complete surveys

Response	Percentage
I never removed the monitors	31.7%
I removed the monitors only to shower or bathe.	46.3%
I removed the monitors because they were uncomfortable.	9.8%
The monitor(s) fell off.	2.4%

Table 6. Reasons for removing monitors

Question	Percentage of Females Endorsing at least once during the day of data collection	Percentage of Males Endorsing at least once during the day of data collection
Stress	94.7%	84.2%
Stress caused by romantic partner	68.4%	68.4%
Feeling connected or close to your romantic partner	94.7%	94.7%
Feeling annoyed or irritated with your romantic partner	94.7%	78.0%
Expressed irritation to your romantic partner (among those who felt annoyed or irritated towards their partners)	78.9%	84.2%

Table 7. Endorsement over the day of data collection

In the last hour, how:	Female Frequency of Skin Conductance Responses	Male Frequency of Skin Conductance Responses
Stressed were you?	.11*	.34 (ns)
Happy were you?	-.03*	.37*
Sad were you?	.03*	.19*
Nervous were you?	-.03 (ns)	-.52*

Table 8. Multilevel regression testing the association between hourly self-report variables and EDA data

Discussion

- In general participants were compliant with the protocol and completed the questionnaires on time
- Levels of reactivity were relatively low as measured by self-reports
- We captured meaningful daily experiences (feeling stressed, irritated with partner, etc.)
- This is a promising framework for studying couple dynamics in daily life