



# μEMA: Microinteractions-Based Ecological Momentary Assessments using a Smartwatch

## Abstract

Ecological Momentary Assessment (EMA) is a method of *in situ* data collection for assessment of behaviors, states, and contexts. Questions are prompted during everyday life using an individual's mobile device, thereby reducing recall bias and increasing validity over other self-report methods such as retrospective recall. We describe a microinteraction-based EMA method ("micro" EMA, or μEMA) using smartwatches, where all EMA questions can be answered with a quick glance and a tap – nearly as quickly as checking the time on a watch. A between-subjects, 4-week pilot study was conducted where μEMA on a smartwatch (n=19) was compared with EMA on a phone (n=14). Despite an ≈8 times increase in the number of interruptions, μEMA had a significantly higher compliance rate, completion rate, and first prompt response rate, and μEMA was perceived as less distracting.

## μEMA: Overview



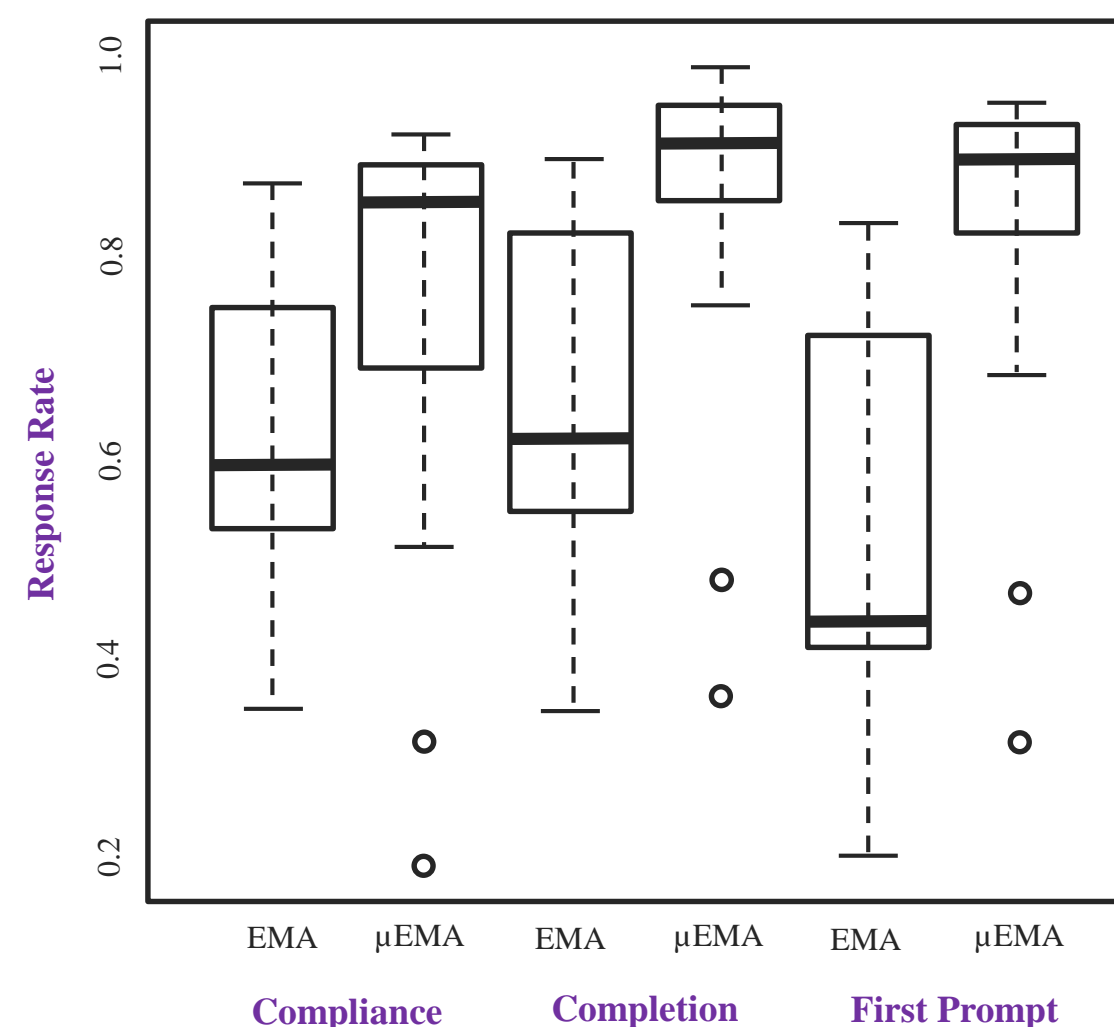
## Interrupt more, ask less

μEMA uses *only* microinteractions to gather EMA data related to health behavior and context. All the survey prompts in μEMA (micro-EMA) are reduced to single questions with "Yes", "No" type of answers. Between 8 AM to 8 PM, participants are prompted with more than 36 times in a day. Each interruption consists of only one single question, which can be answered **as quickly as checking time on your watch**.

Traditional smartphone-based EMA interrupts 6-7 times a day, whereas μEMA interrupts **more than 8 times** of traditional EMA.

## μEMA: Evaluation

μEMA was compared with traditional EMA in terms of study compliance, survey completion rates and response rates for first delivered prompts. In a between-subject experiment, participants responded to EMA prompts using traditional EMA and μEMA for a period of four weeks. This work only focuses on study engagement. Therefore, a survey from a prior study was used, which was a combination of Positive and Negative Affect Schedule (PANAS) and a physical activity questionnaire.

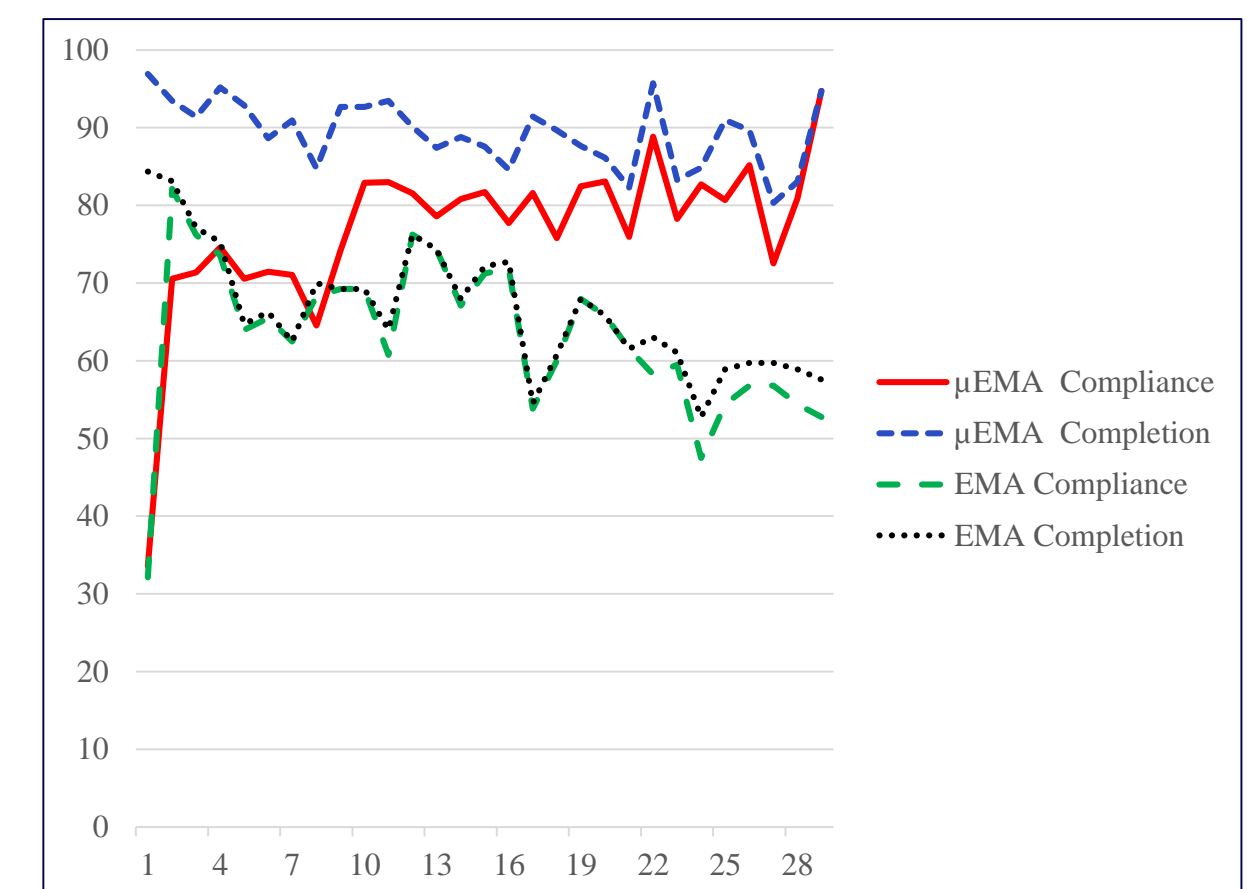


μEMA has higher response rates as compared to traditional EMA. Table below summarizes these response rates for μEMA and EMA. Despite 8 times more interruptions than EMA, μEMA had higher response rates.

	EMA	μEMA
Mean Question Set Compliance	64.54%	81.21%
Mean Question Set Completion	67.36%	91.81%
Question Sets Answered	1546	15278
Questions Answered	9270	15278
Mean Question Sets Completed After first prompt	53.28%	88.33%

## Results and Conclusions

- **High compliance:** μEMA participants were 1.25 times more likely to respond to a scheduled prompt
- **High completion rates:** μEMA participants were 1.35 times more likely to respond to a delivered prompt
- **High response rates for first delivered prompts:** μEMA participants were 1.65 times more likely to respond to a first delivered prompts



μEMA compliance and completion rates remain at a high value constantly for the four weeks. However, EMA compliance and completion constantly drop towards the end of the study.

## Team

**Dr. Stephen Intille** - [s.intille@neu.edu](mailto:s.intille@neu.edu)

Assoc. Prof., CCIS & Bouve

**Caitlin Haynes** - [cahaynes1202@gmail.com](mailto:cahaynes1202@gmail.com)

Perkins school for the blind

**Dharam Maniar** - [maniar.d@husky.neu.edu](mailto:maniar.d@husky.neu.edu)

MS CS, CCIS

**Aditya Ponnada** – [ponnada.a@husky.neu.edu](mailto:ponnada.a@husky.neu.edu)

PhD Personal Health Informatics

**Dr. Justin Manjourides** - [j.manjourides@neu.edu](mailto:j.manjourides@neu.edu)

Asst. Prof., Bouve