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Data Collection Considerations Using Ecological Momentary Assessment: Novel Approaches To Assess Psychosomatic Health

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Background

COVID-19 has increased the risk of mental health disorders and substance use in vulnerable populations such as pregnant women and women with young children.

The purpose of this study was to characterize the effect of the COVID-19 pandemic on psychosomatic outcomes in pregnant and postpartum women with intersecting vulnerabilities.

Ecological Momentary Assessments (EMA) are a novel data collection method using a participant's cell phone.

Phone type and exposure group may affect the quality of EMA data collected.

Methods

A subset of pregnant and postpartum women were identified from the ENRICH-2 prospective cohort study.

Women were recruited and classified into alcohol-using and control groups.

A phone app was used to collect emotional regulation data by a repeat EMA 'instance' survey three times a day for two weeks.

Heart rate variability (HRV) data was also collected pre, during, and post survey while performing background syncing on the phone app paired with a Garmin smartwatch. HRV data included standard deviation of all R-R intervals (SDNN), root mean square of successive RR intervals (RMSSD), high (low) frequency in normalized units (HF_NU, LF_NU), and low-frequency/high-frequency ratio.

Mid-study analysis was performed to compare the 2072 EMA surveys completed and 4220 HRV outcomes collected among participants to identify potential differences in EMA data collection by phone type (Android or Apple) and exposure group.

Results

To date, data were obtained from 57 participants (43 controls; 14 alcohol-using).

Type of Phone Used (% of participants):

Android: 47% (42% controls, 64% alcohol-using)
Apple: 53% (58% controls, 36% alcohol-using)

There were no significant difference in demographic characteristics between the exposure groups or in phone type (Table 1).

There was a significant difference for total number of EMA surveys completed between Android and Apple, 34.7 vs. 37.8 surveys (p=0.028). However, while completed surveys were lower for Android users in both controls and alcohol-using groups, differences were not significant (controls: 35.7 vs 37.7, p=0.15; alcohol-using: 32.8 vs 38.2, p=0.14)

HRV instance data shows there are significant mean differences between the control Android users (N=1154) and Apple users (N=2240) (p<0.01), and between the alcohol-using Android users (N=440) and Apple users (N=386) (p=<0.01) (Table 2). SDNN and RMSSD values for Android users were fairly consistent for controls and alcohol-using groups. However greater variation for these values was observed for Apple users within each group: within controls, Apple user values were significantly higher than Android, while within alcohol-using, values were significantly lower than Android.

Table 1: Demographic table by phone type

Demographic Table by phone type (n=57)

Variable	Android (N=27)	Apple (N=30)	Total (N=57)	P-Value
Mom age (Mean ± SD (N))	31.1 ± 4.7 (N=27)	28.9 ± 4.7 (N=30)	30.0 ± 4.8 (N=57)	0.081[1]
Years of education completed (Mean ± SD (N))	15.3 ± 3.2 (N=27)	16.3 ± 3.5 (N=30)	15.9 ± 3.4 (N=57)	0.24[1]
Marital Status				
Single/separated/divorced	6 (22.2%)	5 (16.7%)	11 (19.3%)	0.74 [2]
Married/Cohabitating	21 (77.8%)	25 (83.3%)	46 (80.7%)	
Total	27	30	57	
Hispanic, Latino or of Spanish decent	16 (59.3%)	14 (46.7%)	30 (52.6%)	0.43 [2]
Race				
White	17 (63.0%)	22 (73.3%)	39 (68.4%)	0.37 [2]
Black or African American	0 (0.0%)	2 (6.7%)	2 (3.5%)	
American Indian or Alaskan Native	2 (7.4%)	1 (3.3%)	3 (5.3%)	
other	8 (29.6%)	5 (16.7%)	13 (22.8%)	
Total	27	30	57	
Education				
high school or less	7 (25.9%)	5 (16.7%)	12 (21.1%)	0.73 [2]
some college or vocational school	7 (25.9%)	8 (26.7%)	15 (26.3%)	
college degree or higher	13 (48.1%)	17 (56.7%)	30 (52.6%)	
Total	27	30	57	
Income				
under 20,000	4 (14.8%)	1 (3.3%)	5 (8.8%)	0.51 [2]
20,000-49,000	10 (37.0%)	11 (36.7%)	21 (36.8%)	
50,000-69,000	5 (18.5%)	6 (20.0%)	11 (19.3%)	
70,000 or over	8 (29.6%)	12 (40.0%)	20 (35.1%)	
Total	27	30	57	
currently employed	16 (59.3%)	20 (66.7%)	36 (63.2%)	0.59 [2]
Insurance				
no insurance	3 (11.1%)	2 (6.7%)	5 (8.8%)	0.14 [2]
Employer-based insurance	12 (44.4%)	22 (73.3%)	34 (59.6%)	
self-purchased insurance	1 (3.7%)	0 (0.0%)	1 (1.8%)	
Medicaid	10 (37.0%)	6 (20.0%)	16 (28.1%)	
other	1 (3.7%)	0 (0.0%)	1 (1.8%)	
Total	27	30	57	

[1] based on Mann-Whitney test; [2] based on Fisher's exact test

Table 2: HRV measures by phone type for classification group

Control group: Analyses for Observed SDNN values (3x/day [Pre, During, Post] for days participated) (N=3394)

Variable	COVID_PHONE_TYPE = Android (N=1154)	COVID_PHONE_TYPE = Apple (N=2240)	Total (N=3394)	P-Value
SDNN (Mean ± SD (N))	58.6 ± 24.4 (N=1154)	62.5 ± 23.0 (N=2240)	61.2 ± 23.6 (N=3394)	<.0001[1]
RMSSD (Mean ± SD (N))	42.1 ± 18.2 (N=1154)	43.2 ± 16.2 (N=2240)	42.9 ± 16.9 (N=3394)	0.0063[1]
HF_NU (Mean ± SD (N))	46.3 ± 10.9 (N=1154)	47.0 ± 8.3 (N=2240)	46.8 ± 9.3 (N=3394)	0.0006[1]
LF_NU (Mean ± SD (N))	53.7 ± 10.9 (N=1154)	53.0 ± 8.3 (N=2240)	53.2 ± 9.3 (N=3394)	0.0006[1]
LF_NU/HF_NU (Mean ± SD (N))	1.3 ± 0.7 (N=1154)	1.2 ± 0.5 (N=2240)	1.2 ± 0.6 (N=3394)	0.0006[1]

Note: [1] based on Mann-Whitney test

Alcohol-using group: Analyses for Observed SDNN values (3x/day [Pre, During, Post] for days participated)

Variable	COVID_PHONE_TYPE = Android (N=440)	COVID_PHONE_TYPE = Apple (N=386)	Total (N=826)	P-Value
SDNN (Mean ± SD (N))	59.2 ± 25.5 (N=440)	54.5 ± 21.2 (N=386)	57.0 ± 23.7 (N=826)	0.0070[1]
RMSSD (Mean ± SD (N))	42.2 ± 17.4 (N=440)	35.8 ± 13.6 (N=386)	39.2 ± 16.1 (N=826)	<.0001[1]
HF_NU (Mean ± SD (N))	48.6 ± 10.7 (N=440)	44.3 ± 9.0 (N=386)	46.6 ± 10.2 (N=826)	<.0001[1]
LF_NU (Mean ± SD (N))	51.4 ± 10.7 (N=440)	55.7 ± 9.0 (N=386)	53.4 ± 10.2 (N=826)	<.0001[1]
LF_NU/HF_NU (Mean ± SD (N))	1.2 ± 0.6 (N=440)	1.4 ± 0.8 (N=386)	1.3 ± 0.7 (N=826)	<.0001[1]

Note: [1] based on Mann-Whitney test

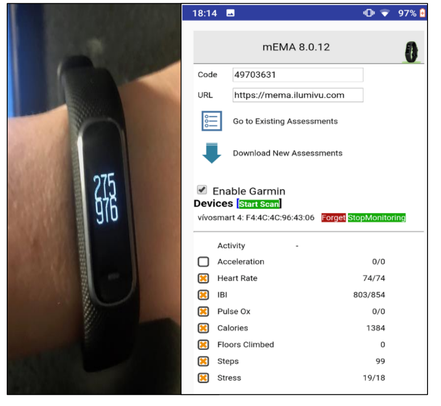
Conclusions

Emerging results demonstrate that there are significant differences in the amount of EMA data collected by phone type.

Additionally, the direction of the mean difference in SDNN and RMSSD values is opposite for the alcohol using and control groups. This may be due to the small number of alcohol-using participants.

In this study to date, phone type results in differences in amount of data collected, which may be related to app performance on different phone makes and models.

Phone type is an important methodological aspect of studies with an EMA component and should be factored into study design.



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