

# Reliability Of Capturing Sleep Diary Data Via Wrist Worn Electronic Device

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## Introduction

- Paper sleep diaries are the gold standard for assessment of sleep continuity variables in clinical practice as well as research.
- In recent years, web based programs via computer or hand held devices have shown promise in improving timeliness and accuracy of data collection.
- In this study, we assessed the reliability of using a wrist worn electronic sleep diary that also included actigraphy in comparison to collecting sleep diary data via paper diary.

## Problem

- The main concern with paper sleep diaries is that it is unknown to the researcher when the subject filled out their diary.
- For example a subject may simply fill out their paper diary 20 minutes before turning it in to the researcher as opposed to daily per instructions.
- Previous literature has shown that diary questions answered at the end of each day and in the morning within an hour of waking are more highly correlated with objective measures of sleep.

## Methods

- **Design:** This study (n=35) was nested within a larger (n=300) cohort for a prospective questionnaire validation study.
- Prospective design included capturing two weeks of paper sleep diary, electronic sleep diary, and actigraphy data.
- **Study sample:** Baseline data included sex, age, race, ethnicity, years of education, Insomnia Severity Index (ISI) total score, work schedule, and one night screen for sleep apnea.
- **Study Procedure:** Two weeks wearing Pro-diary Actiwatch and filling out paper sleep diaries twice daily.

### Demographics n=35

	% (n)	Mean	SD
Age		36.62	14.969
Gender	Male	23	
	Female	77	
Race	African American	14	
	White	82	
	Mixed Race	3	
Ethnicity	Non-Hispanic or Latino	97	
Insomnia Category	Insomnia (>7 ISI)	51	7.8 5.6
Obstructive Sleep Apnea	(AHI>5)	23	2.58 3.43
Shift Worker		31	
Education	>High School	11	
	2 Years College	23	
	4 Years College	37	
	>4 Years College	29	

## Results

Paired t-test Differences Between ProDiary and Paper Diary [M(sd)] n=33	ProDiary	Paper Diary
Sleep Latency (p=.17)	15.1(15)	18.4(19)
Wake After Sleep Onset *(p=.00)	10.4(9)*	4.4(6)*
Number of Awakenings (p=.08)	1.1(0.9)	1.4(1.3)
Early Morning Awakenings (p=.21)	9.9(11)	9.1(11)

Paired t-test Differences Between ProDiary and Motionware [M(sd)] n=29	ProDiary	Motionware
Sleep Latency (p=.31)	15.1(15)	18.0(11)
Wake After Sleep Onset *(p=.00)	10.4(9)*	45.7(19)*
Number of Awakenings *(p=.00)	1.1(0.9)*	36.0(9)*

Paired t-test Differences Between Paper Diary and Motionware [M(sd)] n=30	Paper Diary	Motionware
Sleep Latency (p=.86)	17.3(18)	18.0(11)
Wake After Sleep Onset *(p=.00)	4.1(6)*	45.0(19)*
Number of Awakenings *(p=.00)	1.5(1.3)*	36.0(9)*

## Conclusions

- Comparing electronic to paper recording of sleep diary data, data captured via electronic diary is statistically the same as paper diary with exception of wake after sleep onset.
- Comparing electronic and paper recording of sleep diary data to objective capture of sleep variables, data capture via both paper and electronic diary is statistically the same as motionware for sleep latency. Variables representing wake after sleep onset and number of awakenings were statistically different. The patients' perception of awakenings during the night is often found to be different than objective measure of awakenings. Additionally, actigraphy capture of motion during the night is very sensitive and could reflect motion from sleep apnea or periodic limb movements of sleep.
- Overall, electronic capture of sleep diary data is more accurate than paper diary capture. This is likely because the device is worn on the watch at all times and thus providing ease in entering data as well as the patient having knowledge that time of data entry is captured via the device.

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COMPLETE IMMEDIATELY BEFORE BED:

DATE	1	2	3	4	5	6	7	8	9	10
Typical Day? (Yes/No)*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fatigue (None 0-1-2-3-4-5 A Lot)	0	0	0	0	0	0	0	0	0	0
Stress (None 0-1-2-3-4-5 A Lot)	2	2	2	2	2	2	2	2	2	2
Alert (Not Very 0-1-2-3-4-5 Very)	1	3	2	2	2	2	2	2	2	2
Concentration (Poor 0-1-2-3-4-5 Good)	3	3	3	3	3	3	3	3	3	3
Mood (Bad 0-1-2-3-4-5 Good)	4	4	4	4	4	4	4	4	4	4
Pain (None 0-1-2-3-4-5 A Lot)	0	0	0	0	0	0	0	0	0	0
Head (Full 0-1-2-3-4-5 Bad)	3	3	3	3	3	3	3	3	3	3
Temp (Minutes)										
Time Spent Exercising (minutes)										
Time Spent Outside Today (minutes)	60	60	60	60	60	60	60	60	60	60
Number of Alcoholic beverages	120	120	120	120	120	120	120	120	120	120
Prescriptions (Yes/No)	N	0	0	0	0	0	0	0	0	0
OTC Meds (Yes/No)	N	N	N	N	N	N	N	N	N	N
Monstrants (Yes/No)	N	N	N	N	N	N	N	N	N	N
Menstruation pain (None 0-1-2-3-4-5 Bad)	0	0	0	0	0	0	0	0	0	0

PLEASE INDICATE ON THE BACK OF THE SHEET WHY ANY OPEN DAY WAS NOT TYPICAL AND/OR WHAT INDICATORS YOU TOOK ON ANY OPEN DAY

COMPLETE IMMEDIATELY ON AWAKENING:

What time did you go to bed - intending to sleep?	1am	2am	3am	4am	5am	6am	7am	8am	9am	10am
What time did you get out of bed on the morning?	11am									
How many minutes to fall to sleep	15min									
How many times awake during the night	0									
How many minutes awake during the night	0									
How many minutes awake before the alarm	0									
How many minutes out of bed when awake during the night	0									
How much time from waking last night (minutes)										
Sleep Quality (None 0-1-2-3-4-5 Good)	5	5	5	5	5	5	5	5	5	5
Fatigue (on awakening) (None 0-1-2-3-4-5 A Lot)	0	0	0	0	0	0	0	0	0	0



### List Questions

For example:

Q. 'Which do you find disturbs your sleep at night?'