UbiComp 2015

SleepTight: Low-burden, Self-monitoring Technology for Capturing and Reflecting on Sleep Behaviors

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Self-monitoring

An activity of recording one's own behaviors, thoughts, or feelings

[Kopp, J. (1988) Self-monitoring: A literature review of research and practice]

Self-monitoring is important

Therapeutic Purpose

Being aware of how you are doing can result in **reactivity*** and enable you to change behavior or maintain appropriate behavior

* **Reactivity**: The change in the frequency of a target behavior



Data Capture Mechanisms



Manual Capture

- Increased self-awareness
- Engagement with data
- Flexibility of choosing target behaviors
- Some data can only be tracked manually
- High capture burden
- Forgetting -> compromised data accuracy

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Automated Capture

- Reduced mental load
- Better accuracy (depending on the data)
- Cumbersome to wear (wearable sensing)
- Reduce engagement with data





Data Capture Mechanisms



Sleep Tracking

	Sleep Medic	ine Associates	Sleep / Wake Di	ary				_
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
NAME:	DATE:	DATE:	DATE:	DATE:	DATE:	DATE:	DATE:	
Answer the following in the morning								
What time did you get into bed last night?	:	:	:	:	:	:	:	
What time did you turn everything off and try to fall asleep?								
How long did it take you to fall asleep after that?	:	:	:	:	:	:	:	
What did you do between getting into bed and falling asleep?								
Did you wake up during the night? How often? How long were you awake total?								
What time was your final awakening this morning?	:	:	:	:	:	:	:	
What time did you get out of bed?	:	:	:	:	:	:	:	
Did anything unusual happen yesterday that might have affected your sleep? (Illness, disturbances, emotional stress, etc)								
What is the total amount of time you slept last night in hours and minutes? (Best estimate)								_
Did you take any medication that might have affected your sleep? What? When?								
Answer the following in the evening								
Did you nap today? How many times? When? How long?								
Did you consume any medicine that you do not take on a daily basis? What? How much? When?								
Did you have any caffeinated or alcoholic beverages today? What? How much? When?								
Please rate your average sleepiness today on a scale of 1-10. 1=wide awake, 10=very sleepy.							s	http://www.swedish.o leep Center Patient Resourc

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Goal

To support easy & flexible manual capture of multiple behavior factors

SleepTight Design Goals

1. Capture both target behaviors and contributing factors



SleepTight Design Goals

- 1. Capture both target behaviors and contributing factors
- 2. Reduce the capture burden



SleepTight Design Goals

- 1. Capture both target behaviors and contributing factors
- 2. Reduce the capture burden
- 3. Provide feedback to promote self-reflection



SleepTight Design

Capturing Multiple Behaviors Leveraging App Widget Feedback

Capturing Multiple Behaviors

Target behaviors: Sleep

Last night, I went to bed at	11:55 PM
Minutes to fall asleep	10 mins
This morning, I woke up at	7:08 AM
I finally got out of bed at	7:22 AM
Last night, I woke up	
How long have you stayed awake in total?	1 min
The overall sleep quality was	
8890	
Very Poor Poor Neutral Good	Very Good
About 1 hour before going to bed, I did the following	Check
activities: Email, Web surfing	
My sleep was disturbed by No reason	Check

Contributing factors

11 - 7 - 7 - 11 +

Custom Behaviors

Capturing Multiple Behaviors

Target behaviors: Sleep

Last night, I went to bed at	11:55 PM
Minutes to fall asleep	10 mins
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Last night, I woke up	1
How long have you stayed awake in total?	1 min
The overall sleep quality was	
8890	
Very Poor Poor Neutral Good	Very Good
About 1 hour before going to bed, I did the following activities: Email, Web surfing	Check
My sleep was disturbed by No reason	Check

Contributing factors



Leveraging App Widget





Leveraging App Widget

of unlocking event / day 4.8-105.3 times

Truong et al., (2014)





Lock screen

Home screen

Leveraging App Widget



Lower Capture Burden

Lower Access Burden

Feedback for Self-reflection





4-week View



Comparison View

Daily View

Study Design

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App-only System Condition

Study Design



Full System Condition

Study Design

A three-phased study



22 participants (9 Males, 13 Females) Average age—29.7 years old (range: 20-49) Random assignment

Findings

Data Capture Behaviors Information Access Self-reflection

Data Capture Behavior [Diary adherence]



Data Capture Behavior [# of total contributing factors]

Full system: 151.11 (SD = 68.82)

App-only system: 141.5 (SD = 78), p = N/S

9% of the contributing factors were captured from the widgets

Time Difference b/w Event Time and Logging Time

Full System: 7.1 hours < App-only System: 11.7 hours (SD = 3.33) p = .02 (SD = 5.00)

Number of 'Add Activity' Events by Hour of Day



Self-reflection

Self-reflection during **opportune moments**:

What did you learn?

"...my time to go to bed is a little inconsistent"

"...I don't drink as much alcohol as I thought I did"

"...drinking alcohol seems to lead to poor sleep."

Finding-Sleep pattern (neutral statement)

Finding-Other activity (disproof)

Hypothesis-Relationship between sleep and other factors

Designing Successful Manual Tracking Tools

Lower the User Burden

Lower the Capture Burden Lower the Access Burden Leverage Visual Reminders

Leverage Manual Tracking in Self-reflection



Thank you!



Funding: Intel ISTC Pervasive Computing NSF Awards 1344613 Google

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