Help people get their most, best sleep by making mobile tech, wearables, and smart devices smarter.
Clearly “Sleep” is of General Interest

Google

why can’t I sleep
why can’t
The Current Problem

There has been a proliferation of devices that measure sleep and display sleep data

But

Such devices and systems do not provide science based, data driven, guidance about

• How to get more sleep, and/or

• What amount (and timing) of sleep is optimal for the individual
Existing “Sleep Coaching” is Limited

- Recommendations are not individually-tailored
- Recommendations are not actionable
- Recommendations are not feasible
- Recommendations are not self-correcting
- Recommendations are just tips
What if your wearable could actually tell you how much sleep you need?

And was driven by an individualized, self-correcting set of algorithms that actually worked and could optimize your sleep?

And what if it talked to the IOT devices around you to provide support?
What is Our Goal?

This is a lot like building a great bathroom scale

• You can tell someone how much they weigh
• But a scale cannot tell them whether that weight is optimal for them,
• Or how to lose or gain weight if they need to.

Imagine if you had a scale that not only gave you all kinds of information about your weight (and body fat distribution, etc.) but also was able to use that information to optimize a weight loss plan specifically tailored to you. Our system is able to tell people what their ideal weight should be, based on their own data.
The Hypknowledge Approach

Screen for sleep disorders (Screener)
via an online and/or smart phone based instrument
Positive results: provide information

Gather sleep data (Tracker)
via online and/or smart phone sleep diary interface
via passive trackers (e.g., Fitbit, Sleep Cycle, etc.)
via voice interface / smart speakers (e.g., Amazon Alexa)

Display data (Reporter)
In tables and graphs on user page & phone app

Process data (Optimizer)
via Hypknowledge sleep extension algorithm
via Hypknowledge sleep optimization algorithm

Provide recommendations re: sleep scheduling
via email and texts
via on-line dashboard
via voice interface / smart speakers
via device screens
Presently Developed (2.0)
# Presently Developed

## Sleep Disorders Symptom Screener

### SDS-CL-25

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<th>Date</th>
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1. **Work Shift:** n/a | 0 | 1 | 2 | 3 | 4 | 5 |
2. **Work Hours:** 0 | 1 | 2 | 3 | 4 | 5 | 6 |
3. **Daytime Sleepiness:** Yes/No | 0 | 1 | 2 | 3 | 4 | 5 |
4. **Sleep Timing:** 0 | 1 | 2 | 3 | 4 | 5 | 6 |
5. **Sleep Quality:** 0 | 1 | 2 | 3 | 4 | 5 | 6 |

**Instructions:**

1. **My work or other activities prevent me from getting at least 6 hours of sleep.**
2. **My bedtime or wake time varies by more than 2 hours.**
3. **It takes me 30 minutes or more to fall asleep.**
4. **I am awake for 30 minutes or more during the night.**
5. **I wake up 20 or more minutes before I have to and can’t fall back asleep.**
6. **I am tired, fatigued, or sleepy during the day.**
7. **I sleep better if I go to bed before 9pm and wake up before 4:30am.**
8. **I sleep better if I go to bed late (after 1am) and wake up late (after 9am).**
9. **I am prone to fall asleep at inappropriate times or places.**
10. **I snore.**
11. **I wake up with a dry mouth (mouth is dry).**
12. **My snoring is so loud, that my bed partner complains.**
13. **I have been told that I stop breathing in my sleep.**
14. **I wake up choking or gasping for air.**
15. **I have uncomfortable sensations in my legs, especially when sitting or lying down, that are relieved by moving them.**
16. **I have an urge to move my legs that is worse in the evenings and nights.**
17. **I wake up frequently during the night for no reason.**
18. **When angered, startled, frightened, I experience sudden muscle weakness.**
19. **When falling asleep or waking up, I experience scary dreamlike images.**
20. **When I first awaken, I feel like I can’t move.**
21. **I have nightmares.**
22. **For no reason, I awaken suddenly, feeling startled and afraid.**
23. **I have been told that I walk, talk, eat strangely or violently when asleep.**
24. **I grind my teeth or clench my jaw while I sleep.**
25. **My sleep difficulties interfere with my daily activities.**

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Sleep Disorders Symptom Screener
Presently Developed

Sleep Disorders Symptom
Checklist - 25

Answer all questions for what has been typical for you for the last 3 months.

Date: [mm/dd/yyyy]

Sex:
- Male
- Female

Weight:
- [lbs]
- [kg]

I identify my Race/Ethnicity as (pick all that apply):
- White
- Black
- Asian
- Hispanic/Latino
- Other

My highest degree is (pick just one):
- High School Diploma / GED
- AA
- BA/BS
- MA/MS

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Sleep Disorders Symptom Screener
Presently Developed

Sleep Disorders Symptom Screener
Presently Developed

Sleep Disorders Symptom Screener
Presently Developed

Sleep Disorders Symptom Screener
Presently Developed
Email with PDF of Screener

Subject: FW: FW: Sleep Disorders Screener

SDS-CL-25 (V6)

Thank you for your interest in your sleep health. Thank you for taking the time to complete the screener. A PDF of the screener is attached to this email. The items in the last two columns (highlighted in gray) indicate that you are experiencing one or more symptoms of one or more of 13 sleep disorders. If you have such “positive signs”, you may wish to share the PDF of the screener with your primary care provider. Alternatively, or additionally, you may wish to seek out information or specialty care.

For information on sleep disorders, please visit
https://www.sleepfoundation.org/

In order to identify sleep centers in your area, please visit.
http://sleepeducation.org

In order to identify Behavioral Sleep Medicine specialist in your area (those that treat insomnia), please visit
https://cbit.directory/
https://www.behavioralsleep.org/

We hope this information is helpful.
Sleep well

Sleep Disorders Symptom Screener
Presently Developed
On-Line Sleep Diary

Sleep Diary

1. What time did you get into bed? (TTB)
2. What time did you start trying to fall asleep? (TTS)
3. How long would it take you to fall asleep? (SL)
4. How many times did you wake up not counting your final wake time? (NWAK)
5. What time did you wake for good? (TFA)
6. Was this earlier than you wanted to wake up? (TE)
7. What time did you finally get out of bed? (TOB)
8. How would you rate the quality of your sleep (last night)? (Poor 0 - 1 - 2 - 3 - 4 - 5 Excellent) (SQ)
9. How rested or refreshed did you feel this morning? (Not very 0 - 1 - 2 - 3 - 4 - 5 Very) (REST)
10. Yesterday, how many times did you nap or doze? (NAAPS)
11. Was this an unusual night of rest? (This will omit this record from your sleep suggestions).

Submit Diary Responses
Presently Developed

iPhone Sleep Diary

Questions

What time did you get to bed last night?

10:45 AM

Yesterday

I napped during the day for
I dozed in the evening for

Last night

I started trying to sleep at 11:00 PM
I took minutes to fall a sleep 5 minute(s)
I was awake during the night for 10 minute(s)
I awoke for good at 06:30 AM
I awoke minutes before wanted to 0 minute(s)
I got out of bed at 06:35 AM
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SMS and Email Notifications

Good Morning! Remember to complete your daily sleep diary today.

Yesterday 6:00 AM

Good Morning! Remember to complete your daily sleep diary today.

Today 6:00 AM

Perlis, Michael L.

To: Hypknowledge Sleep Manager; mperlis61@gmail.com
Subject: RE: Diary Reminder

From: Hypknowledge Sleep Manager <notify@hypknowledge.com>
Sent: Tuesday, March 2, 2021 12:05 PM
To: mperlis61@gmail.com
Subject: Diary Reminder

Hello there.
If you have not done so already, please remember to fill out your sleep diary for today.
Thanks.
Presently Developed
Out of Range and Invalid Response Notifications
Presently Developed

Diary Data Database

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Presently Developed
Sleep Data Graphics
Presently Developed

Fitbit API interface

for data acquisition
for the provision of recommendations
Presently Developed

Fitbit API interface

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Presently Developed Dashboard Recommendations
In Development / Planned Development

**Screener**
Enhance aesthetics
Allow email to have a report attachment

**Tracker and Reporter**
Free standing tracker (for use by clinicians, researchers, & industry)
Expand data capture from multiple passive trackers

Process data (Optimizer)
via Hypknowledge sleep extension algorithm (Beta version running)
via Hypknowledge sleep optimization algorithm

Provide recommendations re: sleep scheduling (Optimizer)
via email and texts (Beta version running)
via on-line dashboard (Beta version running)
via voice interface / smart speakers (in development)
Hypkknowledge

Michael A. Grandner PhD MTR
Director, Sleep and Health Research Program
Director Behavioral Sleep Medicine Clinic
Assistant Professor of Psychiatry
University of Arizona College of Medicine

Michael L. Perlis PhD
Director, Behavioral Sleep Medicine Program
Associate Professor of Psychiatry & Nursing
Perelman School of Medicine
University of Pennsylvania

Donn Posner PhD
Adjunct Clinical Associate Professor,
Psychiatry and Behavioral Sciences
Stanford University School of Medicine
Clinical/Research Psychologist, Palo Alto
Institute for Research
Dr. Michael Perlis

• Director of the Behavioral Sleep Medicine Program and Tenured Associate Professor of Psychiatry at the University of Pennsylvania

• Internationally recognized expert in sleep medicine with over 30 years of experience, especially in the domain of Behavioral Sleep Medicine

• Leading authority on treatments for insomnia

• Lead author/editor of the two primary textbooks in the field of Behavioral Sleep Medicine. Note: These texts have been translated into multiple languages.

• Lead lecturer and course developer for two CE three day workshops on CBT-I. These courses have provided training to more than 2000 individuals worldwide.

• > 165 publications on sleep

• An established track record of funding from the NIH

• Editorial Boards of SLEEP, Journal of Sleep Research, Behavioral Sleep Medicine, Sleep Medicine Reviews, Sleep Medicine Research, Health Psychology, and Behavioral Research and Therapy.

• Many national committee memberships and chairships, including being the founding President of the Society of Behavioral Sleep Medicine
Dr. Michael Grandner

• Director of the Sleep and Health Research Program at the University of Arizona
• Licensed clinical psychologist and Director of the Behavioral Sleep Medicine Clinic at the Banner-University Medical Center in Tucson
• Internationally recognized expert in sleep health with over 15 years of experience in the field
• Research focuses on real-world implications of sleep and health
• Published >100 scientific articles on sleep
• Editor of “Sleep and Health” – the first textbook in this field of research
• Editorial Board of SLEEP, Sleep Medicine, Journal of Clinical Sleep Medicine, Behavioral Sleep Medicine, Journal of Sleep Research, and Frontiers in Neurology; and Associate Editor of Sleep Health
• Many awards for his work from scientific and professional organizations
• Several national committee memberships and chairships
• Some work with FitBit, including presence on Scientific Advisory Panel
• Work with other organizations, including technology, athletics, and health companies
Dr. Donn Posner

• Nationally recognized master CBT-I therapist with over 30 years of experience
• Leading authority on treatments for insomnia
• Author/editor of the two CBT-I treatment manuals
• Lecturer and course developer for two CE three day workshops on CBT-I. These courses have provided training to more than 2000 individuals worldwide.
• One of the first certified behavioral sleep medicine specialists
• Founding member of the Society of Behavioral Sleep Medicine
• Recipient of the SBSM society’s Peter Hauri Career Distinguished Achievement Award.
Where we stand

• First patent pending, second in preparation
• Expert-led scientific team
• Extensive sleep tech industry connections
• University backing
• Preliminary data showing proof-of-concept (Sleep Extension)
• 2nd generation platform (up and running)