

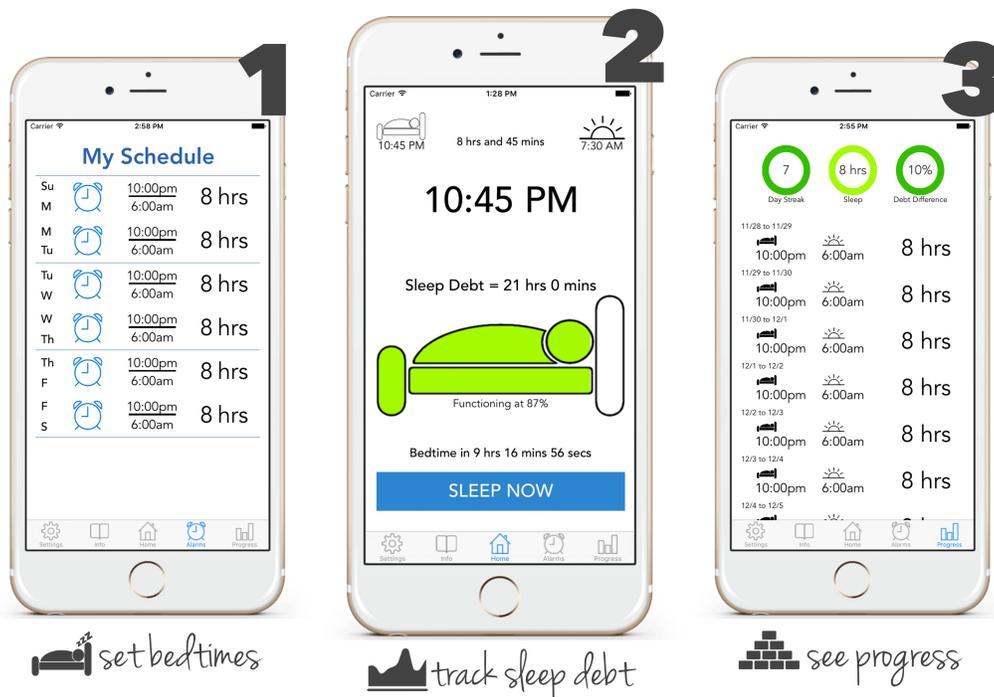
consistenzzzz

sleep more, five better.

Gabriella Brignardello, *Manager* • Brian Higgins, *Developer*
Nate Lohn, *User Tester* • John Morgan, *Designer*

Problem & Solution Overview

Currently, people lose countless hours of quality sleep to homework and technological distractions, such as late-night use of their computers or phones. We aim to change this by providing a platform to inspire users to develop more consistent sleep habits. With *consistenzzzz*, users can set sleep goals, track their sleep debt as well as their progress, and leverage sleep to combat their unhealthy habits.



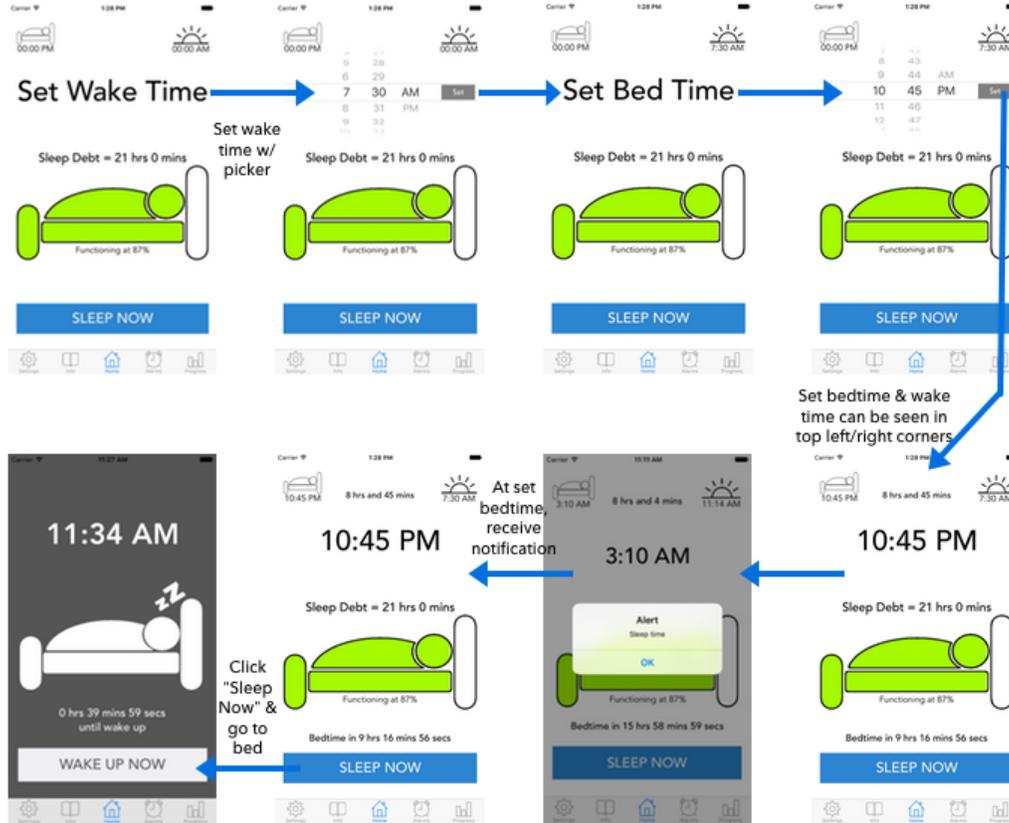
1, 2, 3, repeat.

Tasks & Final Interface Scenarios

The three tasks that users can accomplish with *consistenzzz* are:

Simple: Go to bed at bedtime Goal

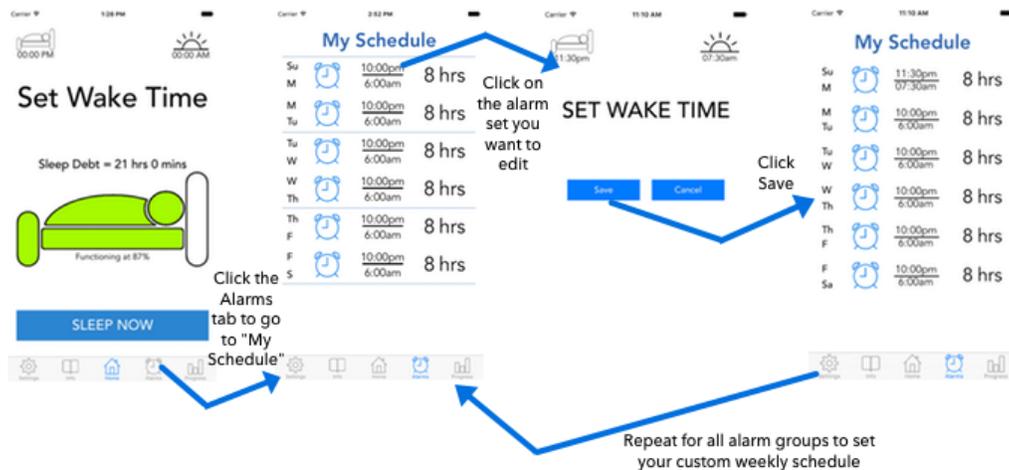
We chose the first because it is not only the most straightforward, but it is the core of our mission – set a bedtime goal and reach it. Small steps build big habits, and this is the first step.



Task Flow #1

Moderate: Set a schedule (using sleep debt information)

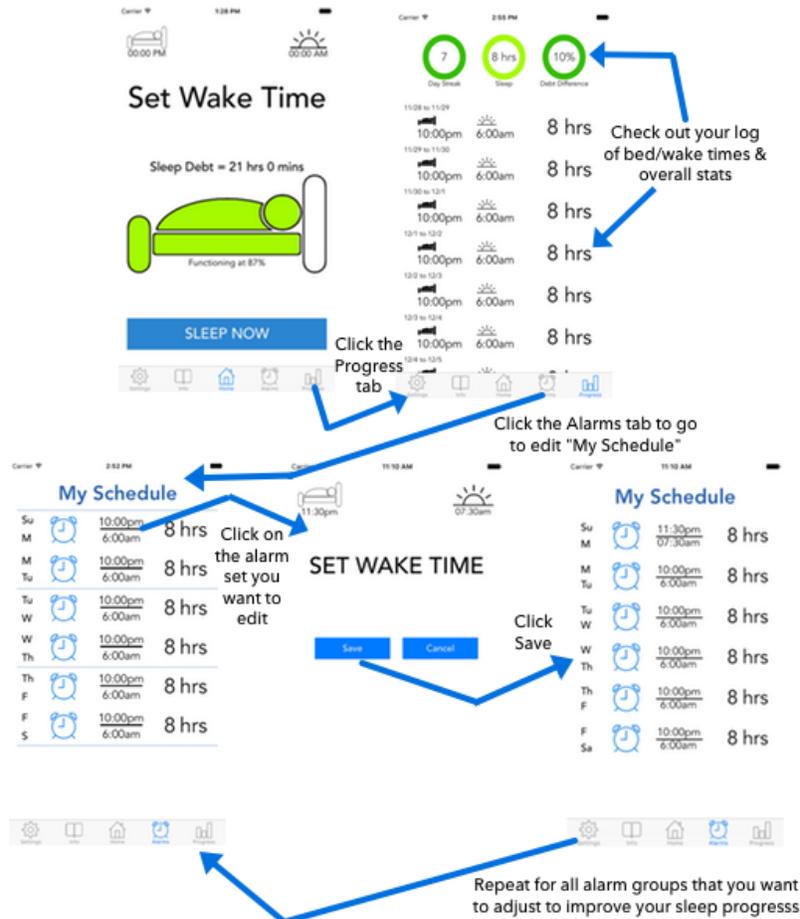
Our second task involves looking to the sleep debt graphic and related information (i.e. functioning percentage and number of hours of sleep debt) to encourage you to get more sleep by setting up your weekly schedule of alarms. This task builds on the first and is important to solidifying habits.



Task Flow #2

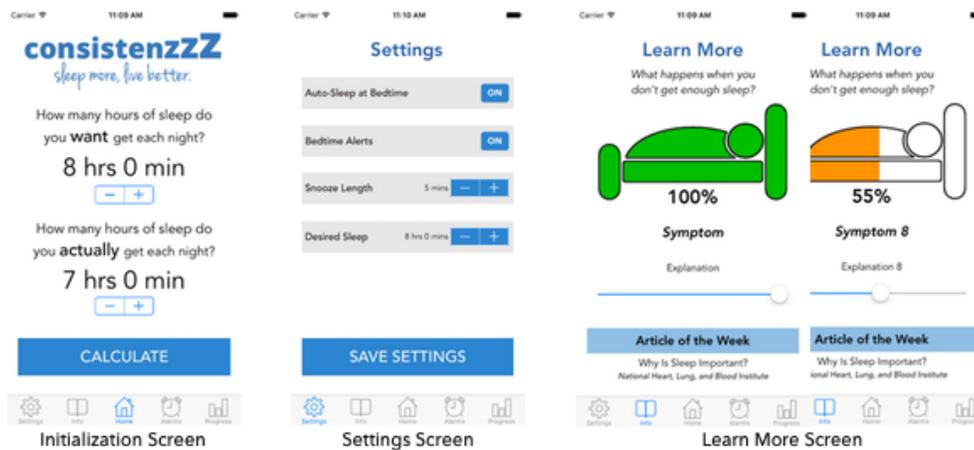
Complex: See your progress and adjust

Our final task was chosen because it involves the user evaluating if his/her habit building is going well. Specifically, the user views the progress tab, which has a log of sleep/wake times and hours slept for the past 2 weeks, as well as some 'stats' (i.e. average hours of sleep, debt difference, and day streak of app use) – both of which allow the user to see how he/she is doing with sleep goals and sleep debt. The task #3 flow is as follows:



Task Flow #3

Additional screens that are not in the task flow

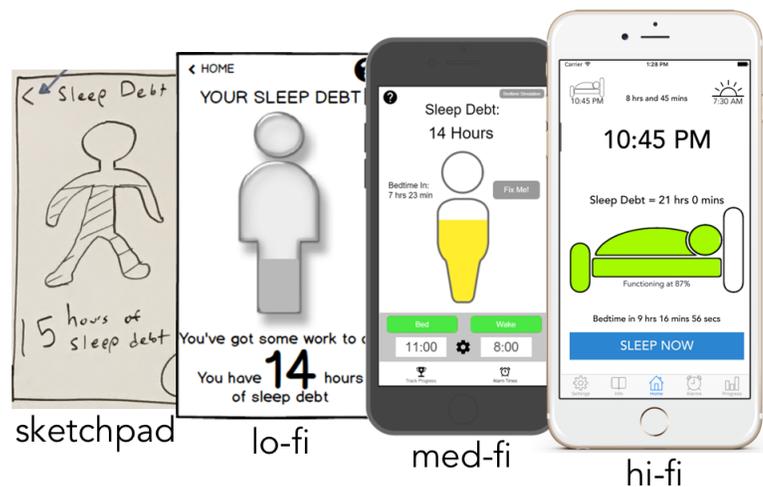


Non Task Flow Screens

Design Evolution

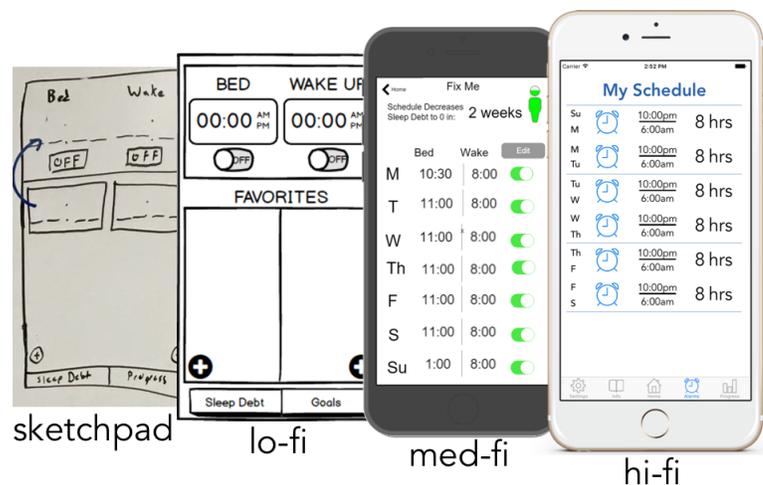
Throughout all of our iterations of *consistenzzz* – specifically from sketchpad to lo-fi to med-fi and finally to hi-fi – we had 3 major sections: sleep debt, alarms, and progress. The focus and content of our home screen also changed throughout our design process.

Sleep Debt: The sleep debt graphic concept remained the mostly the same throughout all of the iterations in that it has always pictured a person who is some variation of filled to demonstrate how lack of sleep can deplete you and how getting sleep can fill you back up; alongside the graphic, we have always included information about specifically how many hours/minutes of sleep debt the graphic represents. In our hi-fi, we decided to change it to a person in bed so that the graphic was more consistent with our logo and brand, and the horizontal layout worked better with our home screen. Furthermore, in our last iteration, we added a “functionality” percentage to complement the graphic and made the graphic animated so that the user can see it increase or decrease after the set up process or after a night of sleep, allowing them to feel like they are interacting more with the data.



Design Iteration of Sleep Debt Graphic

Alarms: In our sketch and lo-fi stages, the alarms were the central focus of the app and the user’s ‘favorites’ were stored on the home screen. The set up process was also fairly tedious as users had to select several settings, their recurring preferences, and type in their alarm time, as we initially thought this method would be preferable to users. However, after a round of user testing, we found that users preferred interfaces that did not involve many steps to complete simple tasks that they are already familiar with like setting alarms.



Design Iteration of Alarms

Furthermore, users did not like that the alarms were the home screen and so in the med-fi prototype, we moved the alarms to its own tab of the app and constructed an alarm setting process that could be completed on one page – users could scroll up and down to adjust the bed/wake times and turn alarms on and off with the switch. This turned out to not be ideal either as our heuristic evaluation feedback suggested we should make the alarms screen less busy and more intuitive given that a bed and wake time for one day appeared confusing given that users go to bed on one day and wake up on the next. Thus, we created our final hi-fi version of this screen which involves alarm groups which

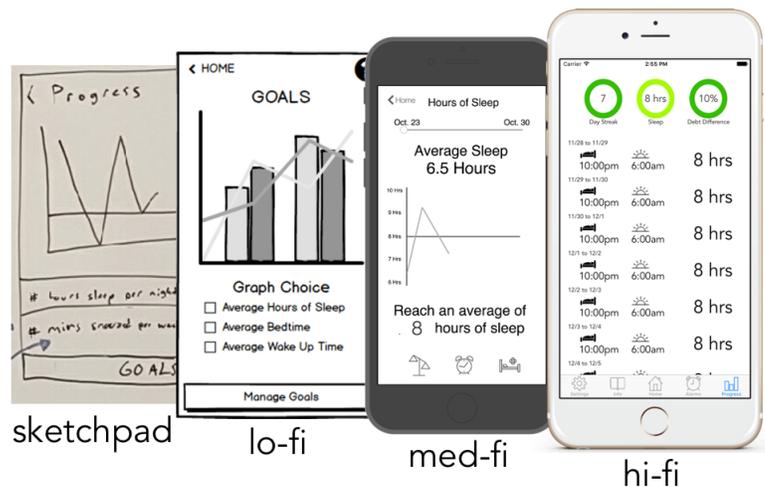
have a bed and wake time that are set/edited together, similar to setting/editing alarms on the home screen (this is further explained in the next portion of this report), as well as information about how many hours of sleep the user would get with those alarms in place. Overall, we believe that this design is cleaner and more intuitive for users.

Progress: Throughout the design process, the purpose of the progress page has remained the same – give users information that tells them how they are doing and that will motivate them to do better. Over the first three iterations (sketchpad, lo-fi, and med-fi), this section of the app remained pretty similar in that it displayed different goals (i.e. average hours of sleep, average bed/wake time, average snooze time) in graph form. Initially we offered users the option to set their own goals and see those on this page but we realized that it was better to show only the most relevant information to the user that will really help them improve their habits. So, in the the med-fi iteration, we only offered progress information about the user’s sleep debt, average sleep, and number of naps. In the hi-fi version, however, we distilled the progress information even further (i.e. stats about average hours and debt difference, as well as day streak of app use) and shifted the focus of this screen to displaying a log of sleep data as we believe this is more useful for a user who wants to see how he/she has been doing.



Design Iteration of Progress

Home screen: As aforementioned, the home screen was initially focused on alarms; however, we realized that the most interesting and informative feature that our app offered was sleep debt tracking and so we moved this to the home screen and improved the design of the graphic, making it animated and more interactive. Overall, we believe our shift in focus of the hi-fi home screen to setting and reaching nightly sleep goals and displaying sleep debt information is much better for the user, encouraging app usage.



Design Iteration of Home Screen

Major Usability Problems Addressed

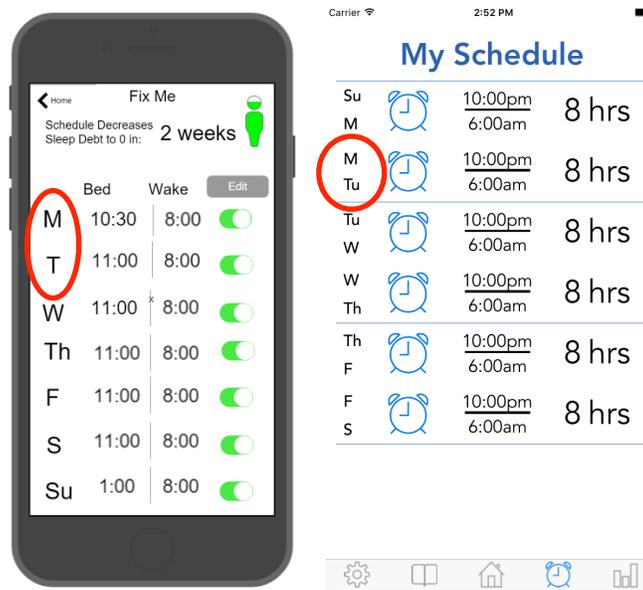
1. "[H26: Recognition not Recall] [Severity 3] [Found by A, B]: Setting Bed and Wake times in "Fix me". The "Fix me" screen asks users to make a lot of choices. The user probably has to recall every factor that impacts his/her sleep schedule over the next couple of days or weeks. This can be a daunting task for someone who has a packed and messy schedule. I recommend selecting the bed and wake time in Calendar so one knows when he/she is able to sleep and makes plans accordingly."

 - **Resolved:** We did not implement the "Fix Me" functionality, so this screen was removed.
2. "[H21: Visibility of system status] [Severity 3] [Found by B]: Partial acceptance of suggestion. "Schedule decreases sleep debt to 0 in" field is static if user only partially accepts schedule - may be due to limitations in prototype, but if not, should change depending on what parts of suggested schedule user accepts."

 - **Resolved:** We did not implement the "Fix Me" functionality, so this screen was removed.
3. "[H25: Error Prevention] [Severity 4] [Found by A, B, D]: The location and function of "Accept" in "Fix me". The function of the "Accept" button is very unclear and unintuitive. (As of now, clicking "Accept" in "Fix me" causes every time to revert to default.) I believe one should not be able to click "Accept" until the time in every activated day has been set. Also, the relative location of the "Accept" button near the top of the screen is not intuitive, as it implies that one has to change it before setting the bed and wake times."

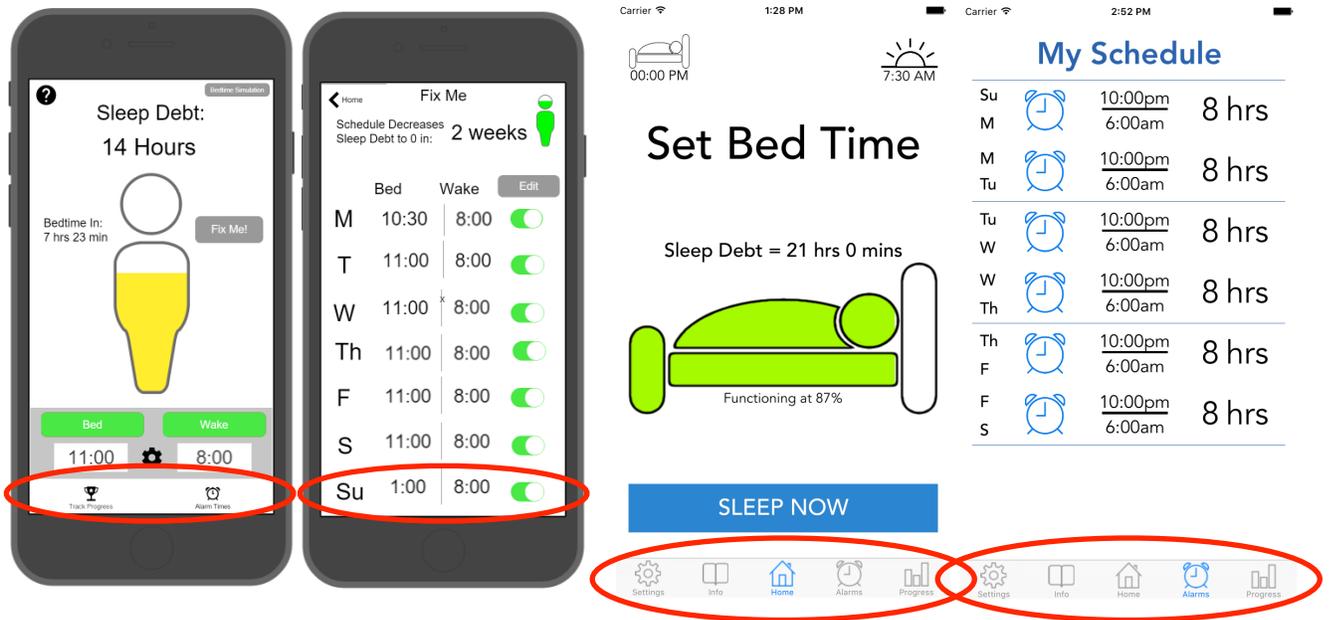
 - **Resolved:** We did not implement the "Fix Me" functionality, so this screen was removed.
4. "[H22: Match Sys & World] [Severity 4] [Found by A, B]: 1AM this morning counts as today or yesterday? For those of us who stay up late, it is customary for 1AM on Tuesday morning to count as Monday. Officially, however, anytime past midnight counts as the next calendar day. This incompatibility results in a serious problem. For example, if I set the bedtime on Monday to be 1AM, does it mean 1AM on Monday or Tuesday? If the former is true, then what if I want to go sleep at 1AM on Monday morning and 11PM on Monday night. How can the app allow two bed times on the same day? People will definitely be confused."

 - **Resolved:** We now include Monday at 1AM as part of the "M - Tu" option on "My Schedule", or the Alarms tab. Each sleep time and wake time are set as "Day 1 - Day 2" (i.e. alarms for Day 1 bedtime and Day 2 wake time are grouped) instead of just as "Monday" or "Tuesday" because that is most analogous to sleep.



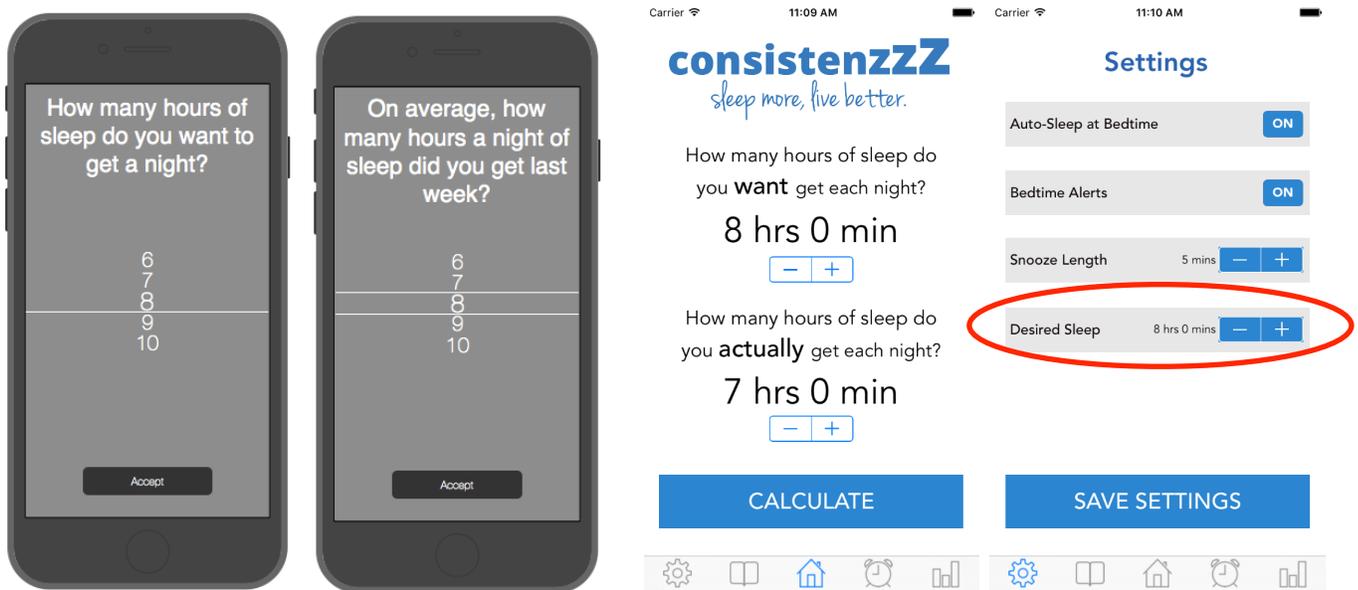
Heuristic Evaluation Change: Alarm Grouping

5. "[H23: User Control & Freedom][Severity 3][Found by C]: No escape from the additional info screen. Not yet implemented: Links to additional info has no recovery mechanism. I click in and it tells me that it's not implemented, but it doesn't give me an way back."
- **Resolved:** A static navigation tab bar now allows users to navigate to and from any screen at any point during their interaction with the application with ease.



Heuristic Evaluation Change: Static Navigation Bar

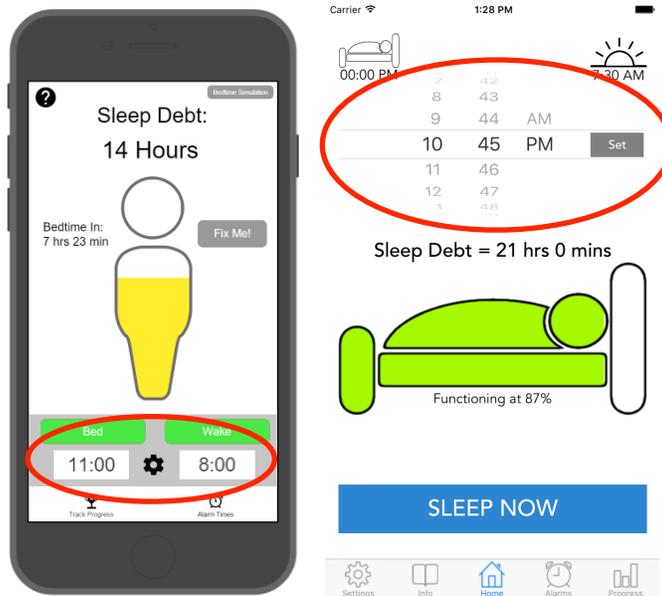
6. "[H23: User Control & Freedom][Severity 3][Found by A, C]: Initial settings unchangeable. Upon entering the app for the first time, one is asked how much time he/she wants to sleep per day and how much time he/she has slept. It is unclear how the user can change the settings on those screens once he/she has passed onto the Home screen for the first time."
- **Resolved:** After setting up these times for the first time (the process remained similar but was merged onto one page), adjustments to initial settings (i.e. desired sleep) can now be done in the Settings tab; average hours of sleep you actually get doesn't need to be adjusted because the app will record this information from user's bed/wake times.



Heuristic Evaluation Change: Adjustments to Initial Settings

7. “[H23: User Control & Freedom] [Severity 3] [Found by A, D]: Bed and Wake time only in half hour long increment. The app only allows users to choose bed and wake times at half hours (i.e., at 8 o’clock, 9 o’clock, 10 o’clock, and etc.). This probably does not satisfy user needs because we often want to wake up some time in the middle of an hour. I recommend changing scrolling to typing for time selection.

- **Resolved:** The user now has complete control over bed and wake time because we now use the fully sized Apple default time pickers that have all hour and minute options in a single, intuitive selection mechanism (rather than the not obvious time scrollers that required the user to swipe up/down to change the time within the box).

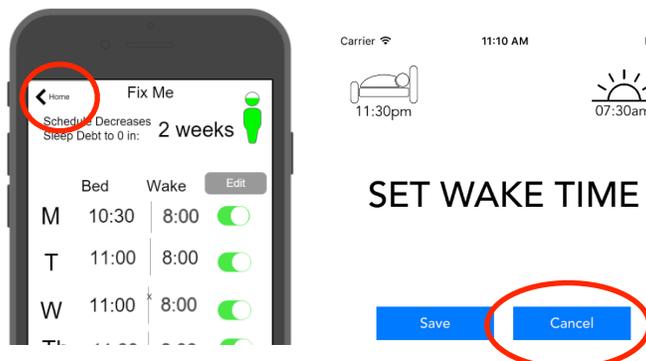


Heuristic Evaluation Change: Fully Sized Apple Default Time Picker

8. “[H23: User Control & Freedom] [Severity 4] [Found D]: No back buttons. The only back buttons go to the Home Screen, but none just go back as an “undo” function. Also, people are used to a button in that position taking them back, as opposed to home, which could cause usage errors that makes them lose inputs. Replace home buttons with back buttons since people will more frequently need to go back 1 screen than to go to the home screen.

- **Resolved:** A static navigation tab bar now allows users to navigate to and from any screen at any point during their interaction with the application. Screens that are not connected to the tab bar have buttons that take them back one screen, such as “Cancel” on the screen for editing alarms.

See “Heuristic Evaluation Change: Static Navigation Bar” image above.



Heuristic Evaluation Change: No Back, Only Cancel When Necessary

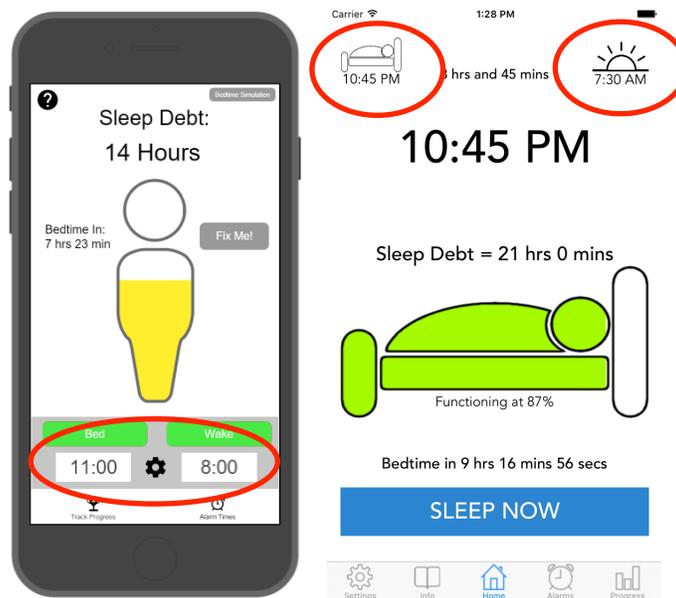
9. “[H24: Consistency & Standards] [Severity 4] [Found by A, B, C, D]: Time selection scroller. Throughout the app, it is not clear that the scroller to select time is actually a scroller. For example, the Bed time and the Wake time displayed on the Home screen look more like a fixed display rather than something that can be changed by scrolling. The height of the scrolling area is so small that users do not recognize it as scrollable. I recommend changing scrolling to typing in the time.”

- **Resolved:** We now use the fully sized Apple default time pickers because they are much clearer, more intuitive and familiar, and have increased heights so it is obvious they are pickers. They also allow for more precision with time selection, as aforementioned in #5.

See “Heuristic Evaluation Change: Fully Sized Apple Default Time Picker” image above.

10. “[H24: Consistency & Standards] [Severity 3] [Found by A, B, C, D]: “Bed” and “Wake”. The “Bed” and “Wake” boxes look like buttons but are in fact switches. The user can get easily confused by what these boxes do. If one intends them to be switches rather than buttons, one should make them look like switches.”

- **Resolved:** We removed these switches and replaced them with new icons in the top left and right corners (i.e. bed and sun, respectively) that much more clearly indicate their functionality as buttons and the alarm that they correspond to.



Heuristic Evaluation Change: More Intuitive Bed/Wake Time Icons

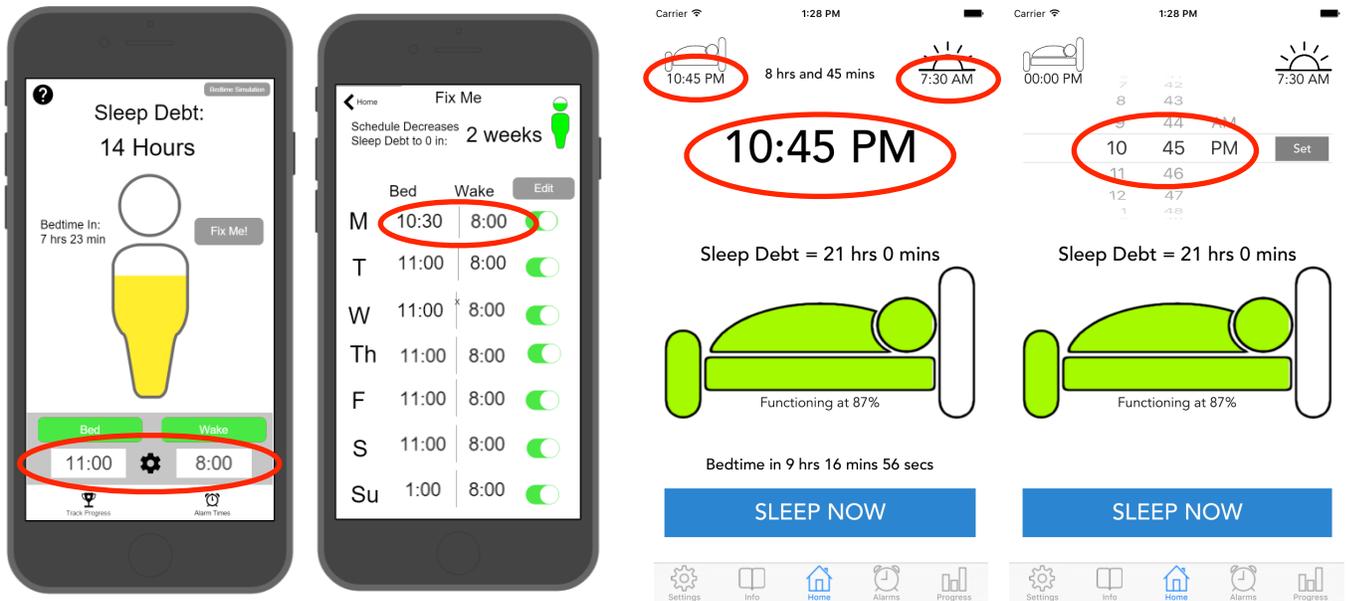
11. “[H27: Flexibility and efficiency of use] [Severity 3] [Found by B]: Adjust times from stats menu. No easy pathway to adjust wakeup and sleep times from the stats menu, which is the logical next step for users to change behavior after reading stats. Include option to “fix this statistic” that redirects to a suggested sleep schedule.”

- **Resolved:** Because a static navigation tab bar now exists on every screen in the application, the alarms tab can be accessed at any point in the user’s interaction, particularly after seeing his/her progress or stats, to easily adjust his/her alarms and sleep schedule.

See “Heuristic Evaluation Change: Static Navigation Bar” image above.

12. “[H25: Error Prevention] [Severity 3] [Found by A, B]: Time display AM/PM confusion. All time displayed in the app do not show whether it is AM or PM. Users might be confused with what time they are choosing. Maybe instead of inserting AM or PM after every number, the app can distinguish time using color (dark blue indicating night time; light blue indicating day time).”

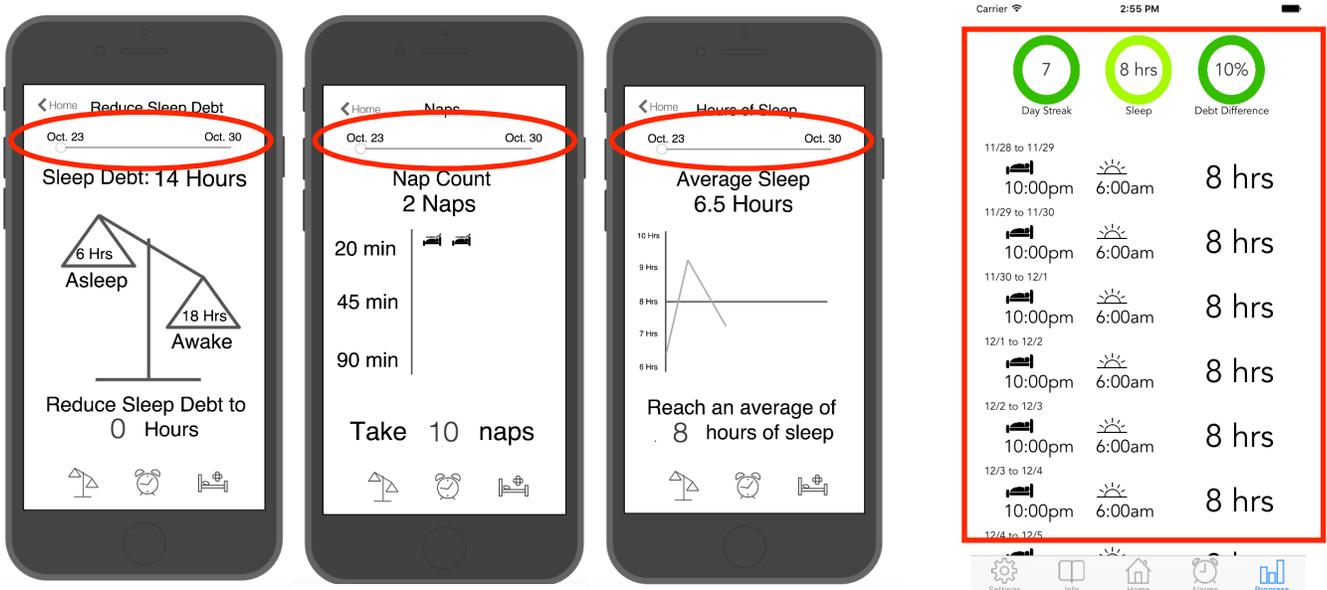
- **Resolved:** All time displays now show AM/PM as this is clearer and avoids user confusion.



Heuristic Evaluation Change: AM/PM on All Time Displays

13. “[H25: Error Prevention] [Severity 3] [Found by A, B, D]: Slider of the “Track Progress” Interface Each of the three “Track Progress” interface has a slider on the top portion of the screen. However, as one modifies the slider, one’s hand or finger probably hides the display below. I recommend putting the sliders near the bottom rather than near the top.”

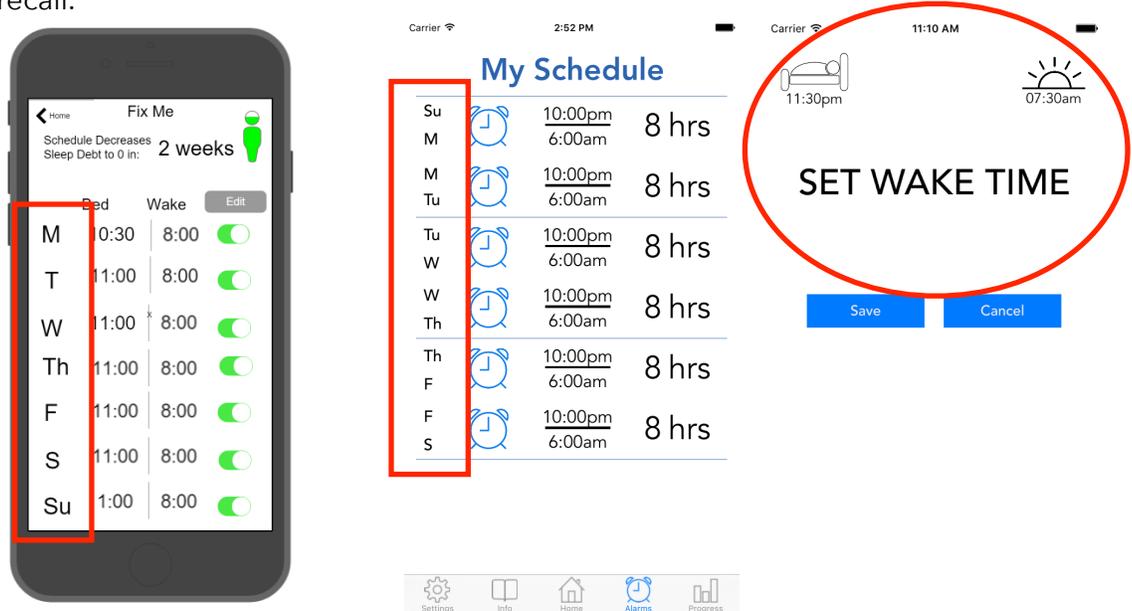
- **Resolved:** The progress tab is now a log of sleep/wake times and hours slept for the past 2 weeks that is complemented by 3 main stats (i.e. average hours slept, sleep debt difference, and days streak of consistent app use); for this reason, this is no longer a problem and any time selection for track progress has been removed.



Heuristic Evaluation Change: Progress Screen Redesign

14. “[H26: Recognition not Recall] [Severity 3] [Found by A]: Setting Bed and Wake times in “Alarm”. In “Alarm time” of Task 3, the screen setting bedtimes and that setting wake times are two separate screens. This requires users to remember the time chosen on the other screen in order to calculate how much sleep they are going to get each night. Doing so requires very good short term memory.”

- **Resolved:** Because both bed/wake time alarms are now organized on “My Schedule” (a single alarms tab) and “Day 1 - Day 2” (i.e. alarms for Day 1 bedtime and Day 2 wake time are grouped), the editing screen for one alarm group displays both and the user can toggle between the two on that page by selecting the appropriate icon in either the top left or right corner (bedtime and wake time, respectively) and then the time currently being edited appears in the center of the screen and is adjusted through a fully sized Apple default time picker. This method avoids any issues the user might have with short-term recall.



**Heuristic Evaluation Change: More Intuitive Alarm Setting
(parallels Home Screen Alarm setting)**

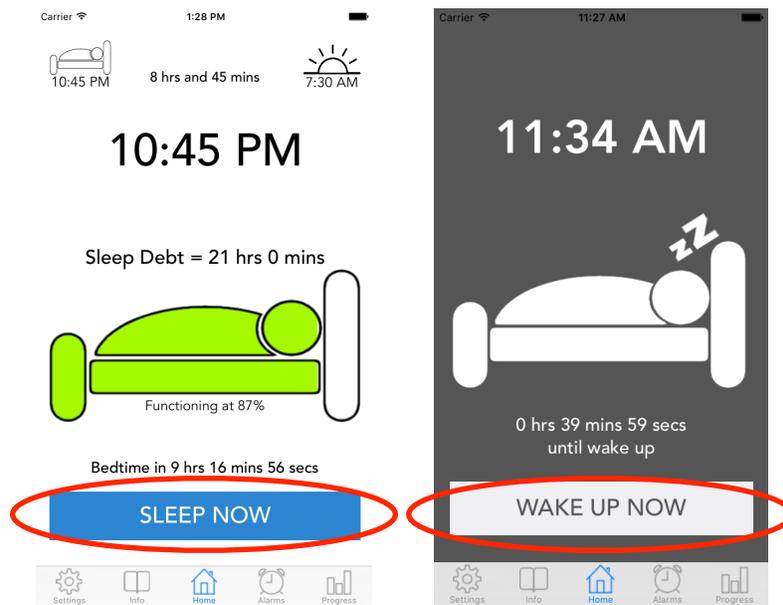
15. “[H27: Flexibility and efficiency of use] [Severity 3] [Found by B]: Setup alarm times. The flow to setup alarm times involving a list, scrolling, and toggle for specific days is not very intuitive. Old times that are set are not saved - new alarms override old alarms. Multiple alarms cannot be set for one day. Replace with text input alarms that push to a new screen with alarm information, as Apple clock alarm app does.”

- **Resolved:** Alarms have now been changed so that the user has a “My Schedule” where there is only one bed/wake time group for each day. Alarms now do a much better job of displaying this information compactly because they are displayed as “Day 1 - Day 2” (i.e. alarms for Day 1 bedtime and Day 2 wake time are grouped and can be edited together). The setting/editing of these alarms is now very similar to the home interface as well in that the user can toggle between the bed/wake time on the edit page by selecting the appropriate icon in either the top left or right corner (bedtime and wake time, respectively) and then the time currently being edited appears in the center of the screen and is adjusted through a fully sized Apple default time picker.”

See “Heuristic Evaluation Change: More Intuitive Alarm Setting” image above.

16. "[H29: Help Users with Errors] [Severity 3] [Found by A]: Sleep information updated? If the user goes to sleep before bedtime or wake up after the wake time, or take naps that are not recorded, it is unlikely that additional sleep times can be recorded easily into the app. The user, over the long run, will definitely commit errors such as forgetting to register sleep time. The app must come up with some way to ensure these errors do not take place; otherwise, all the Sleep Debt data would be useless."

- **Resolved:** For purposes of this prototype, only one sleep and wake time can be registered per day, meaning that naps cannot be accounted for. However, we have added a "Sleep Now" button on the Home screen which automatically changes the user's bedtime to now; similarly, there is a "Wake Up Now" button on the sleeping screen which automatically change the user's wake time to now. With these 2 buttons, we can now more accurately record the user's bed/wake times if they choose to go to bed or wake up after/before a pre-set time.



Prototype Implementation

We built the prototype using Xcode and Objective C, and used Parse for the backend. Xcode's system of storyboards made creating our designs very straightforward, but also led to a few issues. Managing storyboards and transitions between storyboards can cause logic errors that can't be sorted out in the code, and require extensive knowledge of the storyboards themselves. We originally used Github to try and merge, but storyboards seemed to create merge errors that were difficult to solve. Moreover, Objective C itself can also be difficult; much of our application functionality requires pulling dates and displaying them as strings, but string concatenation in Objective C does not have an operator like in other languages. Additionally, Parse was very helpful in storing and saving information from one screen to the next, and ensured that user information would persist between uses of the app. One member of our team didn't have access to Xcode 7, only Xcode 6.4, which meant the most recent version of Parse caused compilation errors and so the app couldn't run in the simulator.

We made a few shortcuts in order to make sure our demo was adequately complete as well as adequately functional. For one, users can only go to sleep and wake up once in a day. This simplifies the logging and tracking of sleep and centers more on the mono-phasic sleep habits that we are trying to create. We also decided that only the home screen creates alerts at bedtime for this implementation, because the alerts are adequately shown via the home screen when bedtimes are set there. For the sake of time, only the first alarm is "editable", whereas the other alarms stay at their preset data point. Finally, some of our settings – namely snooze – are yet to be implemented.

Because *consistenzzz* requires weeks of use to collect adequate data, we decided to hard-code data in the progress screen and pre-set alarms so that users could still see what these screens would look like. This also meant the statistics in the progress screen are made from this dummy data, and so aren't as meaningful to the user.

In the future, we think expanded support for user control – editing, settings, alarms – would help to finish the application. These are features that are useful but not central to carrying out a user test of the core functionality of *consistenzzz*. We also would have liked to create improved graphics and visualizations for sleep debt and other data that we present, as well as more customized iconography. While the concept behind our home page's visualization of sleep debt is clear, the execution could still be improved and better show users the analogy to a battery.

Summary

Through our multiple iterations of *consistenzzz*, we were able to hone in on what users wanted in terms of both design and functionality. Our initial thoughts focused on setting alarms and schedules, but we quickly realized through user testing that people found our sleep debt information to be most interesting and preferred to set nightly alarms rather than a week's worth of alarms. While there is still room for improvement, such as our future goals mentioned above, we feel that our hi-fi prototype of *consistenzzz* helps solve a real problem by helping users set and reach sleep goals, track their sleep debt, and build better sleep habits, truly offering users a way to sleep more and live better.