



Sleepy Games

HCI x Philips Healthcare

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What is Sleepy Games?

- Year-long project
- 15 Games, 74 Game Designers, 7 challenges, 5 main insights

Our Goal: to change sleep behavior and improve sleep quality

Scope & Timeline



The Team

CMU Faculty

Jessica Hammer

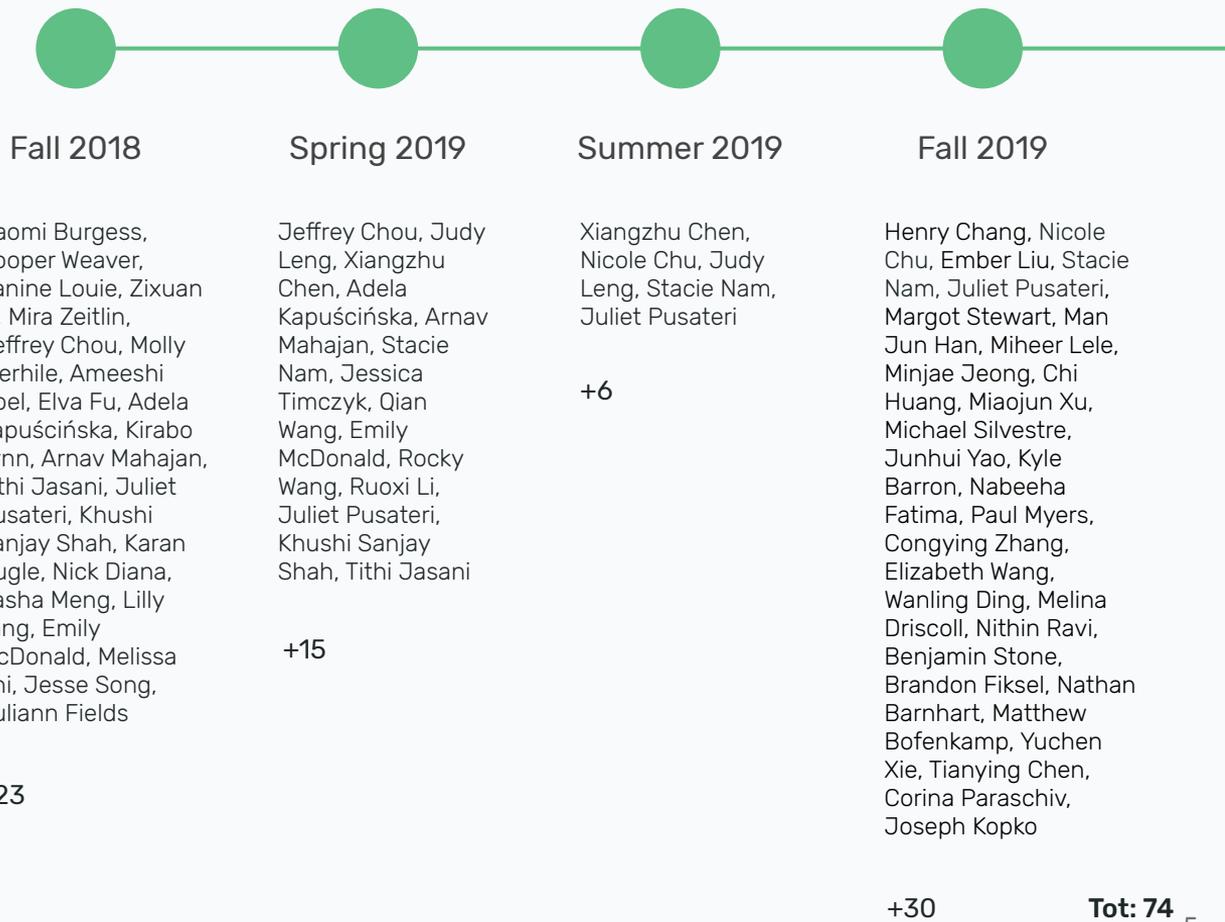
& Staff

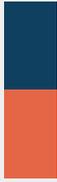
Adela Kapuścińska

Philips Healthcare

Peter Weeks

Stephan Morgan





Design Challenge

How can games support healthy sleep?



Our Vision

Sleepy Games are **transformational games** that **aim to improve sleep quality** for players. Sleepy Games do so **by targeting context and time-specific barriers** that arise for players throughout their day.



Culyba, S. The Transformational Framework (2018)

Core Values



To Philips

- **Identifying the problem space through play and ritualized mechanics**
- Improve the stigma of treatment, **embedded design**
 - More avenues to explore to improve sleep quality that isn't just focused on an illness, cure.
- Non-traditional solutions that bypass user biases and concerns
- Controlled familiarity to mitigate negative effects of unfamiliarity/sleep issues: users understand the game systems with which they're working



To Players

- **Context-dependent, human-centered intervention-making**
- Addressing physical and cognitive stresses
- Physical, more emotional appeal to users
- **Multi-sensory product design**

Games

(in alphabetical order)



Jumping jacks	Jumping on one foot	Sit on the floor while doing armny	Upside Down leaning on wrist	Singing
Do a Split	While holding your breath	Lunge	Wall sit	Spinning



GAME

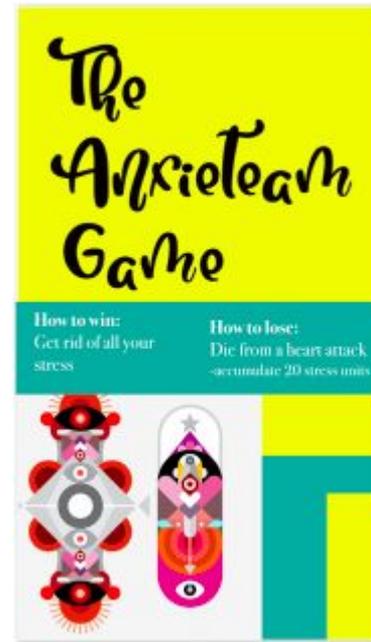
Anxiety Cards

User Group: People whose lack of self-efficacy in prioritization result in anxiety thereby affecting sleep quality

Problem: Users cannot manage anxiety from different factors in life, leading them to sleep troubles

Identified Barriers:

- Use of transgressive elements
- Anxiety created by overwhelming workload or over-commitment to social activities would be hard to alleviate through playtesting
- Point values distribution between “stress” and “time”



Solution: To help people know the risk, develop skills to reject it and have guidance into actual practice in the game, thereby alleviating stress and improving sleep quality

GAME

Anxiety Cards



HOW TO PLAY

Multi-player Game

- Card type: situation / opportunity; point values: stress / time
- Players are expected to play all the cards out and to not let stress go above 20.
- First round, each player randomly choose 5 cards, get 6 time, 10 stress.
- From the second round, the stress value that player draws at each round increases
- Each round: +3 time, draw one card
- If one's stress cards go over 10, then you lose the game; the one who first draws all the stress cards out will win the game

DESIGN CONSIDERATIONS

- Play aids reduce game complexity.
- Color codes and visual cues guide players.
- Designed points mechanics by testing several combinations of roles and situation cards.
- Specific situations and roles require player interaction.
- Roles allow direct action over other players' stress or resources.

MANIFESTO BITE

Sleepy Games are not Solitary

Sleepy Games can also mediate the inverse - **social relationships that are impacted by sleep.**

GAME

Brain Clam

User Group: People who suffer from recurring nightmares that disrupt sleep and bring about discomfort in their waking lives

Problem: Disrupted sleep affects physical and emotional state. Users have no other way to stop having nightmares.

Identified Barriers:

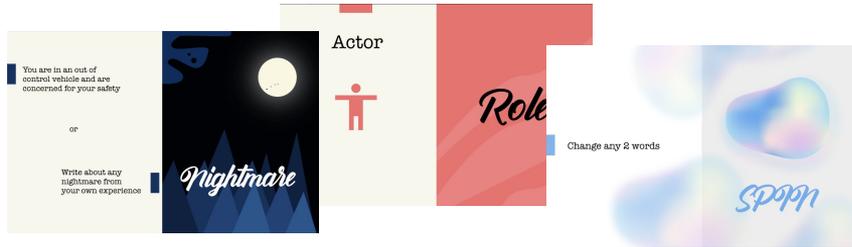
- Little to no incentive or motivation to try new options to make nightmares less frequent
- Discomfort when sharing nightmares/trauma in a group
- Players could relive trauma when sharing



Solution: To provide accessible therapy for those commonly afflicted with nightmares

GAME

Brain Clam



HOW TO PLAY

Four-player Game

- 2 main roles: the Dreamer (one player) and the Spinners (all other players)
- Each player draws a Nightmare card and chooses to type out a dream based on either their card or their own dream
- The Dreamer copies their text onto a shared Google Doc
- Each Spinner draws a Role card and a SPIN card
- Spinners edit the Google Doc based on their SPIN cards, while the Dreamer sculpts Play Doh to represent their nightmare
- Spinners present the edited Google Doc to the Dreamer based on their Role card

DESIGN CONSIDERATIONS

- Playing with a close group of friends ensures comfort and a way to de-stress (“group therapy”)
- If uncomfortable sharing nightmares, the inclusion of the Nightmare card prompt can mask the real nightmare
- Multiple aspects of game reframe nightmare: Google Doc edits, physical Play Doh resculpting, change in scent and taste with cinnamon and bubblegum

MANIFESTO BITE

Sleepy games live in Vulnerability

Sleepy games must **embrace vulnerability** to create a safe space without inhibiting or negative feelings.

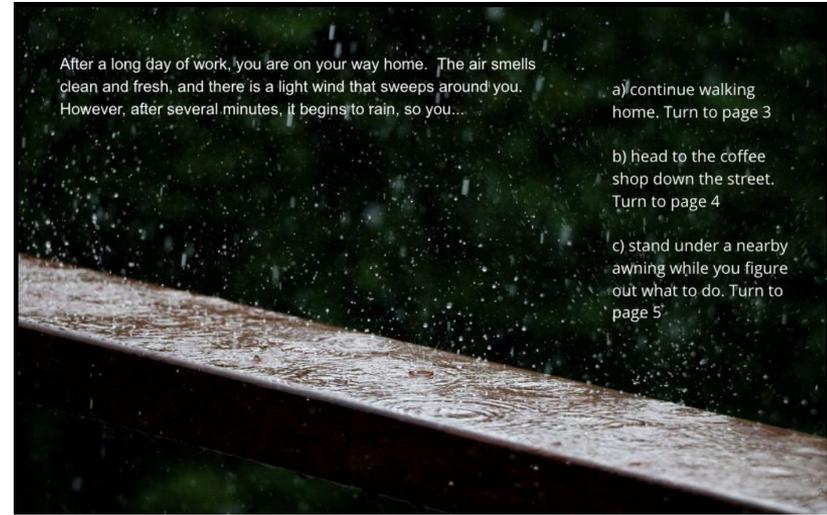
GAME

Dream On

User Group: People who sleep away from home in unfamiliar environments, such as travelers or first-year college students

Problem: Anxiety & discomfort caused by sleeping away from home.

Insights: players would disassociate themselves from unfamiliar surroundings by sensing familiar imagery and smell.



Solution: To transport players to a cozy place before bed via fun choose-your-own-adventure stories

GAME

Dream On



HOW TO PLAY

Single-player Game

- After reading each passage of the story, choose a scent from the accompanying wax candles.
- Pick the route in the story (A, B, or C) that the scent inspires you to choose.
- Continue until you have reached a passage with no options, which is the ending.
- Repeat as necessary!

DESIGN CONSIDERATIONS

- Replayability ensures no risk/consequences and affirms feelings of safety.
- Game can be played anytime, anywhere due to portability and zero-risk.
- Calming pictures, descriptive passages, and scented wax create an immersive environment that player can feel comfortable in.
- Smell strongly links memory and emotion, which creates familiarity in a new environment.

MANIFESTO BITE

Sleepy Games don't make you sleepy

Sleepy games can employ **high and/or low cognitive load** to facilitate player **engagement** and **disengagement** from play.

GAME

Dreamland

User Group: people with SAD who don't use a sunlamp during the day because of context and social stigma

Problem: Users often try to use their sunlamp right before bed

Identified Barriers:

- Incorrect use of sun lamp
- Daytime obligations
- Social stigma related to traditional SAD treatment



Solution: To provide safe/comfortable context to get light earlier in the day

GAME

Dreamland



HOW TO PLAY

Two-player Game

- Each player holds a shield.
- The players bounce the ball between each other.
- The players can make rules and goals for the game.

DESIGN CONSIDERATIONS

- Walk up and use design proposes that people can engage with the game physically, willingly and without instruction.
- Combination of larger-than-life objects with built-in therapy lights is eye-catching and invites to be used.
- With a non-explicit intention of the game, the feeling of embarrassment in public is reduced.
- Physical activity provides instant mood boost.

MANIFESTO BITE

Sleepy Games are not Band-Aids

Sleepy Games **address the sleep issue of the user at the appropriate time** by providing an **opportunity** and **structure** to engage with it and to positively impact their sleep quality.

GAME Flow

User Group: People who struggle to sleep because of chronic pain

Problem: People experiencing chronic body pain often has a hard time sleeping due to their conditions

Identified Barriers:

- Body pain could happen in many parts of the body; hard to find a panacea for all



Solution: To provide structure for people with pain to share their pain with their partner and alleviate pain through stretching

GAME Flow



HOW TO PLAY

Two-player Game

- Players spin a wheel to find a stretch position
- Players then attempt to balance a ball in between them while doing the stretch
- Players repeat the process when they have completed or fail to balance the ball while doing the stretch

DESIGN CONSIDERATIONS

- Stretch exercise may increase player excitement; thus, soothing music plays in the background
- Modular spinning wheel to provide replayability and custom difficulty
- Multiplayer to enhance sense of community and shared experience

MANIFESTO BITE

Sleepy games live in Vulnerability

Sleepy games must **embrace vulnerability** to create a fun environment without judgement

GAME

Lights Out

User Group: Adults responsible for small children

Problem: Balancing the sleep time between parents and children is difficult

Goal: To make a child's bedtime routine more efficient, thereby enacting a behavior change upon the household

Identified Barriers:

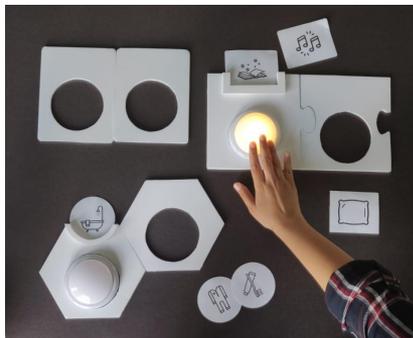
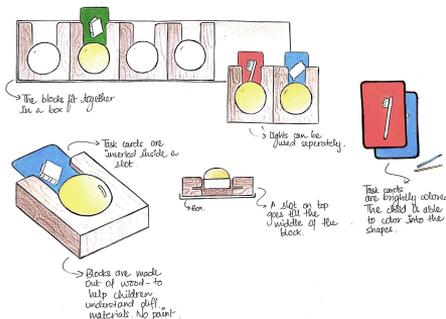
- Preset bedtime routine



Solution: To provide a product experience focusing on light to change sleep habits in the long term.

GAME

Lights Out



HOW TO PLAY

Multi-player Game

- The game materials include 6 tap lights, an assortment of task cards representing different bedtime activities and Dream Ticket cards.
- Parents and children act out the bedtime routine by completing tasks on the tap lights, turning them off once finished and generating a creative Dream Ticket for the night.

DESIGN CONSIDERATIONS

- Modularity: the ability to add and take away unplanned tasks
- Low-tech
- Durability
- Physicality: ideal shape to fit into a child's hand

MANIFESTO BITE

Sleepy Games are not Solitary

Sleepy Games focus on **game mechanics that address social impact** to influence sleep quality.

GAME

Mirror Imagezzz

User Group: People sleeping together with friends that they have not slept in the same space with in the past

Problem: Exploring vulnerability and social dynamics to make this new (possibly temporary) space feel safe for sleeping

Identified Barriers:

- First Night Effect
- In new environments, half of brain stays awake to keep a “Watchful Eye”



Solution: To provide agency and comfort to players by allowing them to determine the level of exertion

GAME

Mirror Imagezzz



HOW TO PLAY

Multi-player Game

- The leader chooses bedtime routine, then randomly picks challenge card.
- Each follower randomly picks a body part card. Followers can't use that body part until the round ends. Followers use ribbons to mark the body part.
- The leader perform the activity and the challenge at the same time
- Followers combine into one body, and imitate what the leader did.

DESIGN CONSIDERATIONS

- Having the players have to follow a fun bedtime routine and connecting together introduces vulnerability, which lessens worry about sleeping away from home
- By having players watch the leader perform bedtime tasks, a 2-way empathy is built between players, due to mirror neurons, a likely a basis for empathy.
- By introducing outlandish bedtime routines, players do physical activities that lead to better quality sleep.

MANIFESTO BITE

Sleepy Games have Optimal Level of Exertion

Fluctuating levels of exertion - dependent on how players decide to perform routines or join bodies. **Diversity of play** - can be played in any environment, at any time, and so leaves decision of exertion level up to players. **Agency** - players choose exact level that they are most comfortable with.

GAME

Office Shots

User Group: Young professionals who have sedentary jobs and rely on caffeine to stay energized at work

Problem: Users are unaware of other energizing methods except caffeine

Identified Barriers:

- Users doesn't know how to drink coffee most effectively
- Users are expected to stay focused on task/project, but working without breaks can be tiring, so user might turn to coffee for boost in productivity
- Users are used to drinking coffee and do not keep track of how much they've already consumed



Solution: To gradually reduce their caffeine intake and offer alternative strategies for staying energized

GAME

Office Shots



HOW TO PLAY

Multi-player Game

- Co-workers negotiate the distribution of the Coffee Token before playing.
- Players can redeem their Coffee Tokens to claim their cups of coffee, or challenge other players to gain more!
- Challenge Cards have players perform alternative methods of keeping energized, other than caffeine.
- Played throughout the working week.

DESIGN CONSIDERATIONS

- The mini games are not meant to substitute coffee because instantaneous energy boost they provide is not able to sustain after the mini-game session concludes. Instead, we incorporated them to give players an excuse to get out of their “zone” and take a break.
- Conversation points are included to help players externalize their coffee habits or preferences and become more self-aware.

MANIFESTO BITE

Sleepy Games are not Solitary

Sleepy Games can also mediate the inverse - **social relationships that are impacted by sleep.**

GAME

Peellow

User Group: Pregnant individuals who want to have a good night's rest but cannot control urination

Problem: User has to wake up multiple times throughout the night to pee

Identified Barriers:

- There is no method to stop people from having to urinate
- Over the course of the day liquid builds up in your extremities, so by raising your feet, the liquid will drain and be absorbed by your kidneys, making you have to pee.



Solution: To build a habit of peeing before bed by elevating the person's legs in the evening for about an hour before going to bed, and rarely wake up to use the bathroom at night

GAME

Peellow



HOW TO PLAY

Two-player Game (one pregnant person P and their partner/friend/family A)

- Players lay down together and Player P places their feet on the Peellow.
- Player P asks voice assistant to start playing the collaborative playlist their friends/family made. Player A starts a 30 second timer.
- Both players guess the artist, title, and/or the album name at the same time.
- Whoever gets the most points that night after 1 hour or when Player P goes to pee is awarded a glow-in-the-dark star to place over their bed.

DESIGN CONSIDERATIONS

- Reduces amount of peeing at night using biological mechanisms
- More effective sleep reduces stress/anxiety
- Competition adds excitement while building good habits
- Bonding opportunity with partner/friend/family
- Rewards players with visual accumulation of stars at night from playing the game every night throughout the pregnancy

MANIFESTO BITE

Sleepy Games are not Band-Aids

Sleepy Games **address the sleep issue of the user at the appropriate time** by providing an **opportunity** and **structure** to engage with it and to positively impact their sleep quality.

GAME

Pictolag

User Group: An individual having difficulty sleeping because of jetlag

Problem: Jetlagged people tend to fall asleep and wake up earlier than desired. Inability to sleep at socially acceptable hours may have detrimental effect on social life.

Identified Barriers:

- Jetlag caused by CRSD:
Circadian rhythm sleep disorder
- Factors that influence circadian rhythm are ambient light exposure & melatonin



Solution: To make players engage in playing game in a lit room at dusk before sleeping hours, and encourage the players to eat walnuts as part of the game.

GAME

Pictolag



HOW TO PLAY

Multi-player Game

- Each player writes their precious moment on an index card and shuffles.
- One drawer is chosen randomly, the rest becomes eaters.
- Drawer draws what is written on the chosen card and eater can guess the drawing after finishing the walnuts.
- After eater is done eating walnuts, they say “jetlag” to guess.

DESIGN CONSIDERATIONS

- Walnuts are known source of melatonin, which is a hormone released during night-time hours. Melatonin, and walnuts by extension, could potentially be used to promote deeper and more restful sleep.
- Playing with close friends and the orientation around valuable and familiar memories helps players achieve an engaged but relaxed, low-stress mental state prior to sleeping

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GAME

Shuteye

User Group:

Partners who struggle to gain closeness

Problem:

Conflicting schedules, spatial constraints or lack of communication can cause partners to be distant from each other

Solution:

To encourage interaction, communication, and sharing between couples through a story-building card game



GAME

Shuteye



HOW TO PLAY

Two-player Game

- Partners decide who's the "Hero" and the "Narrator"
- Hero draws cards and chooses a part of their body to be massaged
- Narrator will massage the Hero while creating an epic story using the drawn cards
- Narrator will end with a moral of the story
- Switch roles and play as many times as desired
- Recommended that partners audio record these stories to playback later

DESIGN CONSIDERATIONS

- Massage highlights the intimacy of sharing a bed and re-engages partners in something physical.
- Focus on collaboration opens communication between partners.
- Playfulness of card game and fantasy storytelling helps remove any tension.

MANIFESTO BITE

Sleepy games live in Vulnerability

Sleepy games must **embrace vulnerability** to create a safe space without inhibiting or negative feelings.

GAME

Sleepy Squad Challenge

User Group: Freshman and sophomore college students who regularly use their smartphones before sleeping

Problem: Smartphone use during the night negatively affects sleep quality and quantity

Identified Barriers:

- Game is largely driven by self-motivation
- Heavy reliability on smartphones: checking smartphone is an extremely difficult habit to break



Solution: To design a method for people to put physical and/or mental distance between themselves and their phones at night, breaking the social-media checking habit

GAME

Sleepy Squad Challenge



HOW TO PLAY

Single-player Game

- Before going to bed, pick a card from the deck of Sleepy Squadmate cards (animal cards)
- Put on the sleep mask and blindly build the animal you picked out of the Legos provided
- Place your Lego animal on top of your phone, and go to sleep
- If you had woken up in the middle of the night and touched your phone, repeat the challenge again
- If you did not touch your phone throughout the night, post a photo of your Sleepy Squadmate on social media
- Repeat for 7 days to complete the challenge!

DESIGN CONSIDERATIONS

- Incorporation of Legos and cute animals adds playfulness and enjoyment
- Legos add physicality and replayability aspects
- Ikea effect: users value their Sleepy Squadmate
- Incorporation of social media “challenge” appeals to intended user group
- Motivation otherwise directed to checking phone is directed to complete challenge

MANIFESTO BITE

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GAME

The Coolkit

User Group: People who are living with others and have little control over their surrounding temperature.

Problem: Temperatures above 68°F cause people wake up in the middle of night during sleep.

Identified Barriers:

- Altering external temperature is difficult due to people's preference in atmospheric temperature during sleep.
- Edibles can have a negative effect on sleep quality.



Solution: To physically lower body temperature by allowing players to undergo a series of challenges to lower the imaginary temperature to an ideal one.

GAME

The Coolkit



HOW TO PLAY

Single-player Game

- Pick a card from the Cold or Hot stack.
- Perform the challenge on the card, then decrease or increase the temperature on the Thermostat if the card is blue or red, respectively.
- Put the card into a discard pile after drawing.
- Only decrease temperature upon completion of challenge; always increase temperature if a red card was drawn.
- Repeat the above steps until you have successfully decreased the temperature to 68°F.
- If all draw piles are empty and 68°F hasn't been reached, reshuffle the cards into drawing piles, then continue tomorrow before you go to sleep.

DESIGN CONSIDERATIONS

- Physical movement from card challenges promotes sweat evaporation, which cools your body down.
- Playing in the dark helps biologically signal to your body that it is time for sleep.
- Blank cards exist for the roommate to write new challenges. This creates a more customizable narrative, adds an elements of surprise, and opens up temperature conversation between roommates.
- The physical thermometer gives player agency and control.

MANIFESTO BITE

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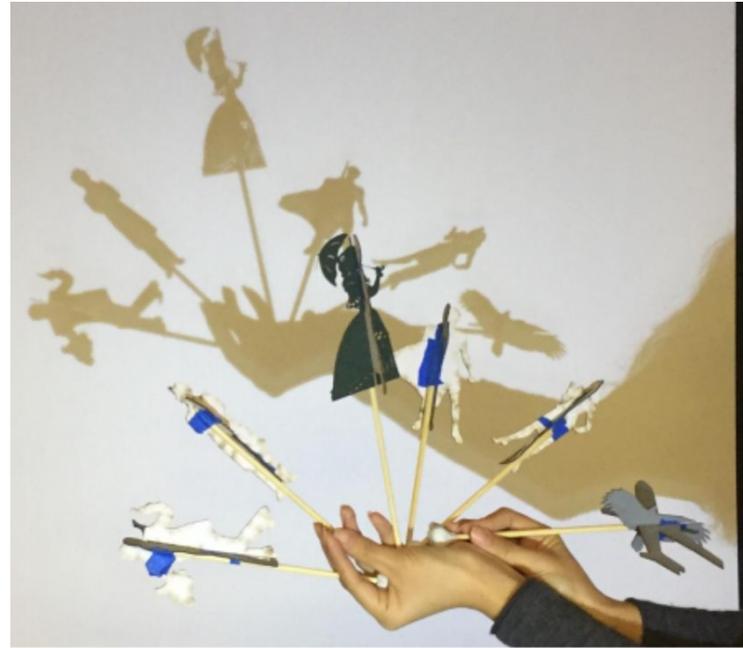
GAME ZZZ

User Group: People experiencing anxiety, depression, and stress.

Problem: “The misery cycle” - Anxiety affects sleep, causes more fatigue, which induces more anxiety.

Identified Barriers:

- Fatigue, low energy during daytime
- Difficulties coping with stress



Solution: To reinvigorate playfulness and distracts player from stress via shadow puppets enacting an audio story

GAME ZZZ



HOW TO PLAY

Single-player Game

- Pick an audio story.
- Lay on the bed in a preferred sleeping position with lights off.
- Follow the audio stories and use shadow puppets and light source to create shadow play on the wall.

DESIGN CONSIDERATIONS

- Creates just enough cognitive load that it distracts the player from any persistent negative thoughts (Cognitive Load Theory).
- Doesn't create so much engagement or excitement that players are unable to disengage and fall asleep.
- Gives players a chance to replace a negative bedtime experience with a playful and positive one.

MANIFESTO BITE

Sleepy Games Don't Make You Sleepy

The game relies heavily on **high intrinsic cognitive load**. Also, the **game stimulates emergent behavior based on unknowns**.

The 7 Challenges

Through an **iterative game design process** and **extensive analysis of our design artifacts and documentation**, we identified seven cross-cutting challenges of designing games for sleep, and articulated the sleepy games approach to addressing each one.



Agency and Control



“*Dream On* gave them a sense of control, not just within the game but over an environment that was not necessarily welcoming.”

Definition:

Sleeping on demand is difficult and the sense of not being in control of one’s sleep can actually make it harder for people to sleep.

Solution:

A sleepy games approach to resolving this contradiction is to avoid asking players to directly try to sleep. Instead, the game provides a challenge in the context of which players *can* experience agency; secondary effects of completing that challenge in turn affect sleep.

Example: [Dream On](#)

Physiological and Mental Arousal



“Conversation points are included in *Office Shot* to help players externalize their coffee habits or preferences and become more mentally self-aware.”

Definition:

A racing heart or a racing mind can be a challenge to relax. Having an optimal level of arousal for sleep at bedtime may mean: 1.increasing arousal earlier in the day; 2. addressing long-term sources of high arousal such as anxiety.

Solution:

Sleepy games recognize that sleep-related experiences do not always need to be relaxing. For example, games can address high mental arousal by matching it with games that require high cognitive load. By distracting players from their racing thoughts, their healthy sleep can be supported.

Example: [Dream On](#) / [Office Shot](#)

Intervention Timing



“*Dreamland* addresses the sleep issue of the user at the appropriate time by providing an **opportunity** and **structure** to engage with it and to positively impact their sleep quality.”

Definition:

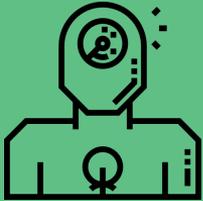
Sleep is often mediated by behaviors that happen at non-sleeping times of day. For example, caffeine intake during the day can affect sleep. Additionally, sleep can be affected by long-term changes, such as seasonal affective disorder. A sleepy game approach recognizes that gameplay can affect sleep at many times of day and on many timescales.

Solution:

Sleepy games therefore need to consider sustained engagement over instant transformation, and relevance to the user’s larger life context rather than only when players are trying to sleep.

Example: [Dreamland](#) / [Office Shot](#)

Multisensory Experiences



“Having the smells available made it easier to relax and actually just focus on the game itself...having that extra sensory bit made it easier to concentrate and forget about all the other things that usually swirl around my mind”

Definition:

The **multisensory experiences** included scent, sound and wind effects that, for example, allowed participants to **experience** temperature changes in the brewery or smell the hops used in the brand's fermentation process.

Solution:

Good sleep hygiene involves creating an environment conducive to sleep. Designing for sleep means designing for all five senses. A sleepy game design process treats the aesthetics of game objects as critical; this design concern may also manifest in the environment in which the game is played.

Example: [Dream On](#)

Social Embeddedness



“I feel if I map this game directly to my life, I would ... have a half an hour discussion everyday with my roommates where we openly discuss about things that we may be shy about or feel inconvenient or awkward about then.”

Definition:

Decisions about sleep are embedded in a social, rather than a solitary, context. While no one else can sleep on your behalf, opportunities for healthy sleep are constrained by social factors.

Solution:

Sleepy games consider the social space as design material. Sleepy games may ask the player to play within their social context by inviting others in their life to join, or to play with their social context by setting up temporary norms around sleep within the frame of the game.

Example: [Good Night](#)

Identity and Values



“Establishing regularity in their lives can help create a more meaningful and familiar connection between parent and child thus promoting a more efficient bedtime routine.”

Definition:

Sleep habits and preferences are interconnected with identities and values. For example, parents are typically busy, but also see bedtime as an important time to reconnect with their children. They therefore want a bedtime routine that is both meaningful and efficient.

Solution:

Sleepy games recognize these value conflicts and are designed to address their value and identity needs. For instance, a sleepy game approach would increase the efficiency of the bedtime routine, while helping parents and children playfully connect.

Example: [Lights Out](#)

Vulnerability



"[a co-worker] was asking what the challenges were. So it was like a talking point for all of us that was not work related...it was a positive thing in the culture"

Definition:

Sleep is a vulnerable state. Sleepers cannot directly perceive what is around them, nor can they deliberately act to control their environment.

Solution:

Sleepy games embrace play as a way of directly addressing vulnerability. They tackle sensitive and intimate topics surrounding sleep. They use playfulness and embedded design techniques to transform behaviors that are often protected by players' defensive tendencies, and to help players embrace being vulnerable rather than avoid it.

Example: [Office Shots](#)

Iteration & Playtesting



Designers
testing each
others' games



Feedback from
academia &
industry experts



Playtest night
at CMU



External playtest
recruitment

Findings from Field Studies

1

Players were **highly engaged** and **enthusiastic** about exploring alternative methods.

11 of 12 players played the games voluntarily for 2 Days.

2

Players reported **increased awareness of their sleep-related choices**.

"If I skipped breakfast in the morning at home, I drink coffee at work cause I'll go to the cafe and pick up like a pastry and a coffee. I won't just pick up the pastry."

3

Players had **unexpected and positive social interactions** in multiplayer games.

5 of 6 players felt they understood their fellow players better.

The Next Level Up

Currently

- We have explored how sleepy games can fit in people's lives by tapping into people's basic desire for fun, connection, and compassion.
- Sleepy games provide a low barrier-of-entry method to improving sleep.



In the future

- We want to provide better measurement to the effect that sleepy games can bring to players by:
 - increasing the fidelity of the games,
 - devising structures of experimental studies,
 - digitizing the means for people to play.