RIGHT UP

EDUCATING AND ENGAGING CHILDREN AND GUARDIANS ON THE BENEFITS OF GOOD POSTURE

CSE: Introduction to HCI

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Table of Contents

The Team

RUI WU

Lead Designer (33%)

Rui oversaw creating the initial paper prototype and any design changes made to the prototype. Beyond that, she mainly focused on the art/layout of the initial paper prototype game.

SIYU PAN

Creative Director (33%)

Siyu primarily identified and documented the use cases of the product. She played a large part in creating the majority of RightUp's Digital Prototype, and making it polished and ready to present.

NATHAN LEE

Product Manager (33%)

Nathan was primarily in charge of performing usability studies and bringing results back to the rest of the team. He also was the lead reporter for this paper and wrote the majority of the content.

Problem and Solution Overview

PROBLEM STATEMENT

With the increased usage of technology, there is a steady rise of back and neck pain due to poor posture from technology use compounded over time. Given this increasing trend, our problem statement is thus: "**how can we address the issue of chronic back and neck pain due to compounded poor posture by focusing on improving posture as early on as possible?**" To do this, we are designing for children ages 6-11 in the effort to correct and educate them, as well as their guardians, on the importance of good posture, by creating a fun and engaging game for both sets of users.

SOLUTION OVERVIEW

We are designing a virtual reality (VR) game, RightUp, that educates and engages children and their guardians on the benefits of good posture, helps children develop a habit of good posture, and protects them from future spinal pain. Our design will contain information about the importance and need for good posture, instructions on how to properly model good posture, and in-game activities. The VR technology functions by positioning the user's height, depth, and width in a 3D space with two cameras. In said activity, participants will be given different level of abilities (ex. attack power, damage resistance) and different perspectives about the in-game world, as they stand taller or bend down lower, as monitored by the two cameras. Players standing and modeling good posture will be given greater abilities and allowed greater interaction with the virtual world around them, incentivizing and teaching them to stand in good posture. This game can be played briefly through a story driven quest campaign, and can be played by multiple players in real time (e.g., a parent and child). Parents are given in game diagnostics on themselves and their child's posture, and have the option to send said details to their mobile device or email, for further education.

Initial Paper Prototype

INITIAL DESIGN

Before the Game: Preparing (for both children & parents)

1. Choose your role and enter equipment room after watching a short tutorial.

2. Choose your cloth and weapon and put on your smart watch, which displays your blood level and coins amount.

3. Leave the equipment room and enter forest to start playing the game. Task: find the treasure box.

During the Game: Playing (for both children & parents)

4. Bad posture view in the forest - can't see signpost.

5. Good posture view - able to follow the signpost to find the treasure box.

6. Bad posture - can't beat monsters.

7. Good posture - receive upgraded weapon to beat the monsters.

8. Defeat the monsters and receive treasure rewards.

During the Game: Additional Features (for parents only)

* Parents can press the button on the watch to use monitoring tool when they look at their children.

* The monitoring tool is able to help parents identify their children's posture problems.

* Parents can click on a particular problem to learn more about the problem and tips to fix the problem.
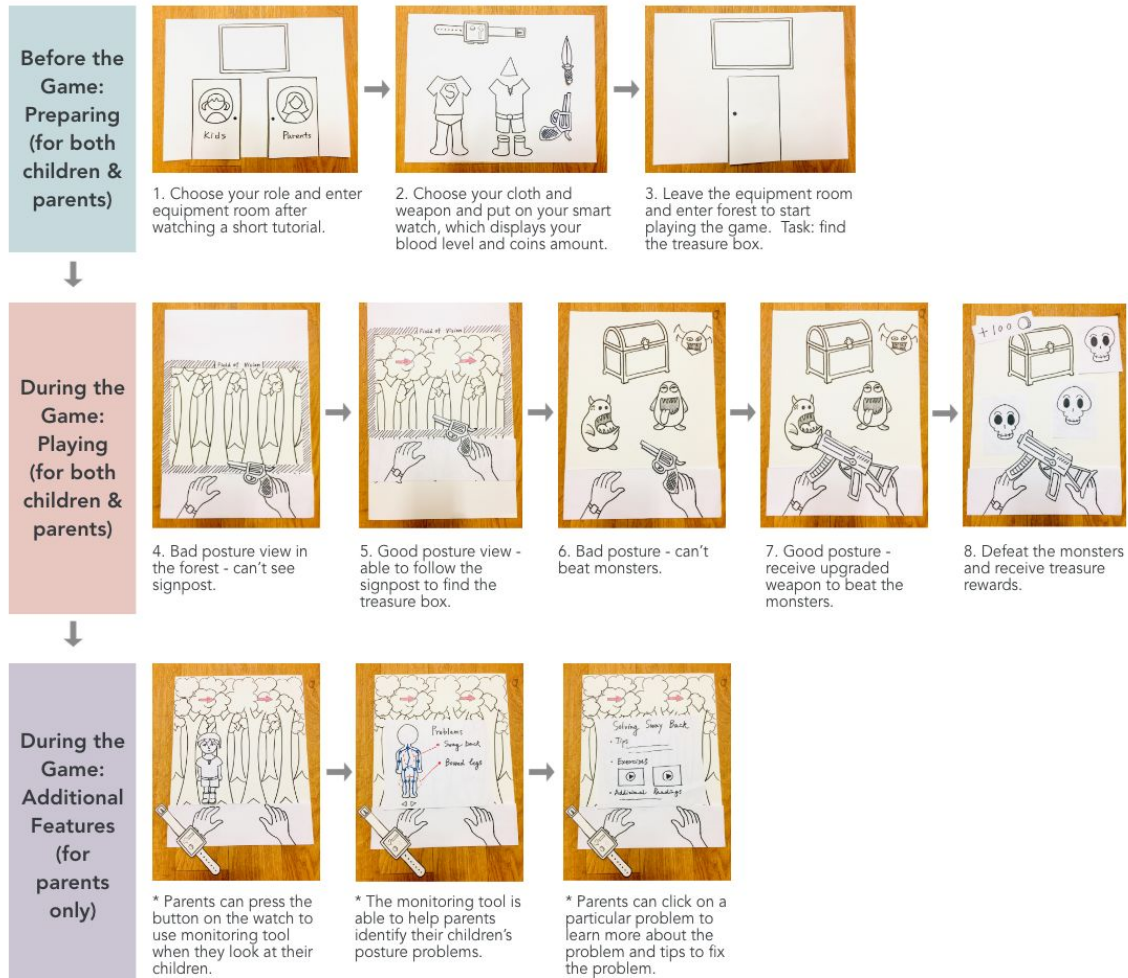
Figure 1: Initial overview of the paper prototype

TASKS

Our initial tasks chosen were to 1. Engage children and 2. Educate guardians on posture and child development. We found it very quite easy to incorporate both into a VR game, in which children could be taught to keep good posture through the game, engaging them with a story driven first-person-shooter role-playing-game (FPS-RPG). Meanwhile, parents would be able to be taught the importance of posture and their child's development through the game monitoring and gathering statistics on their child.

CRITICAL ASPECTS OF THE DESIGN

Regarding the design, we found that the most important part of the game were the initial screen of preparing for the game, the actual exploration of the game world, the combat sequence, and the user diagnostics. The first three correspond to engaging the children, while the first and last correspond to educating parents.

The initial screen of preparing was quintessential because it first told users their affordances in game. Specifically, it stated what the objective of the game was (retrieve the treasure chest), and that by keeping good posture, the user could both see more and get a buff (increase to damage and damage resistance) during a given battle sequence.

The exploration of the game world was important as it gave users a sense of a wide world to explore and adventure out into. As if they were actually going on a long quest, and that there was a large world for them to explore. It also introduced the idea that the better posture they stood with, the more they could see, and could see directionals of how to proceed in the game world.

The combat sequence was important as it engaged the user, making the game actually a game! There was an aspect of challenging the player with difficult monsters that made the game fun and satisfying to beat. Notably, it also prompted users to have good posture, very heavily emphasizing that they could do more the better posture they held.

Finally, user diagnostics were incredibly important as they addressed the task of educating parents on their child's posture, development, and any possible issues within that. This really tied the game together, making it both educational yet fun!

Testing Process

After creating our initial prototype, we paired up with another group to perform a heuristic evaluation. Working with said group (John and Lior), we were able to identify some key issues in our prototype about the flow of the game, allowing us to make critical changes before starting our usability testing.

Usability Test Participants

For the initial usability tests, the test was performed by a male Computer Science student who has experience designing Virtual Reality (VR) games. We performed the test in an isolated, quiet area with plenty of space to allow the user to walk around and move their hands. We had one group member read instructions and give dialogue for the game, and the other hold the paper prototype and demonstrate the game's interaction with the user. We had the user stand about two feet away from the prototype, using their body and hands to control their "in-game hands" to interact with the world around them. We gave them the following tasks to complete:

- Enter into the game as either a child or parents
- Explore the game and find the monster
- Defeat the monsters
- Retrieve a stolen treasure chest from the monsters
- If the person was a parent, view the information about their child's posture

Post the test, we found that an initial dialogue script was necessary. In this test, we had to verbally walk the player through the game, which would rarely occur in a finished product. So we drafted an initial script that could be read every time to the user at the start of the game, to provide them context and what the game was about. We also found that controllers were necessary for the game, and so provided controllers as well as an briefing to future users on how to use the controllers.

The next two users were a male child, 10 years of age. The test was run, similarly to the initial usability test, the first focusing on the child and his interaction with the game.

Figure 2: Nathan Lee conducting the usability study with a father and son

We revised the order of the information given, giving him a briefing of the context of the game, how to use his controllers, the objective (retrieve the stolen treasure chest), and the importance of posture in the context of the game (power-ups, buffs, etc.). Post the tests, we modified the wording of the script to provide better clarity to users.

The third test included the male child from the second test, with his father as well. Though the child had already completed the quest, this test was performed specifically to test the interaction between father and son in beating the quest. The modified script was delivered, but the father was given the parent's script, which emphasized the importance of teamwork and that the father could view his child's posture and development in game.

One last test was run with the improved prototype with a UX Design manager, in a similar situation. The user was given the improved script, and given the same set of tasks. This was performed to identify any potential issues in the user design.

Testing Results

HEURISTIC EVALUATIONS

We realized that during this stage, we presented a few accessibility issues to users, such as pausing and exiting the game, accessing/closing out screens, and security for the game to prevent kids from playing as a parent. We also forced them to remember the bulk of what they had been taught, rather then giving them helpful hints throughout the course of the game. The main issues and solutions are as follow:

- **User Control and Freedom:** Users were lacking a pause/exit button, and were confused on how to pause or exit the game. As a result, more refined controllers were added to allow users to step in and out of the game, as well as more intuitively interact with the world around them. Users were also given better access panels to allow them to exit out of menus/informationals, and to send it to their phone to view at a later time.
- **Recognition and Recall:** Users were initially given a long informational on how to interact with the game world (e.g., better posture results in better gameplay) than were promptly sent off to the races, with little to no further instruction. This caused confusion to users as they were already given a plethora of information. To solve this issue, we implemented a notification that would trigger, providing information to users on when to have good posture (e.g., "Stand up tall for more attack power").
- **Error Prevention:** Users had no issue in signing in to an unauthorized account (a child logging in as a parent), so we implemented a login screen that prevented children from playing as a parent.

USABILITY TEST 1:

It was during this test that we identified that a we needed much more documentation and help for the users.

- **Detail and Documentation:** The user was confused as to what each weapon was, how it functioned, how much damage it gave, how we would recognize damage we've taken, and how to actually use their weapons before the combat sequence. As a result, we implemented a much greater set of information pop-ups for the user for them to know what each piece of equipment does, as well as implementing a sort of test-weapon-room that allows them to practice fighting before actually stepping into the game.

- **Separate Accounts:** We also identified a need for different save games, and so implemented an interface that allowed them to choose which save file they'd be using, building it upon the login screen mentioned under Heuristic Evaluations.

After our initial usability test and changes, our prototype was as follows:
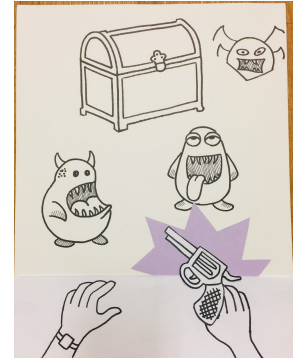

USABILITY TEST 2:

We noticed that the child was disappointed as to actual game itself, and modified accordingly to have RightUp feel more like a game and engage users better:

- **Holistic Demo:** The child was disappointed by the length of the game, and didn't know they beat the demo until we had told him. In response, we implemented a start and end screen to clearly identify when they had started and beat the game.
- **Guidelines and Equipment:** The user was confused as to what the watch did and how it functioned, not knowing how the buttons worked. As we had the controllers available, we removed the buttons from the user's in-game watch.
- **Transitioning to Battle:** The user was thrown into the battle sequence without any warning and thus was a little alarmed. In response, we added a visual cue of a monster hiding in the forest for them to interact with.

USABILITY TEST 3:

The parent was confused on a lot of the interactions with the game, and how he knew if his good posture or actions were "working":


- **Visual Buffs:** The user was confused as to when he knew he was doing more damage to the enemies. As a result, we added in a visual cue to let users know when they were doing more damage.
- **Better Pop-ups:** Do to confusion on how to exit, we gave users even clearer instructions on how to exit out of a given screen.
- **Better Swords:** We allowed the user to swing the sword instead of having to press the trigger button every time, making it more intuitive.

USABILITY TEST 4 AND DESIGN CRITIQUES:

The final review and any design critiques made were much more about engaging kids and informing them how to interact with the world in a much less language-heavy basis, using more pictures and physical activities:

- **More Graphical:** Users suggested that younger kids don't have extreme reading abilities, and that we should modify parts of the game to allow for more intuitive gameplay/alerts.
- **More Exercise:** The designer suggested that if we're making a VR game, might as well get physical to allow the children to stretch and apply good posture! We therefore changed the battle sequence to allow for greater motion in-game.
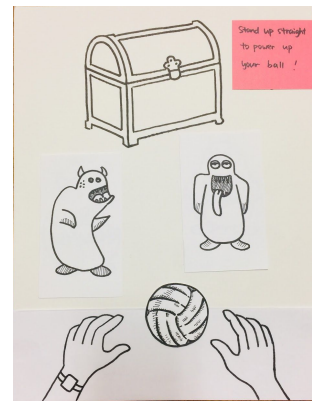
Final Prototype

Figure 2: Final design for the paper prototype

This is the final iteration of our prototype. As you can see, many modifications were made to the game, mainly in 1) how the battle sequence is demonstrated and occurs, 2) how

users are instructed and how they interact with the system, and 3) making it more gamified -- with controllers and a clear start and end to the demo.

Again, as stated earlier, the critical aspects of the design still stayed relatively the same: the initial screen of preparing for the game, the actual exploration of the game world, the combat sequence, the user diagnostics, and a new piece, the in-game prompts for the user. The in-game prompts were incredibly useful as they allowed the user to remember less and be immersed more, especially as they had so much to adjust to in the game.

TASKS

Engage children: This task was addressed by making the game, well frankly, feel more like a game. This came in part of creating a clear start and end to the demo, creating a world that users could flow through without mistakes or confusion, and making a fun and interesting battle sequence with monsters for all users. Many of these were improvements made throughout the usability test, allowing for incredibly clear and fun gameplay for many children.

Educate guardians on posture and child development: The second task was not as heavily addressed beyond accessibility for the user. We gave more detailed instructions on how to view the information on posture and any issues with a child's posture, and the ability for users to send more information to their personal computer or mobile device. This allows for immersive education about posture and a child's development without breaking the flow of the game.

POSSIBLE CHANGES

If we were to make any further changes with the prototype, it would be to make the demo longer and the world more immersive. Many users were vying for a more explorable world, e.g., to see the village that we were rescuing the treasure for, and to just get a better idea of the world around them.

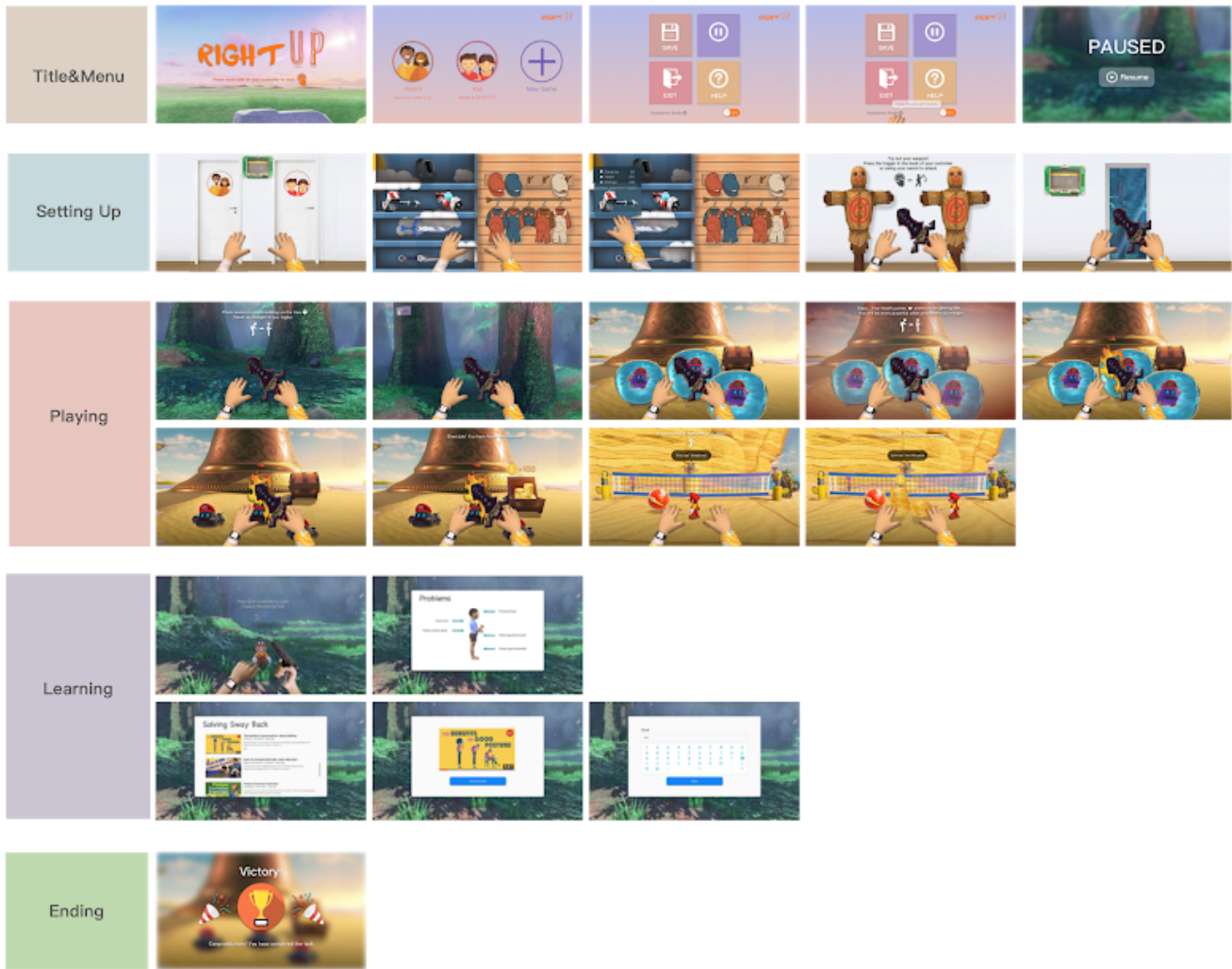## Digital Mockup

DIGITAL DESIGN

Figure 3: Digital Design Mockup

For the digital design, we had issues transitioning over the artstyle to the digital, as we wanted a beautifully designed world. We were able to base large portions of the design off of exiting games. One of the more challenging issues we had were the initial setting up screens in which a user was able to select an account, enter in, and begin playing. The initial account selection screen still remains a critical aspect of the game. Meanwhile in combat, we had to implement a plethora of different screens to describe the interactions with the game. As this is a core element of gameplay, this remains as a critical aspect of

the game. Meanwhile, for education, we built a more fluid UI in which users can view and send all details to themselves outside of the game.

Tasks

Engage children: Whereas the prototype focused more heavily on the start and end of the game, the battle sequence was most difficult to create. However, we were able to digitally mockup the necessary pieces of any battle sequence, showing when the user is damaged, and when they beat the game as well. The digital prototype adds a level of realism to the VR game, and the polished feel of the game adds to the users' gameplay and desire to explore in game. The digital mockup essentially implies that the user can perform many more activities and interaction with the world around them, driving immersion in the world.

Educate guardians on posture and child development: The parents are given many more tools, such as specifying which email to send data to, and a clear visual of issues in their child's posture. This allows for them to quickly learn and diagnose any potential issues, as well as allowing them to send the information to anyone whom they choose. This feature educates parents both in-game and out.

Main Changes

As we transitioned from paper prototype to digital, we had to redesign some of the screens, such as the practice shooting range, because of the limited image resources we had. We also added some visual prompts that's not in the paper prototype, considering some of our users may be young children that are not yet literate. Along with that, we added the option to turn off the prompts for experienced users, so that the prompts wouldn't interrupt their gaming experience. In response to the feedback we got in section, we switched out a lot of the image sources to polish the look of the scenes and weapons in the game so that the game can be more suitable for children to play.

Discussion

One interesting thing we learned about the process of iterative design is that it's useful, but to a point. There comes a point when you receive too much feedback, much of which is conflicting, that causes design issues and to move away from the original intention of the game. At some point as designers, we have to push back and make decisions on what are valid suggestions, and what suggestions deviate from our mission.

However, the iterative design process of this project really guided our progress and our mental image of our prototype. When beginning to build our prototype, we had a very clear and distinct mental picture of what the game should be, what made sense to use, and how to start. But as we continued to test, we found that a lot of what we held in our heads didn't make as much sense to users. They would often struggle with completing tasks we thought were rudimentary, and as a result needed more hand holding than we thought. But that's good! We would have never known about this had we not completed usability tests. Another addition was even the flow of the game itself. How the game would perform, what affordances we would give to users, we all learned about how to properly design through the iterative design process. For example, we didn't even know we needed controllers until users were struggling with exiting out of a given scene. We didn't even think to put a pause button in until it was suggested. We needed more visual cues to let the player know when they were having good posture. We found all this out from the iterative design process, and truly learned how important this process is to building and shaping a quality solution.

While the second task of educating parents has not deviated much, we found that the first task of engaging children has changed dramatically. As stated above, the iterative design process showed us the necessity of a definitive start and end, more intuitive combat, and reminders for the player, all of which culminated in a more easy-to-play game that users had more fun playing. And though this hasn't changed our task of engaging children, it challenged and changed the way in which we fulfilled that task. We began to focus more on gameplay, style, and flow of the game much more heavily to provide a quality experience.

Though we mention that there is a limit to the number of helpful suggestions and tests, we feel that we still have not yet reached that point. Our design would have benefited greatly through more usability tests, specifically with children and their parents, to make sure we have a quality game that truly entertains and engages them. As our solution for kids, we want to have more kids of differing demographics to test it and try it out. That way, our product would be designed for the kids, by the kids!

Appendix

INITIAL SCRIPT

The following is the initial script that was read to users upon entry:

"Welcome to the world of RightUp! Please make a selection. Kids, enter the game as a kid, and parents, enter in as a parent!"

[Once game has been entered]

"Now pick your gear, your weapon, and your watch! Your watch displays the amount of gold and health that you have!"

[Game waits]

"Now this game is all about posture! The taller you stand, the more you can see and do. You can a buff during combat, and are much more resistant to enemy attacks!"

"Now your goal is to retrieve the treasure chest! It's been stolen from the villagers, and it's up to you to retrieve it. Happy hunting!"

[If the player is a parent, the following is read]

"Parents, if you want to view the statistics of your children, hover over them and press the button that looks like a magnifying glass on your controller to view statistics on their posture and their development!"