Potty Party, a Tangible User Interface for Potty Training

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Abstract

At some point in his or her life, every socialized human being gets potty trained. This is a natural bodily function that everyone performs daily, and success is essential to being accepted fully into society. Children between eighteen months and four years old often have trouble transitioning from using diapers to using the toilet. Often cases of bed-wetting persist well into the first decade of life. In thinking about different kinds of input that can be sensed, and different kinds of output that can be displayed to influence behavior, it seems a great fit to use new ways of thinking about interfaces to create an educational tool to help with this very common problem.

Keywords

Tangible User Interfaces, Potty Training

ACM Classification Keywords

H.5.1 [Multimedia Information Systems], H.5.2 [User Interfaces].

Introduction

In the United States alone a child is born every eight seconds [9], that's 10,800 births every day, and 3,942,000 births every year. A year or two from now, the close to four million children born this year will all

begin the same transition from baby to "big kid," by leaving their diapers behind and using the toilet.

For some children, the transition will be an easy one—the child may have good body awareness or may be highly motivated by bribery and incentives. But, for others, potty training will be a long, difficult, and highly involved process, not only for the child but for the parents as well. This is often the case when parents start before a child is physiologically ready, but also in situations where the child is unmotivated or afraid (plagued by negative associations with potty training) to make the transition.

In order for a smoother transition to take place, parents need to keep in mind the three components of readiness for potty training [6] which include:

- physical readiness (i.e. the ability to hold larger amounts in the bladder)

- physiological readiness (i.e. the ability to walk to the potty)

- psychological readiness (i.e. being motivated and having a desire to use the potty)

No matter what the case, parents always need to devote a lot of time and patience in order for potty training to be successful [2]. For this reason, there is a huge demand for effective potty training products that cover every aspect of the process.

Current products range from decorated, fun pull-ups and toilet seats to books and videos like "Potty Time with Elmo" or "Too Big For Diapers," and even to

training dolls like Potty Patty or Potty Elmo that involve the parent teaching the child to teach the doll how to use the potty.

But, two main problems exist with these current implementations:

- They only target the problem at **one point in the process** (they only focus on psychological readiness, helping the child become more motivated and comfortable using the potty) rather than creating a **coherent system** for the entire potty-training process.

- They do not provide reinforcement during the time when the child is actually **ON the potty and IN the space** (the bathroom).

We attempted to address these issues by creating a potty training system that bridges the aspects of physical and psychological readiness, giving encouragement throughout the three stages rather than focusing on just one.

With this in mind, we had two main goals for our design:

- Close the disconnect between the physical act of drinking, the feeling of needing to go to the bathroom, and the physical act of going.

- Make time on the potty fun and interactive, instilling a desire in the child to WANT to successfully use the potty.

Design

In order to meet our design goals, we re-designed two existing artifacts, a drinking cup and a training potty (see figure 1), focusing on a full embodied experience where the input and output device are one in the same [4].

figure 1: Our potty prototype, with rocket-shaped cup and docking station.

Additionally, by re-designing these objects that already have clearly defined ways of interacting with them, we afford "Really Direct Manipulation" [5] by employing a full metaphor where "the user need make no analogy at all—to their mind, the virtual system *is* the physical system" [4].

Drinking Cup

To help with the current disconnect between associating the feeling of having to go with actually using the toilet, we targeted the point of consumption by implementing a drinking cup shaped like a rocket, which can be "docked" at the potty. The inherent quality of the connection between the child drinking with the cup and having to use the training potty lends itself to the evolution of the toilet-training process. It helps link the cause, drinking a lot of liquid, with the effect, having to go to the bathroom and giving a child fluids is a time-tested way to encourage the need to go potty, and increases the likelihood of successfully going potty.

Training Potty

To help in the space itself (the bathroom) we re-designed a training potty which aids the child before, during, and after use. When the cup is set on its holder, the first audio cue is heard, saying, "Great job, astronaut – now, it's time to pull down your pants and take the captain's chair – that means, sit down on the potty." When the child sits, the potty responds to the pressure of the child's weight on top of it, starting the story, and to the heat of the child's urine or bowel movement (in the success case), responding with lights and stimulating audio.

The child is encouraged to stay on the potty and listen to the stories by creating more of a "game" atmosphere in which a button on the potty acts as a control panel for the ship and allows the child to interact (i.e. influence the story) while they are sitting on the potty. This creates less work for the busy parent who would otherwise have to sit with the child for long periods of time, helping them become comfortable with the potty.

Furthermore, the potty remembers the child's progress throughout the process and alters the stories and feedback as the child's interaction with the system evolves over time, as s/he moves from only using diapers to always using the toilet.

Positive Reinforcement
In our interaction loop (see figure 2), we were very careful not to punish mistakes or do anything that could cause a child to have negative associations with the potty – in the "failure case," in which the child does not actually have to go, the potty simply turns itself off when there is no pressure detected on the seat and/or the cup portion has played itself out. Instead we encourage the child to WANT to successfully go potty, to see the lights, hear the encouragement, and "win the game."

Additionally, we wanted to keep a busy, absent parent in the loop, allowing them to help with the positive reinforcement, by sending them an SMS message alerting them when their child has successfully used the potty. This allows the parent to further encourage the child even when they are not present for the successful event.
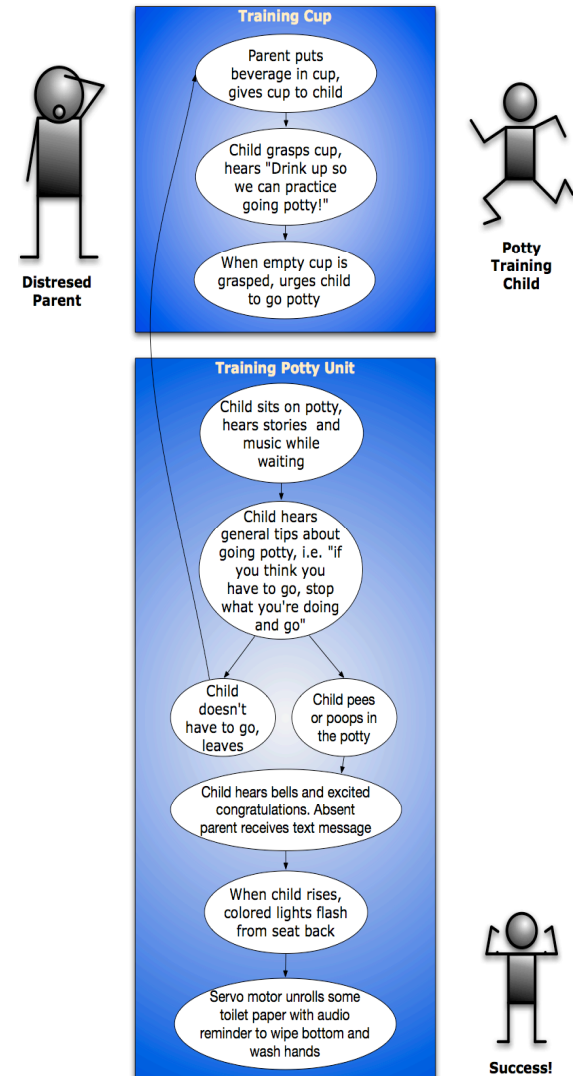
Training Cup

Parent puts beverage in cup, gives cup to child

Child grasps cup, hears "Drink up so we can practice going potty!"

When empty cup is grasped, urges child to go potty

Distresed Parent

Potty Training Child

Training Potty Unit

Child sits on potty, hears stories and music while waiting

Child hears general tips about going potty, i.e. "if you think you have to go, stop what you're doing and go"

Child doesn't have to go, leaves

Child pees or poops in the potty

Child hears bells and excited congratulations. Absent parent receives text message

When child rises, colored lights flash from seat back

Servo motor unrolls some toilet paper with audio reminder to wipe bottom and wash hands

Success!

figure 2: The interaction flow.

Simplicity

Initially we had many ideas to extend the scope of this project ranging from including an LCD screen for visual output like videos and games to completely re-designing the bathroom (i.e. making it "smart") to respond to input created by the child's hands and body. We wanted to keep it simple for two main reasons:

- An overly complex system with too many parts is **daunting to the parent** since it requires a lot of work to setup and maintain.

- Too much output can **distract the child** from the task at hand.

Implementation

We created our prototype using an existing cup and training potty, outfitted them with sensors, and then connected them to Arduino [1] and Processing [7] to sense the input and give the appropriate audio feedback as output respectively.

For the cup, we used a switch for the parent to activate when they handed the cup to the child, thereby starting the audio. The docking station attached to the potty also used a switch to determine if the cup had been docked.

For the potty, we used a force-sensitive resistor to detect the child's weight, a thermistor to detect any urine or bowel movements, and a switch to detect any input from the child.

For output, we used LEDs combined with our own custom audio tracks. The audio was implemented using the Minim sound library [3] and the SMS messaging was implemented using example work that simplified the JavaMail API for Processing [8].

Usecase/Scenario

Tommy just turned three and started potty training. His mother is a graduate student with a lot to do who spends too much time entertaining him while he's on the potty. Her friend recommends Potty Party. Next time Tommy wants some juice she pours it into the drinking cup. After he grabs it he hears the cup say in a dramatic voice, "Well hello there, astronaut, are you ready to go on an important mission – and get poopie or peepee IN the potty?". He continues to play with his toys drinking periodically from the cup. After finishing all his juice, before putting down his cup, he hears the cup say "Okay, astronaut, it's time to dock the ship at the potty, and for you to sit down on our rocket potty". Tommy then sits on top of the training potty which begins to tell him an astronaut-themed story in which the ultimate goal of the mission is to get poo or pee in the potty. Tommy will continue to be engaged even if it takes a while to go potty, because he can push a button to continue the story, even if he doesn't have to go. After the story ends and Tommy has sat for a while he decides he doesn't have to go and gets up to go play. Later on that week, while his mom is in class, Tommy's grandmother gives him milk in the same cup, turning it on to activate the astronaut story. This time he does go to the bathroom on the potty. He then hears bells, sees lights, and hears music and excited congratulations ("I sense this mission is being completed! Hooray! You saved the universe and got pee in the potty!"). Colored lights start flashing, and Tommy is so proud of his accomplishment! At this point his mom receives a text message informing her of the achievement. She can call Tommy to congratulate him,

rather than waiting until later that day, when Tommy may have forgotten how important it is to learn to use the potty correctly.

Future Work

The next stage in the development of this project would be to create a more robust and durable prototype. In this second iteration, we would encapsulate the loose wiring and Arduino processors within the main body of the device. Additionally, wireless capabilities for the cup artifact would have to be incorporated. A small focus group of toddlers and their parents would serve as the initial testers of the device. Additionally, multimedia components such as video and games could be added with the incorporation of a video display screen. Also, interactivity could be enhanced through a control panel of buttons instead of simply one button. There is also the potential to add a separate mechanism to dispense a controlled amount of toilet paper using a servo motor mechanism.

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