

BETTER WITH YOU

THESIS

**Submitted in Partial Fulfillment of
the Requirements for
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by

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Abstract

There is a reason that whether one is performing music for an audience, practicing on their own, or just learning the instrument, that person is playing. Music and play are two abstracts that are inextricably linked, from the first drum circle, to the modern rock concert. The key to this link, however, is the act of participation in music. Though today most music is consumed through recorded or presentational means, there exists the possibility that our contemporary tastes for electronic music can still provide a participatory experience for fans. This thesis outlines the development of a musical installation that allows users to engage in an “electronic drum circle” by using human touch to close a circuit and generate music.

Better With You

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Advisor: Advisor's Name

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INTRODUCTION

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CHAPTER

1

Introduction

Play is an aspect of life that tends to become less vital to people as they get older, when it actually continues to be beneficial to those of all ages. The very act of play encourages interaction with others and helps to build connections, which makes it an important activity in childhood. However, as play is regarded as a childish activity, we forget its importance when other responsibilities become a priority. The desire to reintroduce play into the lives of adults who might otherwise neglect it and fail to reap its benefits was the impetus for the creation of the installation *Better With You*.

This project aims to help build connections between people through the use of play as an activity, music as the feedback or reward, and human touch as its primary mechanism. The three core concepts behind *Better With You* work in concert to provide a positive experience for its audience, which consists primarily of two demographics: children aged 9 to 12, and university students aged 18 to 23.

This thesis will explore not only the development and evolution of the installation, but will also discuss the social benefits of music, the role that haptic communication plays in establishing bonds and the benefits of a lifestyle rich in play.

Literature Review

Though *Better With You* may stand alone as an installation, for the purposes of this dissertation, I am also including research that highlights three important aspects of the piece that inspired its creation. I have identified them as:

- The psychological effects of participatory music
- How human touch encourages bonding and trust
- The social and psychological benefits of play

Though there are several texts detailing the cultural effects of music, the relevant focus for this piece is the effect that music has in social settings, especially in a context where people are gathered for a purpose (eg. a gallery, a park, etc.). To start, I read through *Music, Meaning and Transformation* by music professor Steve Dillon. This initial text helped me to gather information on the individual effects music has on our memories and what motivates its creation. In addition, I cite *The Social and Applied Psychology of Music* by David Hargreaves and Adrian North, two music scholars at the University of Oxford, a work that explores several psychological aspects of music, including why music elicits a strong emotional reaction in people and why it is so strongly tied to life experiences, as well as its effects on behavior in real-world situations. Among other things, it helped me to understand the specific music selection that plays in different retail settings, which was surprisingly relevant to this study. Consulting with my thesis advisor, I was directed toward the work of ethnomusicologist Thomas Turino, from whom the text *Music As Social Life: The Politics of Participation* has served as an invaluable resource due to its specific focus on my area of study.

On the subject of human touch, I wanted to not only explore the physiological effects of human contact on the body, but also the cultural implications of touch and why, for example, Americans touch each other in conversation less than the French. This cultural divide is explored in Edward T. Hall's 1959 book, *The Silent Language*, which delves into high and low-context cultures, and why one of the barriers to this

project might be a reluctance by participants to engage in physical contact, however minimal. Touch is also talked about at length in the *Greater Good* blog, maintained by University of California at Berkeley professor Dacher Keltner. Keltner's work deals mainly with the science of happiness, empathy and compassion, all of which tie greatly into the reasons I give for making touch the method of operation.

As I looked more into Keltner's posts, I also found a useful resource in *Touch: The Science of Hand, Heart and Mind* by neuroscientist David J. Linden. Though the book could be used on a number of theses on different aspects of touch, I found a good amount of relevant information in the area of what touch communicates, and how it affects people socially. When I noticed that the first chapter of the book is entitled "Skin is a Social Organ," I knew I had a valuable piece to making my case.

Play is the least studied of the three aspects of *Better With You*, but doctor Stuart Brown was the first to delve into academic study of play, its importance, and its benefits rather than focusing on the rhetoric and reasons behind play. He was also the first to define play within a scholarly context:

"Play must be apparently purposeless, voluntary, possess inherent distraction, freedom from time, diminished consciousness of self, improvisational potential, and a desire to continue (Brown, 28)."

Though play can be ambiguous in its nature, the definition provided by Brown allowed for a criteria that psychologists could look for when observing children and adults alike engaged in playful activity. This would influence further texts on the subject. Indeed, many of the articles cited within this dissertation related to play quote Brown himself as they explore aspects of the topic that aren't included in his book. Brown's text will be the most cited on the subject, but other sources, such as an article from

Psych Central, the oldest independent psychology-based social network on the web. Also included is the book *Play For A Change*, which focuses on the importance of play in children and the case for including provisions for it as an aspect of child welfare when determining public policy.

Comparative Analysis

In order to fully understand the cultural context in which *Better With You* exists, I did an assessment of seven similar installation projects. Some, like this project, fulfil their potential when multiple people interact with them at once. Others are meant to be experienced individually. As I researched them, I found that each has a unique aspect to their nature in order to maintain novelty, which is another quality I am striving for with *Better With You*. For this analysis, I looked mainly at the type of venue that houses each piece, who the target users appear to be, and whether the piece is meant to be used individually, with other people, or can operate either way. I also took into account what does and does not work for each one (Figure 1).

Name	Location	Venue	Social or Individual?	Target Users	Advantages	Disadvantages
Reach	New York, NY	Subway station	Social	Commuters	Easily seen by thousands of commuters a day, simple interaction	Height makes it prohibitive to children and shorter users, communication aspect may be lost.
Sonic Forest	Traveling	Outdoor festival	Both	Festival Goers	Modular, moveable, simple interaction	No visual feedback
21 Swings	Montreal, QC	Street	Social	General public	Social interactive element is rewarded the more users cooperate	Distance between sets of three swings may make it hard to get 21 users to coordinate
Playing The Building	Stockholm, Sweden	Specialized building	Both	Gallery patrons	No electronic component, explores repurposing of materials as musical instruments	Requires large space
Björk @ MoMA	New York, NY	Museum	Individual	Museum patrons	Users can customize museum experience within the installation	Relies on hardware that may receive interference, not meant for social interaction
Scrapple	Various	Museum	Individual	Museum patrons	Modular, custom experience	May rely too much on moveable physical objects
Resonate	Various	Installation Piece	Social	General public	Allows users to explore new types of communication through use of structures	Very big, though modular, not quite portable

Figure 1

The interactions with the pieces can be described as follows:

Reach - Infrared lights are installed on both uptown and downtown platforms. When a user breaks an infrared beam, a sound is emitted on both platforms, allowing people on either platform to communicate with one another.

Sonic Forest - Festival goers can wander through this array of thin columns, activating sounds that emanate from them by breaking invisible beams of light that also come from the "trees."

21 Swings - Users ride on the swing set, causing the piece to emit sound. When the swings move in unison, a three-part harmonic melody plays. If all 21 swings move in unison, the result is a special melody.

Playing The Room - David Byrne's installation allows patrons to "play" items like metal tubing and industrial-grade girders as if they were musical instruments.

Björk @ MoMA - As a patron wanders about the *Songlines* exhibition, a Bluetooth audio tour module detects a user's location and autoplays a relevant narration. Additionally, some of the large musical instruments in the front lobby can be controlled via a special version of the *Biophilia* application.

Scrapple - Part visual playset and music generator, Scrapple has users manipulate the positions of objects on an array that resembles a musical score, allowing them to build a musical piece out of solid parts, which are then played back for the user.

Resonate - An array of circular objects are at the center of a ring of hanging elastic cables, making them look like futuristic harps. Visitors may "play" the cables like instruments, resulting in different audio/visual feedback that encourages people use it to communicate.

To add another level of focus to my research, I concentrated on the works that are meant to be enjoyed socially, as they are closest to matching my own goals with this project. I also looked into how audiences felt about their interactions with each of the installations.

For example, a video of users interacting with *21 Swings* demonstrates an installation that relies on its users to already know the basic functions of a swing set. Once they use the swing and get an unusual response in the form of a visual and audio feedback, they become interested enough to explore different actions in hopes of hearing and seeing different outputs. Since the full potential of *21 Swings* can only be realized with multiple users, they will have to coordinate their efforts in order to hear the payoff of all twenty-one swings moving in unison.

Conversely, *Resonate* doesn't have a set output for any combination of interactions. Instead, users are encouraged to experiment with the response that occurs whenever a cable is manipulated, and develop their own functions for the piece, be they communicative or compositional in nature.

Researching these works helped me to understand what was missing from each of them, which allowed me to focus on the development of *Better With You*. Although each of the social music interactions carries the theme of communication and cooperation, none encourage close contact or a more complex musical variety and novelty for its users. Swinging on any of the *21 Swings* will always play the same song assigned to that swing, but a user on the drum pad of *Better With You* may randomly trigger any one of the five loops mapped to it, each with its own possibilities when combined with the other instruments.

Audience

Based on preliminary user testing at the 2015 IDM Showcase, the target audience of *Better With You* has been determined to be two distinct age groups, children aged 8 to 12, and college students between 18 and 23. Though individuals outside of these demographics were observed interacting with the piece, the users within the specified age range engaged in the intended method of interaction, which involved exploring its function without spoken instruction.

Therein lies one of the bigger questions about *Better With You*: how will people know what to do with it? During discussions with my thesis advisor, Ethan Hein, we tried to find the line between immersion and instruction in order to suggest a starting point for users without outright prescribing the experience. After all, the aim for the installation is for participants to explore the piece and find out how it works on their own. The most popular idea among user testers is a simple illustrated diagram that shows users the basics of the interaction.

The second issue is that the audience I initially intended to attract, adults, is at odds with the audience that I ended up with after testing, children and students. While it's true that the experience would likely have to be tailored to the needs and desires of a younger audience, I maintain that this installation can still appeal to adults in the form of the parents of children using it, especially since children can usually induce play in their parents.

Music as a Social Facilitator

Amongst musicians and those who come from musical families, music has a heavy emotional significance. For example, music professor Steve Dillon notes that a second-generation musician who grew up playing clarinet with his now-deceased father feels closer to said father when playing the instrument. In that example, there is a strong association with not just the sound of the clarinet, but also the act of playing as well as performing certain songs that they would play together (Dillon, 72). In addition, once he began taking lessons and performing more, the act of performance and achievement became motivators to explore the medium on his own, making music its own reward.

However, even among non-musicians, music does have a heavy impact on memory, emotions and actions. In a study conducted by marketing professor Ronald Milliman, the tempo of music affects the speed at which customers move through a store, which in turn affects the daily profits of the store. Tempos in the range of seventy-three beats per minute resulted in shoppers taking 127 seconds to cross the store. Tempos above ninety-three beats per minute influenced customers to move through the same store in an average of 108 seconds, while customers not exposed to music would cross the store in 120 seconds. However, the daily profit tallies from both

experiments showed that days when slower tempos were played earned 38.2% more than days where faster tempos were played (North and Hargreaves, 607). The implication is that faster tempos encourage more movement throughout a space, resulting in less money being spent. Outside of a retail context, this effect may be extrapolated to encourage a user to better moderate time spent in a musical setting.

Musical styles also affect the level of interest arousal in exposed individuals. Upbeat, pleasant music is consistently used by marketers and organizers of volunteer organizations to draw attention to stalls or other temporary outposts where information is offered. Said music also affects people approaching such sites when the person operating them is friendly to them (North and Hargreaves, 619). Adapting this information in a gallery setting or other venue for the installation, this may mean that the generation of uptempo music can potentially draw in more users, which can then affect the mood of both those participating and those observing. Regulating the tempo by keeping it within a certain beats-per-minute range can also affect user retention, with moderate tempos keeping participants from feeling rushed to finish their experience while also maintaining the interest in the interaction.

On a cultural level, music primarily presents in one of three ways, depending on its source; presentational, participatory, or recorded (itself broken into two subcategories, but for the purposes of this thesis will refer to high-fidelity recording), with the first two referring to the ways that music is performed in a live setting. Most of the world experiences music through a presentational method, wherein one or a group of musicians performs for an audience. Because of this, the music may have a higher degree of complexity due to the fact that the musicians performing are usually professionals or at least trained (Turino, 61).

Meanwhile, participatory music, common in places like Africa and South America, or insulated communities like Appalachia, serves as more of a social activity. Musicians of all skill levels are invited to contribute to the song, whether it is a drum circle, a bluegrass jam session or a sing-along. To accommodate the varying degrees of competency, the music is generally repetitive and predictable, looping on a simple chord progression or recentering on a familiar refrain after a certain number of measures (Turino, 59).

With the advent of rock and roll and small music clubs, the line between presentational and participatory has become blurred. It is not uncommon, for instance, for rock musicians to encourage the audience to sing along with them, or to go into the crowd to lend a fan the microphone for a few lines. The introduction of sampling to popular music also bridges the gap between performance and recording by allowing pieces of recorded music to be played like notes. The perception of the disc jockey has evolved from one who broadcasts recordings to a new breed of performer, who manipulates recordings to produce new sounds. DJ culture also gave rise to electronic dance music, a genre that has become a \$6.2 billion dollar industry in and of itself (Coplan).

This project aims to marry electronic music to participatory music, creating what has been described as “the EDM drum circle.” By allowing users to participate in a musical experience with a low barrier to entry, *Better With You* further blends the distinction between DJ, musician, and audience member by making each participant one and the same.

Why Touch?

Human touch-based conduction adds the social element to music generation. If music is one of the most effective forms of nonverbal interaction between people, then haptic communication or touch feedback is definitely the other. The different social functions of touch vary, overlap, and sometimes contradict each other depending on the situation, but in the context of this piece, it is meant to induce feelings of bonding and trust between participants, as they work together to achieve a common goal.

When comparing the attitudes toward touch in modern Western cultures, in this context referring to the United States, England and other countries in Central and Western Europe, to those of regions such as the Middle East and Latin America, one must first assess whether said culture is high-context or low-context. In low-context cultures, most communication must be verbalized in order for social expectations to be fully understood. Conversely, high-context cultures expect that members understand the rules and subtleties of physical expressions, leaving less to be said out loud (Hall, 79). While both types of culture exist on a continuum, it can generally be said that Western culture relies less on haptic communication, and therefore tends to experience fewer of the benefits of touch.

In the Western world, however, one of the most visible examples of the effect of

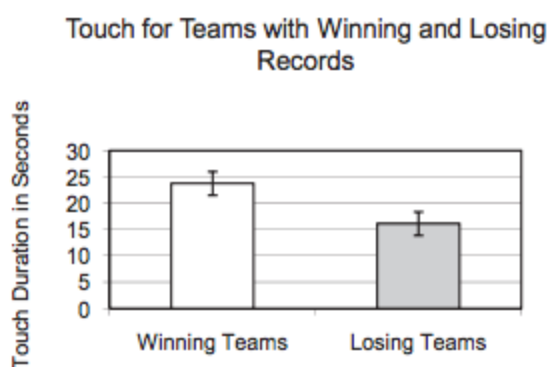


Figure 2. Source: UC Berkeley

tactile communication on cooperation and trust-building is sports, specifically, the National Basketball Association (Figure 2). For the 2008-09 season, a University of California at Berkeley team examined tapes of the performances of

all thirty-two teams in the league, and noting that

winning teams showed a higher occurrence and longer duration of celebratory touches (high-fives, butt pats, chest bumps, etc.). Even with a statistical correction for the possibility that teammates were touching because they were winning instead of the other way around, the correlation between touch and increased cooperative maneuvers (setting up screens, passing) still held up (Linden, 36).

On a physiological level, touch can activate the orbitofrontal cortex, which is linked to feelings of reward and compassion. Furthermore, touch calms cardiovascular stress and triggers the release of oxytocin, the “love hormone.” Finally, a University of Virginia study showed that when exposed to painful stimulus, in the case of this experiment, a blast of white noise, MRI results showed that the areas of the brain associated with stress and threats were not stimulated in anticipation of the noise as long as the participants’ romantic partners were stroking their arm during the test. Touch had effectively worked as an “off-switch” to stress (Keltner).

Since the overall message of *Better With You* is “Music Will Bring Us Together,” this sentiment is reinforced through an activity that builds the association of cooperation and bonding with the reward of a mood elevator.

The Importance of Play

While music and touch are abstracts that define the “what” and “how” of *Better With You*, the most important question anyone needs to answer before embarking on a project is “why?” The answer here is to encourage people to play. Play is an oft-neglected activity that can directly affect quality of life. As children, people use it as a way of exploring the world around them, gaining an understanding of how things work, and developing empathy and communication skills through role play. As we

advance in education and get older, play becomes less important, and in some cases, even neglected. However, the social benefits of play do not stop with children, as adults have been observed using it as a way to reinforce cooperative attitudes between coworkers and reignite feelings of intimacy between couples (Tartakovsky).

As stated in the literary review, most if not all academic research on play centered on the psychological motivations for it, why children tend to do it without prompting and how to define it. In 1989, Stuart Brown, a psychiatrist at the University of California at San Diego founded the National Institute for Play. Brown changed the way play is studied by focusing on the impact it has on our development as children, and why we continue to seek it as we get older. The Institute's work is partly responsible for our modern understanding of effectiveness of play as a therapeutic method, as well as its use in team building.

One of the key defining traits of play is its lack of immediate practical value. It is not required for survival, and doesn't aid in the acquisition of basic needs like food, shelter and money. It is done for its own sake voluntarily, and like music is a self-rewarding system. Ergo, one plays to enjoy it, and the motivation for the activity is the activity itself (Brown, 28 - 30). It is no accident that in English, the word used to describe how one makes music is "play."

For all of its association with fun and leisure, however, play is vital to a child's growth and development. A child at play will benefit from the freedom to act independently, understand the relationships between objects by experimenting with them, and creatively problem solve. In addition to the intellectual benefits, a child also learns how to maintain emotional equilibrium by "playing through" painful or traumatic events, gain empathy and socialisation skills by seeing through a different perspective,

and even develop his or her own self-identity. This is to say nothing of the physical benefits of active child's play, which contributes to the development of motor skills and coordination (Lester, 37). Play was such an important factor to the quality of life of English youth that after a series of studies were released by the Department of Culture, Media, and Sport, the British government started the Play England initiative, which resulted in actions ranging from funding programs to encourage children to engage in sports and outdoor games, to improving the quality of parks and public space in neighborhoods (Lester, 27).

In adulthood, the influence of play in our development manifests as engaging social displays. While in situations like public transportation or the grocery store, people tend to avoid eye contact, stay quiet, and not touch anything. However, in situations where we are expected to be social, offering a hug or handshake as a greeting or engaging in light conversation and joking is considered normal, if not encouraged. The ability to read social cues comes from those first series of introductions we made with our families, our friends and those around us when we still young and playing (Brown, 195). Humans are designed to seek novelty, and play behavior in adults - traveling somewhere new, role-playing to spice up the sex life of a long-term couple, etc. - is how they are able to find novelty without risking their relationships (Brown, 210).

Development

This project began its life as a series of large-scale musical instruments, with the interaction heavily simplified in order to allow users of any skill level to experience music-making in a social setting. The installation would consist of three "instruments" in the shape of a drum kit, keyboard, and harp. In this form, the project was titled *The Big*

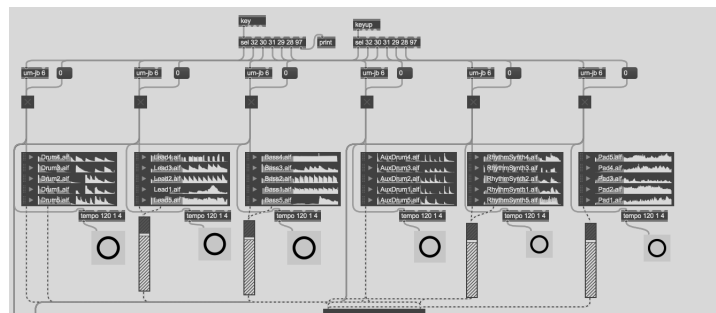
Jam. As the name implies, users could mimic the interactions with real instruments to activate the installation pieces in concert with each other. In order to demonstrate the interaction, I purchased a Makey Makey controller to build a “drum kit.” However, while experimenting with it, I noticed that a human chain could be used to bridge a circuit and trigger a key command. This property of the controller became the focus of the interaction. With human contact factored in, I could focus more on the social aspect of the installation, one that now focused on rewarding a social interaction with additional pieces of a musical composition. With the new mechanics in mind, I retitled the work *Better With You*, taken from the title of a 1998 song by the French house music band Stardust.

From a purely descriptive standpoint, *Better With You* is a music generator. This entails a combination of software that allows for a randomly-generated musical composition that follows a set of rules and some sort of triggering component that usually manifests physically as a button or switch. For this project, in place of a button that activates an action, there is a conductive touch pad that allows users to complete a circuit, resulting in a key command that triggers the start of one component of a musical sequence. Unlike most randomized music generators, this piece relies on multiple triggers, each assigned to a specific portion of a composition (drums, bass, etc), which encourages more people to participate and explore the wide range of possibilities.

The machine is powered by a human circuit, or a chain of people making physical contact in a manner that allows a current to pass through their bodies and into the conductive points of the installation. With enough source power, a single current can pass through multiple bodies to a single point. However, this piece actually splits

Over the course of my research, I've found the most reliable generative composition program to be Cycling '74's Max/MSP. Max is a visual programming language, allowing users to create objects and connecting them with virtual patch cables like one would do with analog music mixing gear. It is also powerful enough to support several voices playing simultaneously.

While effective in the first few iterations, Scratch ultimately proved insufficient for the goals of this installation, as the limited randomization capabilities of the software meant that the samples chosen to play would change after each cycle of the algorithm, resulting in inconsistent musical output. Max/MSP allowed for higher-quality samples to be used, as well as a more refined sample randomizer. In addition, the program allowed for completely random generative



composition with each activation of a trigger (Figure 3).

During the project's first incarnation, I had acquired an Arduino to serve as the microcontroller for the giant instruments, but discarded it after switching to a touch-based interaction. However, it found a new use as the board from which I could control the LED portion of the installation.

Figure 3. The Max patch.

The sample loops themselves were all created using Propellerhead's Reason digital audio workstation. In order to make sure any single loop could synchronize and harmonize with any other loop, each one runs at 120 beats-per-minute, and where applicable, in the key of C with no distinction between major and minor.

Materials

The goal of the physical build of the installation is to allow a large amount of surface area to allow maximum skin-to-pad contact and facilitate electrical conduction. In addition, the materials should lack the haptic feedback of, say, a drum, in order to encourage sustained touch instead of repeated striking as one would with a percussive instrument.

Most of the materials acquired for the construction of this project are consumer-level goods purchased from hardware stores. Each hardware element is constructed from a combination of PVC piping, industrial-strength adhesive, ceramic tile, cardboard foam, sheet aluminum, and insulated copper wire, as well as solid-core wire soldered in series to power the LED strips. The LEDs are Adafruit DotStars, a slightly more advanced version of the brand's NeoPixel LED product line, which are in turn powered by an Arduino microcontroller connected to the main computer.

The cables of each touch pad are housed in a PVC enclosure consisting of a 36-inch pipe with an variable-length coupled fitting, so that users can adjust the height of the pad by about six inches.

This prototype encloses all circuitry except for the computer in a small cardboard box, which includes outputs for a speaker array. For future iterations, for instance, versions that I am submitting to new media festivals, I am developing an enclosure meant to house the microcontrollers, computer, and speakers in a single unit, as well as refine the connections to allow faster assembly of the installation.

Iterations

Alpha

The alpha of *Better With You* was actually the prototype that was developed in my pre-thesis class, which made its debut at the IDM showcase. Consisting of three aluminum foil-wrapped foam pads taped to a modified microphone stand and connected via Makey Makey controller to a Raspberry Pi computer running a Scratch program all housed in a cardboard box, the piece functioned as a rudimentary version of the more sophisticated Max patch that runs the current build. As previously stated, I was able to run the first user test which helped me to determine who the audience would be.

This first version used twelve loops (four per pad) made using the aforementioned Reason program, which was later utilized to create new instruments when the capabilities of the new software expanded the possibilities for voltage capacity. This iteration was not capable of syncing tempos for song components or

generating completely new compositions, but did achieve the effect of allowing users to make a human circuit that made music.

Audience response to this iteration indicated that although the basic mechanics were easily understood after a short demonstration, the software needed to allow for more consistent looping, I needed more durable materials in order to maintain conductivity, and the music needed to be much louder in order for people to understand that their contribution to the composition was meaningful.

Beta

Around the time of my first user test, I moved the core software from Scratch to Max/MSP. This necessitated a move from the Raspberry Pi computer to my Macbook Air, which would serve as a stand-in for the eventual Mac Mini that would drive the interactive portion of the installation. The more powerful computer also allowed me to expand the number of reactive elements from three to five for the purposes of the test.

I was able to discuss the problem of limited split voltages with Eric Rosenbaum, creator of the Makey Makey. He offered a few different solutions, the most viable of which for my time frame was including multiple ground loops, so that additional power could be drawn from the computer. I would still have to build the extra grounds in increments that necessitated human circuit bridging to get the desired reaction, but the newer design allowed me the unexpected benefit of allowing the users to start a composition from almost any point on the installation.

I expanded the number of instruments from three to five, as well as modified the code for the loop generator to avoid consecutive instances of the same random sample selection from each list. With four possible loops from each of the five instruments, this version of the installation allowed for 1,024 possible combinations.



Figure 4. Beta user test, October 2015

This version of the installation saw the pads mounted on microphone stands. A group of about 30 students aged 9 to 12 came to the MAGNET floor on the NYU Tandon campus to help me user test this version (Figure 4). It is there that I found that high-quality loops that easily integrate with each other is preferable to

more complicated generative algorithms. The

children were happy to explore once they realized how the piece worked. Perhaps the most surprising finding was the notion that a home version of *Better With You* could exist, as the most common question asked was “when can I buy one?” Other than that, the need for visual feedback became apparent, as it wasn’t always clear to the users when their pad was active.

Gold

By the time the installation reached this stage, the interaction development was complete, and I shifted my focus to finalizing its physical form. As stated in “Materials,” I built seven separate PVC-based structures with the foam-backed conductive touch pads fixed to the top. Rather than retaining the structure previous iterations, which relied on two or more pads attached to a single stand, each pad now had its own lightweight structure allowing the piece to be rearranged as necessary for the space. The number of instruments now stands at six, each containing five different sample loops, making the number of possible combinations 7,776.

An LED strip was made part of the project gold, but is not currently part of one of the standalone touch pad structures, as one of the challenges with them is triggering certain LEDs to activate whenever a specific key is pressed. However, any interaction with the devices does activate the strip, and when no user is connected to the grounding plate, the LED strip also shuts off.

This version was the one seen at the Arts Media Maker Hack, held at Steinhardt in mid-November of 2015. It was there that Dr. John Gilbert, an associate professor of music education at NYU, suggested that the quality of the loops that had originally been a placeholder for a more randomized generative composition machine were actually sufficient, and even preferable, given the timbral limitations of using MIDI instead of real audio as output. At this point, I considered leaving the interaction elements alone and focusing on the aesthetics and visual feedback of the piece.

Conclusion

The aims of the research arm of this project were to justify the creation of this installation by detailing the benefits of the three abstract aspects central to its use; music, touch, and play. The findings presented in this thesis were synthesized through a combined analysis of existing similar projects, an extensive review of literature related to the three abstracts, and multiple user tests with different demographic groups to more effectively determine the both the target audience, and potential venues for *Better With You*.

From the comparative analysis of other musical installation projects with a social aspect, I've found that users find the most gratification from works that reward

participation in larger numbers. In addition, visual feedback is highly important, even if the main output in a given installation might be aural.

Reviewing academic research on my abstract concepts gave me insight into the different cultural attitudes toward both music and touch. For this particular project, I was drawn to the idea of participatory musical culture, a concept that is mainly Eastern and African in origin, and aimed to recreate that experience in a new media setting. Just as well, I hoped to create a localized version of a high-context cultural experience. That is to say, the meaning of touch is understood as the mechanism behind the installation. Overall, I wanted to create the presence of a sense of play, for all of the benefits it has for people of all ages.

User testing with different groups of people, mainly separated by age, revealed that there is a market for this installation in many high-traffic venue settings. Surprisingly, testing with children also showed me that there is a market for a home version of the project. Meanwhile, testing with students and music technology and education professionals led me to conclude that there was no need to complicate the programming with more complex generative composition algorithms, as short, high-quality audio loops coupled with LED feedback provided more than enough simulation for users, and the exploration of possibilities motivated them to spend more time at the installation.

Future Plans

Analysis of my combined research shows that *Better With You* is capable of existing anywhere, and should be developed for that eventuality. To that end, I am looking to develop an affordable and durable version that can be replicated and/or

licensed for any location. I am also exploring developing a peripheral for the Makey Makey invention kit and some sort of proprietary web-based application or standalone software so that young inventors can build and customize their own version.

I have already begun to enter *Better With You* into many new media art festivals and conferences, in the hope that I will refine the build and develop a system in which the design can quickly be modified to suit any layout. I also plan on further iterating the central enclosure of the piece, which will house the computer, the relevant microcontrollers, and a speaker array.

Whether *Better With You*'s place is in the home with those learning about technology or on the festival circuit, building it has been one of my more fulfilling experiences, and my greatest hope for its future is that one can live in as many venues as possible, encouraging the world to come together and play.

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