Improved Physiology and Psychosocial Well-Being for Children with Physical Disabilities Through Virtual Reality Immersion

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IMPROVED PHYSIOLOGY AND PSYCHOSOCIAL WELL-BEING FOR CHILDREN WITH PHYSICAL DISABILITIES THROUGH VIRTUAL REALITY IMMERSION

by

BETHANY FRALISH

A thesis submitted in partial fulfillment of the requirements for the Honors in the Major Program in Elementary Education in the College of Education and Human Performance and in The Burnett Honors College at the University of Central Florida Orlando, Florida

Fall Term, 2017

Thesis Chair: Dr. Megan Nickels
ABSTRACT

The purpose of this case study was to examine the physiological and psychosocial effects of an immersive virtual reality (VR) system in a female, young adult with right side paralysis following a left hemisphere brain bleed in order to determine the usefulness of immersive VR for children with physical disabilities, in particular, cerebral palsy (CP). The current study consisted of six sessions over a span of three weeks, with each session lasting approximately 45 minutes. Physiological factors (upper body mobility, heart rate variability) were assessed via a hand use questionnaire and a heart rate monitor, while psychosocial factors (e.g. positive mood) were assessed through post-session debriefing discussions with the participant. All measures were completed at each of the six VR sessions, with the exception of the hand use questionnaire, which was administered at baseline, and post-intervention. The VR programs selected were specifically chosen to engage upper body and arm movements. Descriptive analyses and coding of interviews were conducted to examine changes throughout the study sessions. The participant reported an increase in hand mobility and psychosocial well-being, such as improvement in mood, as a result of her participation in the VR sessions. The results of the current study suggest that the use of movement-specific VR programs may be beneficial to children with physical disabilities and CP, although due to the single-subject design of the study, further research is warranted.
ACKNOWLEDGMENTS

The completion of my thesis could not have been possible without the support of my outstanding thesis chair, Dr. Megan Nickels. I thank you for the countless hours you have devoted to mentoring me, and preparing me for my professional future. I am also deeply grateful for the support provided by several other UCF CEDHP faculty and staff, and my parents, through my journey as an Honors in the Major Student.
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## Conclusion And Recommendations

Presents the final conclusions and recommendations based on the research conducted.

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## APPENDIX A: HAND USE QUESTIONNAIRE

### Hand-Use Questionnaire

Provides an overview of the hand-use questionnaire used in the study.

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## APPENDIX B: SESSION TRANSCRIPTIONS

### Session 1 Transcriptions – Everest VR

Contains transcriptions from the first session focusing on Everest VR.

### Session 2 Transcriptions – Pitch-Hit: Baseball

Features transcriptions from the second session centered around Pitch-Hit: Baseball.

### Session 3 Transcriptions – Everest VR

Presents transcriptions from the third session dedicated to Everest VR.

### Session 4 Transcriptions – Pitch-Hit: Baseball

Includes transcriptions from the fourth session related to Pitch-Hit: Baseball.

### Session 5 Transcriptions – Pitch-Hit: Baseball

Contains transcriptions from the fifth session involving Pitch-Hit: Baseball.

### Session 6 Transcriptions – Everest VR

Provides transcriptions from the sixth session focused on Everest VR.

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## APPENDIX C: IRB LETTER OF APPROVAL

Details the Institutional Review Board (IRB) letter of approval for the study.

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## REFERENCES

Lists the references used in the research.

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INTRODUCTION

Cerebral Palsy (CP) specifically describes a group of permanent disorders affecting the development of movement and posture in individuals, causing limited to severe activity restriction (Chen, Lee, & Howard, 2014). CP is attributed to non-progressive disturbances that occurred in the developing fetal or infant brain (Lagunju, Okere, Adebayo, & Eni-Olorunda, 2010). Affecting 1 in every 323 children, CP is the most common motor disability in the world (Christensen et al., 2014).

To date, few studies have examined the mathematical learning of children with CP (e.g., Adams & Cook, 2014; Jenks, Lieshout, & Moor, 2012; Van Rooijen, Verhoeven, & Steenbergen, 2015). These studies have uncovered severe disparities in children’s problem-solving skills and measurement reasoning when compared to typically developing children (Jenks et al., 2012). Measurement is a special challenge for children with CP due to the traditional use of manipulatives for tactile reasoning (Adams & Cook, 2014).

Immersive virtual reality (VR) has the potential to significantly improve the mathematics education and quality of life for children with CP. VR immersion can provide a rich space in which students can synthesize and apply understanding of measurement in authentic problem-solving and exploratory situations. This study was the first phase of a multi-tiered study designed to address the development of appropriate formative assessment to address learning and instruction of mathematics, and specifically spatial measurement among children with CP.
In addition to the potential to improve mathematical learning, immersive virtual reality (VR) also has the potential to significantly improve physiological response for children with CP. Although relatively new, physical therapy studies examining the use of VR to improve motor function in children with CP have shown positive outcomes for improving upper extremity function when comparing pre-VR data with post-VR data (Chen et al., 2014; Do, Yoo, Jung, & Park, 2016). The use of VR also leads to improvement in motor function in children with CP, evidence indicates that the use of VR interventions may improve certain psychosocial health factors in adolescents and young adults (AYAs) dealing with chronic illness (Hamilton, 2016). The use of objective physiological assessments is imperative to establish the link between psychosocial and physical factors. Several studies have utilized heart rate variability (HRV) to examine autonomic nervous system function, which has been directly linked to levels of distress and anxiety in youth (Lehrer & Gevirtz, 2014; Yeh, Wren, & Golianu, 2017).

This research study provides needed information pertaining to the physiological and psychosocial health of an individual with physical disabilities. Since CP is characterized by motor disabilities the use of a participant with physical disabilities is justified because the physical disabilities and affects are comparable. The objective of this study was to identify the benefits of using VR for physiological and psychosocial measures to justify further research to investigate the use of VR to teach measurement concepts in children with CP. Specifically, this study provides data on the use of immersive VR for children with CP and other movement disorders (e.g., following stroke, injury). The primary objective of the research was to determine if immersion in a VR world can improve the quality of life of a 19 year-old participant with physical disabilities as a result of a pediatric stoke, physiologically and psychosocially. This
study investigated the question: What effects does immersive VR have on an individual with physical disability’s physiological health in regards to performance on activities of daily living and psychosocial well-being? It was hypothesized that participation in the VR sessions would 1) increase the participant’s ability to engage in activities of daily living (ADLs), and 2) increase the participant’s self-efficacy in her ability to engage in ADLs that were difficult for her to complete. In the following section I describe the literature relevant to the physiology and psychosocial well-being of individuals with cerebral palsy, and therapeutic uses of VR.
LITERATURE REVIEW

This section contains descriptions of relevant literature regarding children and young adults with CP in relation to physiological and psychosocial health, and VR therapy. I begin by describing general information about CP, transitioning to discussing treatment options next. Following treatment options, I specifically discuss VR as a treatment for CP. Finally, I summarize my overall findings.

General Information on Cerebral Palsy

This section discusses general information regarding CP. In the first portion of this section I discuss the etiology and trajectory of CP. I then discuss the various symptoms of CP including, cognitive delays or disabilities, and physiological and psychosocial health. In the last two portions, I discuss treatment options and VR as a treatment option for CP.

Etiology and Trajectory of Cerebral Palsy

CP is not a “one-size fits all” type of diagnosis, nor is the cause of CP advantageous to identifying appropriate treatment (Miller, 2005). The causes of CP are organized into three categories prenatal, perinatal, and postnatal (Mecham, 1996). Most common causes for CP occur during prenatal development and include damage to the brain, drug use, chromosomal abnormalities, and deformities interrupting normal development (Mecham, 1996; Miller, 2005). Causes during the perinatal period include hemorrhages shortly after birth, and complications during birth resulting in motor impairments (Mecham, 1996; Miller, 2005). Causes during the postnatal period include trauma whether accidental, such as vehicular accidents, falls, and other
direct injury, or non-accidental, referring to cases such as child abuse, infections, and toxicities (Mecham, 1996; Miller, 2005).

**Symptoms**

Individuals with CP experience deficiencies in motor functioning, however, may experience other symptoms. Such symptoms include those relating to cognitive delays, or disabilities, other physiological effects, and psychosocial effects.

**Cognitive delay or disability.** Cognitive function is affected by the age of the child at the time of diagnosis, length of treatment, type of treatment, and changes to the brain (Anderson & Kunin-Baston, 2008; Nickels & Cullen, 2017). Treatments and critical illnesses that deal directly with the brain or spinal cord have the highest risk for latent cognitive effects; these also tend to greatly affect and hinder academic performance, and psychosocial skills (Kirkpatrick, 2015; Nickels & Cullen, 2017). Nabors et al. (2008) note that CP is included in the definition of a critical illness as it is type of developmental illness.

CP, specifically, is caused by damage or abnormal growth to the brain before, during, or shortly after birth and is at least characterized by impaired motor functions (Jenks et al., 2012). Individuals with CP may have effects other than impaired motor functions; cognitive disability is among those possible effects, affecting approximately half of the population of individuals with CP (Benromano et al., 2017; Jenks, et al., 2012). Unfortunately, individuals with CP who do not have a cognitive disability may be perceived with the disability due to the lessened opportunities for experiences and inhibition in environment interactions (McDonald & Chance, 1964).
Individuals with CP are likely to experience other effects which cause a disability in cognitive functions whether it be an intellectual disability, or a disability in hearing, vision, and communication among others (Benromano et al., 2017; Christensen et al., 2014; Jenks et al., 2012; Lagunju et al., 2010; McDonald & Chance, 1964).

**Physiological health.** Individuals with critical illness face several physiological challenges, pains, and discomforts through the duration of their illness. The hallmark of CP is impaired motor functions, stemming from a lack of muscle control (Mecham, 1996). The Cerebral Palsy Alliance (2016) classifies the five levels of CP through the Gross Motor Function Classification System (GMFCS). The levels and characterizations are: (1) the person has the ability to move around (e.g. walk) but has difficulties in balance, coordination, and speed (2) the person has the ability to walk but may require assistance (especially after distance or uneven ground) but has difficulties in balance, coordination, and speed (3) the person can walk with the assistance of a walker or other stabilizing mobility device, or may use a self-propelled wheelchair (4) the person requires a mobility device that is either motorized or controlled by another person (5) the person requires a mobility device similar to a wheelchair controlled by another person; has difficulty with antigravity movements (e.g. holding the head up; Cerebral Palsy Alliance, 2016). Individuals with CP may experience a myriad of other physiological effects including but not limited to communication difficulties, vision impairments, hearing impairments, and sensations of pain (Benromano, et al., 2017; Christensen et al., 2014; Jenks et al., 2012; Lagunju et al., 2010). Unfortunately, because of these impairments, the ability to participate in the activities of daily living may be compromised (e.g. playing sports, using the restroom independently, walking, writing; Lagunju et al., 2010).
Psychosocial well-being. Psychosocial well-being can be referred to as quality of life as defined by Majnemer, Shevell, Rosenbaum, and Poulin (2017). An individual’s health may directly affect his/her psychosocial learning capabilities, motivation to learn, and meaningful engagement in the learning process (Nickels & Cullen, 2017; Novello, Degraw, & Kleinman, 1992; Woodward-Lopez, Ikeda, & Crawford, 2000). Additionally, individuals with CP may experience psychosocial effects due to motor and other impairments. Majnemer et al. (2017) studied the quality of life for children with CP by using the Child Health Questionnaire and the Pediatric Quality of Life Inventory and found that approximately half of the children reported a quality of life similar to that of a healthy and typically developing child, specifically showing lower reports in regards to physical well-being and higher reports on psychosocial well-being. In regards to reports on psychosocial well-being, lower scores correlate with behavior issues, poor social skills, high parental stress, motivation, and persistence (Majnemer et al., 2017).

Furthermore, Dickinson, Parkinson, Ravens-Sieberer (2007) also studied the quality of life of children with CP and found several areas or “domains” leading to reports of lower quality of life in individuals with CP. Such deficiencies in motor control and movement, cause individuals with CP to have difficulty completing activities of daily living (ADLs), which may lead to feelings of depression and helplessness and prevent individuals from fully participating in educational activities (Dickinson et al., 2007; Lagunju et al., 2010).

Treatment Options

Virtual Reality as a Viable Option for Treatment. VR is a computer-based simulation of real world environments, experiences, and activities used in a variety of contexts such as for recreation, education, therapy, and professional careers (Bates-Brkljac, 2012). VR has been used
for several types of therapy including for pain management, and for physical therapy and rehabilitation. For pain management, virtual reality tends to be used for its ability to provide distraction. In physical therapy and rehabilitation, virtual reality can be used to provide individualized and targeted interventions, and utilize simulations for exercises.

**Virtual Reality as a Treatment for Critical Illness.** VR, as a newly emerging tool for therapy, yields minimal results of studies about the use of VR as a treatment for critical illness. However, a study in regards to stroke rehabilitation was found. Studies relating to the use of VR as a treatment for CP are discussed in a subsequent section.

Saposnik and Levin (2011), analyzed 12 studies, and 5 randomized control trials, regarding the use of VR as treatment for arm motor recovery in stroke patients. Of the studies and trials, a larger percentage used non-immersive VR systems (e.g. Nintendo Wii, Cyberglobe, VR Motion) verses immersive VR systems (e.g. IREX, Playstation, EyeMotion; Saposnik & Levin, 2011). The results of the analysis show benefits to using VR for motor function treatments, specifically a higher change of motor strength improvement when patients were randomized to use the VR systems (Saposnik & Levin, 2011).

**Virtual Reality and Physiological Outcomes.** Research shows that immersive VR can be used as a way to decrease the amount of pain experienced in hospital and other medical situations (Das, Grimmer, Sparnon, McRae, & Thomas, 2005; Gold, Kim, Kant, Joseph, & Rizzo, 2006; Hamilton, 2016; Hoffman, Patterson, Carrougher, & Sharar, 2001; Schultheis & Rizzo, 2001; Sharar, Miller, Teeley, Soltani, Hoffman, Jensen, & Patterson, 2009). In one study, pediatric patients at C.S. Mott’s Children’s Hospital in Michigan were able to use Tilt Brush, a program for the HTC Vive VR system, and as a result reported experiencing lower levels of pain.
(Hamilton, 2016). Initially, the VR was introduced to pediatric patients experiencing periods of isolation to provide a few minutes of distraction. Later, its use expanded to help relieve pain experienced by the pediatric patients.

Sharar, et al. (2009) reviewed several pieces of literature describing the use of VR to provide pain relief (e.g. during cancer treatments, dental procedures, and prostate ablations, burn care). Pain relief is achieved through immersive VR because it serves as a distraction, therefore reducing the pain experienced (Hoffman et al., 2001; Sharar et al., 2009). Das et al. (2005) studied VR immersion to relieve pain during burn treatments for children. The study found that with analgesic alone the children reported an average of 4.1 level pain out of a scale of 10, and when VR immersion was provided along with the analgesic, the reported average pain level was 1.3 (Das et al., 2005). Furthermore, often patients, especially children, are reluctant to participate in physical therapy activities as a result of anticipated pain and discomfort however, it is critical that patients participate in order to reduce long-term disability (Hoffman et al., 2001; Sharar et al., 2009). In order to increase patient willingness to participate in physical therapy the authors suggest VR immersion can serve as a distractor to increase positive moods (Sharar et al., 2009).

Gold et al. (2006) noted that over half of children who experience an IV placement report mild to severe pain. In order to reduce pain, immersive VR was used during IV placement. This study specifically notes that VR immersion results in less reported pain because of its immersive nature where the patient’s attention can truly remain in the virtual environment (Gold et al., 2006). This study analyzed the pain levels of 20 outpatient children, ages 8-12, at the Childrens Hospital Los Angeles Department of Radiology, receiving an IV for and MRI/ CT scan. The
children who opted to use the VR were given 5 minutes before and after the IV placement for interaction time. The results of the study show that using immersive VR lessens the amount of pain experienced, as reported by the children, nurses, and parents (Gold et al., 2006).

Kuhlen and Dohle (1995) compiled several pieces of evidence of how VR can benefit physically disabled people, through therapy and rehabilitation, as well as physician use of VR. VR can be used to treat those with disabilities because specific tasks can be created to target the disability. Coupled with the ability to provide targeted treatments the VR has the capability to provide immediate feedback on performance (Kuhlen & Dohle, 1995; Schultheis & Rizzo, 2001). The immediate feedback is imperative to maintain progress because it allows for assessment on the user’s needs and continual individualization (Schultheis & Rizzo, 2001). Additionally, VR allows the disabled to perform tasks of non-disabled because of its ability to utilize the motor functions that are not disabled (Kuhlen & Dohle, 1995). For example, the authors report that at Edinburgh University, a system was developed that provides children with cerebral palsy the opportunity to use muscle signals to control the virtual environment (Kuhlen & Dohle, 1995).

**Virtual Reality and Psychosocial Outcomes.**

At Panamerican University in Mexico City, Jose Luis Mosso Vasquez, a researcher and surgeon found that the use of virtual reality during surgery served as an effective form of distraction to relieve anxiety towards a surgical procedure (AACN Bold Voices, 2017). Vasquez, reported that an elderly woman, anxious towards her upcoming surgery agreed to use immersive VR in place of sedation. The woman reported that she barely felt the surgery. In addition, her
blood pressure decreased during the surgery. Overall, Vasquez reports a 24% decrease in anxiety among patients using the immersive VR (AACN Bold Voices, 2017).

Wout, Spofford, Unger, Sevin, and Shea (2017) found that VR immersion can be used in both the diagnosis and treatment of PTSD in Veterans. Six combat, and non-combat scenes were used with increasing intensity. The researchers found that the VR was effective in the diagnosis of PTSD as the Veterans with PTSD had more intense skin conductance reactivity to the combat scenes (Wout et al., 2017). However, as the scenes were repeated, the skin conductance reactivity decreased overtime showing the VR’s effectiveness for treatment of PTSD (Wout et al., 2017).

**Virtual Reality and Treatment of Cerebral Palsy**

Of the children with CP, about half specifically have impaired use of the upper extremities (e.g., grabbing, reaching, using objects) (Chen et al., 2014). Chen, et al. (2014) conducted a meta-analysis and reported on 14 articles regarding children with CP with impaired upper extremity use, and the use of VR. Of the reported articles, all showed at least one positive effect of using VR for physical therapy treatment (Chen et al., 2014). They concluded that VR can be used in therapy to help children with CP improve upper extremity function through participating in an virtual exercise environment. The environment then can provide immediate performance feedback, allowing for the child’s awareness of performance and opportunity to compare performance in the virtual setting to performance in the real world that supports progress (Chen et al., 2014).

Do et al. (2016) studied three children with hemipelagic cerebral palsy to find whether the use of virtual reality for bilateral training therapy would improve bilateral coordination as
well as the therapy’s effects over the course of twelve intervention sessions. During the intervention sessions, the children were engaged in various games for the Nintendo Wii that utilized upper limb movements such as rowing, golf, and cycling for thirty minutes. The Wolf Motor Function Test was used to track the childrens’ progress throughout the sessions and an activity of shooting a basketball into a moving hoop was used to assess bilateral coordination. The results were positive, and showed improvements in both the mobility of the affected upper limb and bilateral coordination (Do et al, 2016). The researchers concluded that since the intervention resulted in the improvement of upper limb mobility, that the children will experience improved usage of the affected limb during activities of daily living (Do et al., 2016).

Ravi, Kumar, and Singhi (2017) conducted a systematic review of 31 articles on the topic of the effectiveness of using VR as a tool to improve motor function of children and adolescents with CP. Ravi et al. (2017) found that despite being a relatively new topic for research, there is evidence to support the potential use of VR in clinical settings to improve motor function, specifically motor function related to balance and motor skills such as hand use. The framework from the International Classification of Functioning, Disability and Health was utilized to categorize the functional outcomes. The VR systems commonly used across the articles to target balance were the Nintendo Wii, and the Xbox Kinect, both of which are non-immersive forms of VR (Ravi et al., 2017). In regards to improved motor skills, some of the reviewed studies showed that “virtual reality therapy has maximized the function of hand in children during activities of daily living” (Ravi et al., 2017, 256).

**Summary of Overall Findings**

Overall, the use of VR is relatively new, especially in the areas of therapy, pain
management, and distraction. Research shows that the use of VR is effective in those areas. For therapy, VR can be used to specifically target a specific area of need, and has the potential to provide immediate feedback. In regards to pain management VR has proven successful at distracting patients from the procedure or surgery, even allowing for a decreased use of sedatives in some cases. For CP specifically, VR has been used for therapy and has resulted in improvements in motor function and skills.
METHODOLOGY

This study utilized both quantitative and qualitative analysis of six interviews with a young adult during which the VR intervention was implemented as well as interviews regarding psychosocial factors.

**Participant Characteristics**

As a result of undiagnosed childhood illness, Mandy had surgery to place a deep brain stimulator when she was twelve years old (Dixon, 2013). When trying to wake Mandy during recovery following the surgery, medical staff noticed that her left pupil was blown—indicative of traumatic brain injury. A second surgery took place immediately to stop a brain bleed on the left hemisphere of her brain, and it was confirmed Mandy had suffered an acute subdural hematoma (Dixon, 2013). She was placed in a deep coma following the second surgery. An MRI taken during the coma showed brain damage to the left frontal area resulting in CP-like motor disabilities affecting the right side of her body (Dixon, 2013).

The following measures and procedures were approved by the University of Central Florida Institutional Review Board, and informed consent was obtained from the participant prior to any of the testing measure.

**Session Description**

During the first session, the first 5 minutes of the 45-minute session was spent acquainting Mandy to the hardware of the VR. Once Mandy was ready to begin, she explored the program, Everest VR. In Everest VR the user selects a peak to climb with a team. Mandy was
very excited to get started. After 10 minutes of VR engagement Mandy asked to sit down and she remained seated for the remainder of the session. During the session Mandy was primarily engaged in vertical arm movements. Her non-affected arm movements were more extensive, however, as the session progressed and Mandy became more engaged her affected arm movements increased. On Mandy’s exploration of one of the peaks she discovered a camp site where she found a bowl of fruit and threw an apple. Thus her arm movements resembled that of an over-hand baseball throw. Afterwards Mandy reported, *I felt like the hand was open. I could grab and throw the apples away like I could pick up some stuff.*

Mandy was engaged in Everest VR during the third and sixth sessions. During the third session Mandy displayed understanding of expectations for the program and session. Mandy began the session sitting down and remained seated for the entire session. Mandy’s arm movements were once again primarily vertical. In the Everest VR program, the user is equipped with a technical ice axe during climbing as well as a rope. The higher Mandy could extend her arm, the more efficiently she could climb the mountain. The positive feedback between her movements and the program resulted in increasing her arm movements distance. Even though her affected arm distance movements increased, it did not reach the breadth of her non-affected arm movements. The sixth session was the last session that Mandy was engaged in Everest VR. During that session Mandy displayed comparable arm movements.

The second VR program Mandy was engaged in was Pitch-Hit: Baseball where a baseball field was simulated and activities relating to baseball were provided. During all three sessions (second, fourth, and fifth) Mandy remained standing during the session, aside from sparse 5-minute breaks. In the Pitch-Hit: Baseball program Mandy’s arm movements were mostly
horizontal as she generally selected the games where she was the batter. When batting, Mandy would hold one handset with both hands resembling real-world use of a baseball bat. During the second session Mandy explained that her affected arm and hand would be bothersome at times. To remedy, Mandy would switch the control from her affected hand to her non-affected hand. After switching hands Mandy continued to grasp the handset with both hands and continued similar horizontal movements where she would extend her arms towards her back and swing them around to the front of her body.

**Measures**

**Heart Rate Variability**

R-R intervals were recorded during the VR sessions, using Bluetooth-enabled heart rate monitors (H7, Polar, Kempele, Finland). The heart rate monitor was placed on the participant’s chest and held in place using a chest strap and the R-R intervals were transmitted via Bluetooth to a mobile device (iPad Pro, Apple, Cupertino, CA) equipped with a heart rate variability application (Elite HRV). Raw R-R interval files exported from the heart rate variability application were analyzed via specialized software (Kubios HRV 2.2, MATLAB, The MathWorks Inc., Kuopio Finland). Using the R-R interval data, indices of autonomic nervous system activity were calculated using specialized software, with a lower score indicating poorer activity and higher levels of physiological distress. Heart rate variability was defined as the root mean square of differences (RMSSD) between adjacent normal R-R intervals, which was reported in milliseconds (ms).

**Hand Use Questionnaire**
The Hand Use Questionnaire (Sköld, Hermansson, Krumlinde-Sundholm, & Eliasson, 2011) was administered to the participant in order to determine her ability to undertake ADLs, such as eating yogurt, zipping a jacket, putting on socks, tying shoe laces, buttoning pants, and buttering bread, that require use of her hands. The questionnaire tracks the amount of activities performed with one, both, or neither (signifying that the activity required assistance) hand(s), the time efficiency of completing the task compared to peers, and if the hand is bothersome. This questionnaire has been used in previous studies and in one particular study by Cohen-Holzer, Sorek, Kerem, and Katz-Leurer (2017) the Hand Use Questionnaire was used as both the baseline and outcome measure and states that the questionnaire “shows evidence of validity, content validity, high reliability by internal structure, and test-retest reliability” (Cohen-Holzer, Sorek, Kerem, & Katz-Leurer, 2017, 356).

Debriefing Session

At the end of each session, Mandy was asked a series of questions related to her experiences in the VR program. The purpose of the debriefing sessions were to facilitate discussions between the research assistant and Mandy regarding her interaction with the VR sessions, and any physical or psychosocial effects she may have experienced during each session. All debriefing sessions were recorded, and the research assistant took meticulous notes during the conversations. The debriefing sessions were approximately ten minutes each. During the sessions, the research assistant would ask questions such as, Did you feel any psychosocial benefits, so that’s emotions, well-being, less anxiety or a better mood?; When you were first doing it [Pitch-Hit: Baseball] did you feel any stress or anxiety with it being a new game?; How
do you feel over all about this program and think about your arm movements especially your right arm?

**Virtual Reality Intervention**

The VR programs utilized in this study are describe in Table 1.

Table 1

*Description of VR programs Everest VR and Pitch-Hit: Baseball*

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
<th>Movement</th>
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<tr>
<td>Everest VR</td>
<td>The environment is modeled after Mount Everest. Users are tasked with aiding their group to successfully climb the mountain. Other climbers will speak to the user, providing tips and facts about climbing. Snow storms, loss of equipment, and other real-world scenarios are experienced.</td>
<td>The primary movements required in this program mimic the movements of climbing a mountain (reaching upwards and pulling down).</td>
</tr>
<tr>
<td>Pitch-Hit: Baseball</td>
<td>This program includes two scenes, one of a locker room and one of a baseball field. The levels are displayed in the locker room where the program begins. Each level provides a different task (e.g. hitting the ball, catching the ball, hitting the ball through hoops). All tasks are completed in the baseball field.</td>
<td>The primary movement used in this program mimics the movements of swinging a baseball bat (backward to forward). Other movements include throwing a ball in an overhand motion, as well as catching the ball.</td>
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**Statistical Analysis**

Due to the single-design nature of this study, descriptive statistics and qualitative methods were primarily used to analyze the data; however, Rasch analysis is utilized to determine improvements in hand use specific to the Hand Use questionnaire.
RESULTS AND ANALYSIS

Heart Rate Variability

Averaged weekly values for HRV are illustrated in Figure 1. There was a gradual increase in HRV from baseline (68.5 ms) to weeks 3 and 4 (77 ms). Time periods where there were complications with the heart rate monitor (e.g. strap became loose) and periods where Mandy was not engaging in the VR program were recorded and deleted from the HRV files.

![Heart Variability graph](image)

Figure 1: Heart rate variability over the intervention period

Hand Use Questionnaire

The changing relationship in hand use for ADLs can be observed in Fig. 2. The most notable outcomes of this data are the change in activities performed with both hands and Mandy’s perception of how well her hand works. All measures of hand use improved for Mandy with the exception of perception of discomfort or pain (i.e., Does your hand function bother you...
in this activity/situation?). We attribute this decline to Mandy’s increased use of her affected hand of ADLs.

Post-VR assessment following 6 VR sessions
Debriefing Sessions

The VR sessions also yielded positive results for emotional health outcomes, including mood/affect, motivation, psychological well-being, and depressive symptoms before academic work and examinations. Mandy frequently described a positive change in mood during and following use of the VR. For example, following her first VR session, Mandy described the change in her mood:

Yeah like when I went here [arrived at research site] I had like, like my personality was down, like I just had a lot of work. I didn’t know if that [VR] would like make me better
or whatever but when I got in there it was like really made me happy to keep on like and it didn’t make me feel like down about myself a little bit. Do you know what I mean?

In a subsequent session, Mandy described her motivation to attend the session:

*It [VR] made me want to come to the virtual reality, like very much. I didn’t really want to get up but, I had to get up. It has really helped me not be tired.*

Over multiple sessions Mandy described positive emotional feedback:

*It [VR] helps when I, like this helps me stop from feeling sick.*

*I feel that I am less handicapped. . . you don’t think of “oh my hand is paralyzed. Hey, I am handicapped. I can’t do it.” I don’t think about that in that VR game. . . I think of I can do it.*

In the last session, Mandy reported on her anxiety:

*I have anxiety, I can’t, I think too much about things and those disappear and it gives me, it [VR] just makes me happy.*

Additionally, Mandy identified that she does not experience anxiety about using VR:

*I like trying new things I’m not like scared about it [VR].*
DISCUSSION

The purpose of this case study was to examine the effects of a VR session on motor function and psychosocial factors such as self-efficacy in order to improve ADLs in a participant with physical disabilities. Although this study was over a short duration, there appeared to be a substantial increase in the participant’s assessment of her hand use in ADLs. This finding is further supported by her discussions with the research assistant during the debriefing sessions. This finding correlates with the findings of Chen et al. (2014) in which the authors performed a meta-analysis on 14 studies regarding the use of VR for physical therapy and found that each study reported at least one positive outcome pertaining to improving upper extremity functions. The current study, however, extends these findings beyond physical improvements and demonstrates that movement-focused VR sessions may offer psychosocial benefits as well. Additionally, although small in magnitude, an overall increase in HRV was observed during the VR sessions, perhaps lending physiological support to Mandy’s reported feelings of lowered stress and anxiety during the sessions.

The current study contains a number of strengths that should be noted. First, this study was novel in its approach to improve ADLs through VR sessions that aim to increase motor function and psychosocial factors in a participant with stroke-induced physical disabilities which may translate to individuals with CP. Secondly, the proposed study used a combination of objective and subjective assessments to better determine the effects of the intervention on the participant’s physical and psychosocial health. Additionally, the mixed-methods approach to data collection may provide a more detailed interpretation of the participants’ experience during the
VR sessions. However, several limitations of this study should be noted as well. Obviously, the single-subject design of the intervention limits the generalizability of the results. Additionally, the relatively short duration of the study may have limited the generalizability of the results. Additionally, the relatively short duration of the study may have limited the degree of improvement in motor function and psychosocial factors. Future studies should examine the effects of VR in larger samples in order to determine whether both the physical and psychosocial benefits extend toward children with CP. Additionally, continued observation of the effects of VR in eliciting physical and psychosocial improvements is warranted in order to determine whether there is ongoing benefits through the continued use of movement-focused VR training. Such information will enable investigators to better determine the extent of the potential for VR sessions to improve both physical and psychosocial factors, which may lead to overall increases in ADLs.

Conclusion And Recommendations

VR has the potential to improve physiological health, ADLs, and psychosocial well-being of children with CP. This case study demonstrated participant-reported psychosocial and physical health benefits as the result of six immersive movement-focused VR sessions. Although generalizability is limited, the current study has several implications in that VR training may have the potential to improve both physical and psychosocial well-being, which may translate to overall improvement in ADLs among children with CP and other movement-related impairments. Such findings may be critical, as prior studies have shown a link between poorer psychosocial well-being (depression, anxiety) and inability to complete common ADLs,
thus limiting independence and self-sufficiency in children with CP.
APPENDIX A: HAND USE QUESTIONNAIRE
Hand-Use Questionnaire

1) Cut meat (or other hard food to cut up) on a plate.
Do you usually use one hand, both hands together or get help?
   a) One hand  
   b) Both hands  
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

2) Pick money out of a purse or wallet.
Do you usually use one hand, both hands together or get help?
   a) One hand  
   b) Both hands  
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

3) Tie shoelaces.
Do you usually use one hand, both hands together or get help?
   a) One hand  
   b) Both hands  
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot   2  3  4 – It does not bother me at all

4) Screw off the cap of a small, unopened soft drink bottle.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad   2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer   2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot   2  3  4 – It does not bother me at all

5) Open a plastic box with a lid (for example an ice-cream box).
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad   2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer   2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot   2  3  4 – It does not bother me at all

6) Remove the wrapping from a piece of candy.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad   2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer   2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot   2  3  4 – It does not bother me at all
7) Remove the wrapping from an ice-cream.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

8) Pull up the zipper of a jacket.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

9) Put on socks.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

10) Remove a straw from the front of a juice box and insert it. (Refers to the whole process, including taking off the wrapping of the straw).
Do you usually use one hand, both hands together or get help?
a) One hand  
b) Both hands  
c) Get help

How do you think your hand works?  
1 – Bad  2 3 4 – Good

How much time do you need to do the whole task, compared to peers?  
1 – Considerably longer  2 3 4 – Equally Long

Does your hand function bother you in this activity/situation?  
1 – It bothers me a lot  2 3 4 – It does not bother me at all

11) Carry a tray (for example in the canteen).
Do you usually use one hand, both hands together or get help?  
   a) One hand  
   b) Both hands  
   c) Get help

How do you think your hand works?  
1 – Bad  2 3 4 – Good

How much time do you need to do the whole task, compared to peers?  
1 – Considerably longer  2 3 4 – Equally Long

Does your hand function bother you in this activity/situation?  
1 – It bothers me a lot  2 3 4 – It does not bother me at all

12) Take off the protective plastic backing of a Elastoplast.
Do you usually use one hand, both hands together or get help?  
   a) One hand  
   b) Both hands  
   c) Get help

How do you think your hand works?  
1 – Bad  2 3 4 – Good

How much time do you need to do the whole task, compared to peers?  
1 – Considerably longer  2 3 4 – Equally Long

Does your hand function bother you in this activity/situation?  
1 – It bothers me a lot  2 3 4 – It does not bother me at all

13) Cut on a chopping board (for example fruit, vegetables, bread).
Do you usually use one hand, both hands together or get help?  
   a) One hand  
   b) Both hands  
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good

How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long

Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

14) Eat out of a small container of yoghurt.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help

How do you think your hand works?
   1 – Bad  2  3  4 – Good

How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long

Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

15) Pull up track suit trousers.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help

How do you think your hand works?
   1 – Bad  2  3  4 – Good

How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long

Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

16) Cut up a pancake (or other food easy to cut up) on the plate.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help

How do you think your hand works?
   1 – Bad  2  3  4 – Good

How much time do you need to do the whole task, compared to peers?
17) Cut out a picture using scissors.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad   2   3   4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer   2   3   4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot   2   3   4 – It does not bother me at all

18) Open up a box of milk or juice.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad   2   3   4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer   2   3   4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot   2   3   4 – It does not bother me at all

19) Open the zipper on a small bag (e.g. pencil case or purse).
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad   2   3   4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer   2   3   4 – Equally Long
Does your hand function bother you in this activity/ situation?
1 – It bothers me a lot  2  3  4 – It does not bother me at all

20) Button up the trousers.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad   2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer   2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot   2  3  4 – It does not bother me at all

21) Open a small box (for example a box of mints).
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad   2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer   2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot   2  3  4 – It does not bother me at all

22) Handle playing-cards (refers to the whole process; holding, selecting and placing cards in the hand while playing).
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad   2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer   2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot   2  3  4 – It does not bother me at all
23) Spread out glue on paper using a glue stick.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

24) Peel an orange.
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

25) Open a bag (for example a bag of crisps).
Do you usually use one hand, both hands together or get help?
   a) One hand
   b) Both hands
   c) Get help
How do you think your hand works?
   1 – Bad  2  3  4 – Good
How much time do you need to do the whole task, compared to peers?
   1 – Considerably longer  2  3  4 – Equally Long
Does your hand function bother you in this activity/ situation?
   1 – It bothers me a lot  2  3  4 – It does not bother me at all

26) Put toothpaste on a toothbrush.
Do you usually use one hand, both hands together or get help?
   a) One hand
b) Both hands  
c) Get help  
How do you think your hand works?  
   1 – Bad  2  3  4 – Good  
How much time do you need to do the whole task, compared to peers?  
   1 – Considerably longer  2  3  4 – Equally Long  
Does your hand function bother you in this activity/ situation?  
   1 – It bothers me a lot  2  3  4 – It does not bother me at all  

27) Butter a slice of soft bread.  
Do you usually use one hand, both hands together or get help?  
   a) One hand  
   b) Both hands  
   c) Get help  
How do you think your hand works?  
   1 – Bad  2  3  4 – Good  
How much time do you need to do the whole task, compared to peers?  
   1 – Considerably longer  2  3  4 – Equally Long  
Does your hand function bother you in this activity/ situation?  
   1 – It bothers me a lot  2  3  4 – It does not bother me at all  

Sköld, et al., 2011
APPENDIX B: SESSION TRANSCRIPTIONS
Mandy: Whoa!
Bethany: How’s it feel? too loose? Too tight?
Mandy: It’s good.
Bethany: Okay, can you see anything that it says? You got it?
Mandy: Yeah I saw it I clicked on something.
Bethany: You’re like “I did this before I know now.”
Kayla: Oh my gosh it’s so cool!
Mandy: That’s so weird.
Bethany: Does anything need to be adjusted?
Mandy: That’s amazing!
Kayla: Is this what she’s seeing?
Bethany: Yeah, so we can see what she sees. And then uhm… She kind of just moves it around and plays with it. The first time I did this, actually I’ve never done it, last time was both of ours.
Mandy: It was really crazy though.
Bethany: Yeah.
Mandy: Because you are really high up! I don’t know how people are not scared of this!
Bethany: Yeah because it looks like you’re actually. . .
Mandy: You’re you’re if you fall, you’re falling. You know what would be cool?
Bethany: What?
Mandy: Trying a skiing VR.
Bethany: Okay.
Mandy: That would be really cool. I did that for real life at uhm.. in Colorado for the adaptive skiing and I learned how to ski and it was really just incredible. I think the kids would like it too.
Bethany: Mhm. Do you remember how you got to the point where..?
Mandy: Oops I went on…
Bethany: If you can get on that ‘X’, like move your head up. Do you see where there’s the ‘X’ in
the corner? Nope, nope, nope. Do you see those words?

Mandy: Yeah.
Bethany: There’s an X in the top right.
Mandy: Oh, sorry I couldn’t see it.
Bethany: That’s okay! She got to this one point where she was literally climbing up the side of the mountain, remember that?
Mandy: That was crazy!
Kayla: Oh my gosh!
Bethany: I’m going to go ahead and put the earbuds in.
Mandy: Okay.
Bethany: I have to figure out what side they go on. Let’s see if I can do better this time.
Mandy: I think you need to get different earbuds that go on the side.
Bethany: Oh yeah, that hook up and around?
Mandy: I think the kids would work, you know it’s just harder.
Bethany: I don’t even hardly wear earbuds on myself.
Mandy: Oh my gosh!
Bethany: It’s a camp, there are different places you can go. Remember when it’s red that means you can’t jump there.
Mandy: Yeah. They look like aliens.
Kayla: That’s true they do.
Bethany: Are they walking towards you or away from you?
Mandy: Yes.
Bethany: That’s probably why you can’t go that way. You need to go the other direction. That would be my guess.
Mandy: Yeah.
Bethany: Maybe you’re the leader.
Mandy: Oh, I’m the leader? Oh that’s scary!
Bethany: Oh oh! You can put the flag there I think.
Mandy: Oh!
Bethany: You see that black flag?
Mandy: Yeah.
Bethany: And then..
Mandy: Oh.. whoa how do you… oh…
Bethany: Oh now you’re behind him.. I wonder If it saved your spot from last time?
Mandy: Yeah.
Bethany: And that’s why you’re starting off where you are? I’m not sure.
Mandy: I don’t know.
Bethany: Because this looks different.
Mandy: I clicked Everest Summit.
Bethany: Okay. . . I wonder if another button is what sets it down? I don’t know.. I think it wants you to put it where the blue flag is.
Mandy: Maybe?
Bethany: But I don’t know how you would leave it there, you know what I mean?
Mandy: Yeah.
Bethany: Like how you actually set it there.
Kayla: I feel like you’re closer to it now.
Mandy: Yeah, nope. What is like the mission?
Bethany: That’s what I’m wondering, if the mission is getting that flag to that spot. Because I don’t know what else. . . Because you’re holding it, it’s like in one of your controllers. Are you clicking the button under it or on the top?
Mandy: Both.
Bethany: Both, Okay I was just wondering, I don’t know.
Mandy: Hmm. . Maybe I could try a different one?
Bethany: Yeah, uhm, whatever button you pressed that you kept having to click the ‘X’ on, yeah that one, you can go to the lobby and then you might be able to pick.
Mandy: Could I sit down?
Bethany: Yeah I’ll pull a chair up.
Mandy: Okay thank you.
Bethany: Alright it’s right behind you.
Mandy: Thank you.
Bethany: No problem.
Mandy: Whoa!
Bethany, Kayla, Mandy: Whoa!
Mandy: I’m kind of lost now.
Bethany: I’m going to scoot you back a little bit of that’s okay?
Mandy: Yes.
Bethany: Because I don’t know if that’s what’s whacking it out, it does seem a little weirded out.
Mandy: I hope I didn’t break it.
Bethany: You didn’t break it. Can you see the words?
Mandy: Yes. It’s blurry.
Bethany: It looks a little weird on the computer.
Mandy: Whoa, now it’s all blurry.
Bethany: On the computer it says that the base stations lost their optical sync. Which I don’t know why.
Mandy: Oh.
Bethany: I think it’s their communication.
Mandy: Yeah it’s not working. Yeah I don’t, I can’t change. It’s a little blurry.
Bethany: Yeah I’m going to close it.
Mandy: Oh.
Bethany: And open it.
Mandy: Okay.
Bethany: Because it looked like it was flashing from over here.
Mandy: Okay.
Bethany: So there’s something.
Mandy: Ooops.
Bethany: Oh I’m sorry. This just got a little tangled.
Mandy: Ooo it’s snowing.
Bethany: There you go.
Mandy: That’s so weird we’re in Florida, it’s like Christmas time.
Bethany: Okay, maybe that helped it. I don’t know what was going on.
Mandy: Yeah no no it’s okay!
Bethany: Alright so just press any of the buttons that you have. Okay?
Kayla: Ugh technology, right? It does a something and I’m just like what?
Bethany: You’re good.
Mandy: Oh I messed up how do I get back?
Bethany: You’re really close to the table, just letting you know.
Mandy: Okay.
Bethany: It’s okay if you get closer to it.
Mandy: How do you go? It’s very blurry.
Bethany: Was it not blurry earlier, like the first time?
Mandy: Yeah.. now it’s really blurry.
Bethany: Yeah I can see that it’s not as clear on my screen either. I’ll scoot you up a little bit if that’s okay. You’re on the footprints, I don’t know why it doesn’t work. . .Well now I just moved you away from the footprints. . . That’s just me it’s okay.
Mandy: Ooo! Oh, okay.
Bethany: What?
Mandy: Oh my gosh. That’s scary, get out of the way… Oh hi, talk to me!
Bethany: On my screen it says it’s loading. Is the head thing okay?
Mandy: Yes It’s a little blurry.
Bethany: Is it too loose or too tight?
Mandy: No.
Bethany: No, okay.
Mandy: Oh my gosh… Oh yes! Whoa! I did this before.
Bethany: Mhmm.
Mandy: This is so cool!
Kayla: Oh my gosh you’re throwing food.
Mandy: Hey, hi, you!
Kayla: That is hilarious!
Mandy: Come back!
Kayla: I love this!
Mandy: Can you put in the ear piece? I don’t know what he’s saying but he’s not very happy. He’s not like talking nicely.
Kayla: Oh my gosh!
Bethany: It’s 2:52, just to let you know.
Mandy: Oh okay.
Bethany: If you wanted to stop or continue for a few more minutes that’s up to you.
Mandy: Uhm. . . We can just stop.
Bethany: Okay.
Mandy: That was fun!
Bethany: So we will just debrief in a second like we did last time.
Mandy: Yeah.
Bethany: Just to go over a couple of things. And then obviously we’ll take that off. So I’ll go ahead and uhm well let’s let it keep reading so we’ll do that last.
Mandy: Okay.
Bethany: Okay so just kind of same thing as last time I don’t really have particular questions just your thoughts, or feelings, like if you’re telling Jordan about it. Or, kind of like last time when you gave insights on maybe what other people would think or things you liked and didn’t like. That was perfect. So I’m ready whenever you’re ready.
Mandy: Oh uhm. Kind of it’s kind of like you are in a, I can’t think of the word, like a uhm it’s like a different reality like you are in, like, it’s like you’re, it’s like being, fitting, like some actors become the character in the play.
Bethany: Right, okay.
Mandy: So like that in the virtual reality you have to.
Bethany: Right, you know it’s not real but . . .
Mandy: You’re so focused that it seems like you’re doing it. Because you have, when the ear things work you can hear the sounds of the snow and the people talking and you see the, you’re next to, you’re on the mountain you look out and if you fall, you know, like it’s scary, you have to hold on. Like all those things makes it real. Because it’s, it looks real. It’s not like watching a television, it’s, you look all around and you can see it.
Bethany: Right.
Mandy: It’s like 360 degrees and you look all around and all you see is the snow.
Bethany: Right, yeah there’s really no escaping it because it’s everywhere you look it’s there.
Mandy: It’s there but it was really cool!
Bethany: You really liked it?
Mandy: Yeah like when I went here I had like a like my personality was down like I just had a lot of work I didn’t know if that would like make me better or whatever but when I got in there it was like really made me happy to keep on like and it didn’t make me feel like down about myself a little bit. Do you know what I mean?
Bethany: Yes.
Mandy: Like I was feeling a little bit down and like discouraged about my work and that made me feel a little bit better.
Bethany: That’s good. That’s definitely a good thing to know. So, uhm, if you could try to
remember last time maybe a little bit. Uhm, did you notice anything different about your hand because you had the botox? Or does it feel about, did you notice anything at all?

Mandy: I think I didn’t use it but it was looser, I didn’t know what was the purpose of this Everest. Like last time you had to use the little thing to climb up the mountain. I didn’t know what to do in that hour on what was the main thing that I had to do. But I think it is looser if I had the like, the the the obstacle, what is it, like the task.

Bethany: When you were climbing the mountain, and stuff like that like how you were actually?

Mandy: Well like today there was not really a task.

Bethany: Right, okay.

Mandy: So I didn’t know what I could do because I got the botox.

Bethany: Right, okay I gotcha.

Mandy: So I like, although it’s loose I didn’t know what to hold, and grab, and like throw, you know what I mean?

Bethany: Right.

Mandy: But I think it will work better because it’s loose I can grab and use it more.

Bethany: Okay, do you have anything else that you wanted to say?

Mandy: No, I think when you learn how to use the virtual reality I think you’re more comfortable standing for a longer period because it’s not that scary if you don’t know where your feet are, you don’t know where, although it is kind of scary so part of the time I sat part of the time I stand. It just depends on how comfortable. In like regular people, like regular people at the engineering building where they have the 3D printer and all that stuff they had virtual reality and they, some people stood like Jordan stood. But today I am a person who sat so it really depends on a person.

Bethany: Yeah, their preference. So when you were standing you were more comfortable today standing?

Mandy: Yeah.

Bethany: Right and that's just because you're getting used to it.

Mandy: Yeah.

Bethany: And you know you’re not actually going to fall over?

Mandy: Yeah.

Bethany: And things like that?

Mandy: Yeah.

Bethany: So it’s a little bit more comfortable?

Mandy: I think the big things is the wires. The wires could trip trip you.
Bethany: Okay yeah, and we try to watch for that. Yeah just like us on the outside and stuff like that. But I get that it’s still something you might be thinking about.

Mandy: Mhm.

Bethany: Okay awesome.
Session 2 Transcriptions – Pitch-Hit: Baseball

Bethany: Do you want to switch the hands?
Mandy: I got it.
Bethany: You got it? Okay so there’s something that says practice I see. I’m going to scootch you in a little bit more so then you’re actually in the range. This should be a little bit better. Okay. Are you on a field now?
Mandy: Yeah, I’m practicing. So do you hit it?
Bethany: Is it telling you to do anything? I guess it’s adjusting. You’re on a tee-ball setting it looks like. What’s in this hand? Hold this one up real quick. I just don't know if that makes a difference. Oh I think you’re practicing throwing
Mandy: OOOH! Okay.
Bethany: So you’ve got to throw it. I wonder if it’s almost like levels that you would go through?
Mandy: Yeah.
Bethany: There’s balls falling from the sky!
Mandy: The right is when you do the like the getting more balls. The left, I don’t know what it is.
Bethany: So the right is making all the balls fall and the left is throwing them it looks like.
Mandy: Yeah.. I stink at this! What am I hitting?
Bethany: Well some of them. Yeah. That one was not too bad! Oh you’ve got 9 points so I think when you throw it in field, in bounds, you get points. There you go!
Mandy: Oh gosh, okay!
Bethany: I wonder if there’s like a goal?
Mandy: Oh, yeah I see.
Bethany: Like a certain number of points you have to get or something?
Mandy: Mhm. What was that?
Bethany: It’s the pole where the base station is.
Mandy: Oh okay. What am I, uhmm, aiming for?
Bethany: That’s what I’m trying to figure out while I’m watching it.
Mandy: I think I want to see if I can do a different one.
Bethany: Yeah maybe like you can click? One said like self-pitch, right behind you, see like tee-ball is green so that means you have tee-ball on. Keep turning, yeah you see how it says pitcher? I don’t know. Is it the other one by chance, like the other arm you have to use? I don’t know I’m just wondering. . . Ohhh there you go!

Mandy: OH OH OH! I’m like oh wow okay!

Bethany: Oh this is definitely different!

Mandy: Yeah, now I have to do it with my right hand.

Bethany: We can switch the handsets if you need to.

Mandy: Let me see if I can do it.

Bethany: Good.

Mandy: So how do you. . .

Bethany: I wonder how to get him to pitch it to you? I wonder.

Mandy: How do you pitch it? Oops sorry.

Bethany: No you’re fine you didn’t hit me. You hit yourself. I was just wondering, hold on he just threw a ball.

Mandy: Oh gosh!

Bethany: Ooo they’re coming! Throw the ball dude! Oh there we go! Oh, oh wow!! Oh, You hit that one! You hit the watermelon off the cart!

Mandy: Okay so I need to hit it with my other hand.

Bethany: Okay.

Mandy: If that makes any sense.

Bethany: What do you mean hit it with the other hand?

Mandy: So this is the balls.

Bethany: Oh okay! You’ve got like 17 points I think is what it says. That’s good! Or maybe that’s 97?

Mandy: It’s not working.

Bethany: You may need to use the other one to hit, yeah that one.

Mandy: Oooh ooh. No. . . Oh yeah that makes sense sorry!

Bethany: Oh that’s totally fine!

Mandy: Now I get it.

Bethany: So the one that’s in your right hand is the bat and the one that’s in your left is the balls. Right?

Mandy: Okay. Oh now it’s switching.
Bethany: It is?
Mandy: Yeah.
Bethany: Are you sure? I see a baseball bat when you hold that up.
Mandy: Yeah now it’s on the right hand.
Bethany: Let me see if I click this one. Look there’s the balls. . . I shot way to many of them!
    There comes you some more. They’re coming!
Mandy: Aah!
Bethany: Oh you hit a bunch of them! It looks like it’s going to rain in the sky that you have. Oh
    wow you got them all! Here they come!
Mandy: Wow I’m really bad.
Bethany: One time you were hitting almost every single one of them though! See look, you’re
    hitting them!
Mandy: Wooo! Oh my gosh!
Bethany: Do you have to leave at a certain time today so I can be watching out?
Mandy: What am I hitting?
Bethany: The pole that the base station is on. So if you want to you can back up just a little bit.
    There you go, you probably won’t hit it now.
Mandy: Okay.. Aaah!
Bethany: I did that one a little slower that time. Is this one bothering you? Like do you want me
    to just hold this one?
Mandy: Okay.
Bethany: Because that might be a little bit easier. Ooo I did not mean to do that many at one
    time, sorry.
Mandy: It’s okay!
Bethany: I think sometimes it shoots more than I actually press.
Mandy: I’m getting better!
Bethany: Yeah you are!
Mandy: Not that one.
Bethany: You hit that one! Good! Your score is almost thousands! That’s a really high score!
    Where’d the dude go? What? Is it over or something?
Mandy: I think I need to throw it now.
Bethany: Oh yeah, here let me put this other one back on you.
Mandy: I think. . . Or not, there’s no ball there’s no like. . .
Bethany: What, uhm, if we look at the menu behind you again, is there something else that you want to try? Like maybe pitcher? Or there’s...

Mandy: Yeah pitcher.

Bethany: I don't know what it is so we can try that one and see what it is. You have to hit it with the hand with the baseball bat. Yup there you go, you got it!

Mandy: Woo!

Bethany: I’m moving the chair out of the way so if you need it just ask me. I don’t want you to try to sit, it’s not be there.

Mandy: Oh yeah. We can try sitting and see if that works better

Bethany: you want to try sitting?

Mandy: yeah

Bethany: alright hold on, it’s not exactly right behind..

Mandy: I see

Bethany: there you go yeah okay, then I’ll push you. Okay so I gotta hit them again?

Mandy: I think so

Bethany: Yup! It’s coming. I’m gonna back you up some, yeah there you go, so you have a good angle. Oooh! That was a good hit!

Mandy: Ooooh okay!

Bethany: Oh Wait can you change whether it’s tee-ball or pitch?

Mandy: Yeah.

Bethany: Oh!

Mandy: But I don’t know how.

Bethany: Yeah I don’t know either.

Mandy: Oh.

Bethany: Oh there’s the tee-ball.

Mandy: So you have to stand?

Bethany: Do you have to stand? Where’d it go?

Mandy: I don't know I think when you stand here. . .

Bethany: I wonder if it’s a button one of us is accidentally pressing?

Mandy: I know!

Bethany: Ooo that was a good one! That was a good one too! I like the tee-ball one I can make the balls pop up.
Mandy: Oh I got it!
Bethany: Oh well now back to the pitcher. I wonder if you have to hit a certain number of ones and it automatically switches?
Mandy: Yeah… Great exercise!
Bethany: Oh yeah, that’s good though.
Mandy: Yeah.
Bethany: Keeps you healthy!
Mandy: The kids will love it!
Bethany: Oh yeah, I’m really excited to get started with them!
Mandy: And it’s also good if they have don’t have one hand that works you could help by just holding and pressing it.
Bethany: Right, yeah because in Mount Everest I don’t think I could really help you do anything.
Mandy: Help with that.
Bethany: Where with this one it’s
Mandy: Easy
Bethany: easier to help.
Mandy: But you’re also working with both hands holding it.
Bethany: That’s right yeah, you are able to have better control because you’re using both of your hands instead of just one of them. It also makes it seem more real because in real baseball you use.
Mandy: Both hands.
Bethany: Yeah both hands. Did you ever play Wii baseball?
Mandy: Yeah.
Bethany: Would you say this is similar? Or is it really different?
Mandy: A little different. I think you do one. Like you do it like you’re hitting it then you throw it. You know what I mean?
Bethany: Yeah. Is the headset okay?
Mandy: Yeah, sometimes it gets dizzy, not dizzy but like blurry I think it’s how you set it. When you move it it helps.
Bethany: Okay. Oh now we’re back at tee-ball. You okay?
Mandy: Yeah.
Bethany: Do you need to take a break?
Mandy: Let’s try uhmm what’s tee-ball?
Bethany: I don’t know we can try it. There you go!
Mandy: Oh okay.
Bethany: I don’t know why it keeps switching. Turn around real quick and see what it says. I think it went back to pitcher. I don’t know how it’s getting switched.
Mandy: Maybe I need to work harder on this.
Bethany: Let me get you a ball. (to Jeanette): So we found out that one hand shoots the ball and the other hand bats so I’m shooting the ball and she bats. She was just telling me earlier that she was getting tired.
Mandy: I think you can make it higher or lower with this.
Bethany: Oh, with mine?
Mandy & Jeanette: Yeah.
Bethany: I don’t know I keep dropping balls everywhere.
Jeanette: I think you can. I think it looked like you could before.
Bethany: I don’t know if it’s your hand. But I may be wrong. Oh you’re right, you’re right. You wanted it to be lower?
Mandy: I don’t know let me see. Uhmm maybe higher.
Bethany: Okay because you made it lower than it already was.
Jeanette: I’m assuming maybe higher might work.
Mandy: But you have to grab it.
Bethany: Yeah can you look down? There you go. You want to hold it?
Mandy: Oh no, I’m holding this.
Bethany: Did it switch on us?
Mandy: Yeah oh! Oops sorry.
Bethany: It’s totally fine!
Mandy: Oh this hand, both hands can work.
Bethany & Jeanette: Oh okay.
Mandy: That’s weird.
Bethany: Yeah that is weird. Is that a better height for you? Because it’s higher than before.
Mandy: I don’t know. Here let’s try with the other thing.
Jeanette: That seems better.
Mandy: Ah! I was almost there! I did something.
Jeanette: Oh there you go. It’s hard to see where it goes. Oh there it goes!
Bethany: She’s got a pretty high score so she’s hit a bunch of them!
Jeanette: Oh wow that was a good one. Oh nice!
Bethany: You just got a lot of points!
Mandy: I almost got it! So I think the dominant hand goes first and then the less dominant hand if that makes sense. Do you understand? So when I was working on the other hand it bothered me because I couldn’t find a place for my right hand that’s less dominant to fit and it just bothered me a bit but when we moved it to the other hand with the strap on this hand it’s easier to maneuver and doesn’t bother me as much.
Bethany: Okay when you say bother, does that mean that it hurts a little bit?
Mandy: Yeah it was just uncomfortable.
Bethany: Is it okay now? Is it bothering you?
Mandy: No. Let me see if I can do it with the one hand.
Bethany: Okay.
Mandy: I don’t know where the balls are.
Jeanette: Yeah I can’t see where it goes.
Bethany: Me neither.
Mandy: So this is kind of easier if people can just use it with one hand but it’s also good practice with using both.
Jeanette: That’s what I’m thinking.
Bethany: Which is the entire goal. I know you’re probably having a ton of fun but we only have 5 minutes left.
Mandy: Oh okay.
Bethany: So are you okay to debrief?
Mandy: Yeah.
Bethany: Oh I didn’t turn my computer on. Do you mind pressing the power button?
Jeanette: Yeah, sure.
Mandy: That was fun. That was pretty good.
Jeanette: That’s a workout.
Mandy: I understand what you’re saying back to reality.
Jeanette: Yeah it’s weird.
Bethany: Why is this stuck?
Mandy: Oh I was holding it.
Bethany: Oh okay I didn’t want to yank it but I can’t grab it.
Jeanette: Yeah when I first took it off I was disoriented like thinking where am I now.
Mandy: This was more real. Like Everest it was kind of like surreal but also real.
Jeanette: Oh okay yeah, yeah but this was real.
Mandy: Yeah like we did that when we were growing up. Yeah that was cool though. The boys will really like it.
Bethany: Which one do you think you like better?
Mandy: I need to try that out again.
Jeanette: Yeah now that you know kind of how to do it.
Mandy: Is there other sports games?
Jeanette: Yeah that’s what I was wondering?
Bethany: Not on that particular program but there are other programs and games.
Mandy: Can I take this off? Oh I have to leave it on.
Bethany: Yeah just for about 5 more minutes.
Mandy: It’s not that bad I just don’t want you guys to forget.
Bethany: Yeah I won’t forget it, it’s still running.
Jeanette: We actually have a shirt to take heart rate and it was awful because it’s a compression shirt people had to wear and they did not like it because it’s one size.
Mandy: So how is the little kids are going to use the heart meter thing?
Bethany: If they’re not comfortable with it we can use something else.
Jeanette: Yeah there’s a wristband that they could use.
Mandy: Like a watch?
Jeanette: Yeah which is not as accurate but it would still work.
Bethany: I mean obviously we aren’t going to make anybody do anything unless we ask first, like are you okay with this because there are other options if someone’s uncomfortable because if they are uncomfortable going into the session then that’s going to skew results and things like that if they’re too busy worrying about something else.
Mandy: And I’m totally, like I really want to go help you guys.
Bethany: Yeah we haven’t planned a date to go up there yet but I know that she wants you to come with us when we demo because you honestly have more experience than the rest of us because we get to watch you but you’re the one that’s actually in it.
Jeanette: Yeah it’s so different when you are actually in it. I had so much trouble trying to maneuver, like what am I supposed to do with this. It felt weird.
Bethany: I’ve used it before but I haven’t used any of these particular applications that we’re planning on using with the kids and I know that it’ll make a difference, that you actually have experience with what they’re going to be using.

Jeanette: It would be cool if they had more sports games.

Bethany: There’s one I found called VR sports and so I think that one actually has...

Mandy: Different sports.

Bethany: Multiple sports. Which was the one I was going to download but I wasn’t 100% sure if that is right and it costs money.

Jeanette: Ah yeahhh, that makes sense yeah.

Bethany: Okay so do you have any particular questions?

Jeanette: I guess the only thing that I would ask is when you were first doing did you feel any stress or anxiety with it being a new game?

Mandy: No because I like trying new things I’m not like scared about it.

Jeanette: Gotcha.

Mandy: But other people would.

Jeanette: Okay you’d see that being yeah.

Mandy: Like how I’m going to, not really like the game per se, but how am I going to do it with both my hands that don’t work very well.

Jeanette: Right, so like figuring out how to do it.

Mandy: You have to work on both hands, working together.

Jeanette: Yeah okay if people aren’t able to do that it would probably be more.

Mandy: Yeah it’s kind of hard and it was uncomfortable for a while when finding the right position on the right hand holding it.

Jeanette: Okay and then you were able to find it and it felt better?

Mandy: Yeah and then it was fine after that.

Jeanette: And did you feel like it was a good workout?

Mandy: Uh yeah, I didn’t know why the room was hot. Or I was just getting...

Bethany: It’s warm in here.

Jeanette: Yeah, it is warm in here.

Bethany: Yeah maybe it’s the window.

Mandy: But I was concentrating.

Jeanette: You liked it better than the first one, the Mount Everest one?
Mandy: Uhm last, like Tuesday I didn’t know what to do but the time before that I knew I needed to climb and that was kind of cool. I just didn’t know the purpose.

Bethany: Yeah the purpose of it.

Mandy: I know now that I need to move the little thing around so I can see better. It was just blurry last time.

Bethany: So what were you moving, the headset, or what are you talking about?

Mandy: The headset.

Bethany: So you were just moving the placement?

Mandy: Yeah.

Bethany: Okay I just wanted to make sure that we’re on the same page.

Mandy: Yeah because it was just really blurry and like my eyes are fine.

Jeanette & Bethany: Yeah.

Jeanette: So when you adjust the headset it gets clearer?

Mandy: Yeah.

Jeanette: Okay.

Bethany: So how do you feel over all about this program and think about your arm movements especially your right arm?

Mandy: Uhm, I felt like I can use it more than the Everest. I could, my hand is now straight a little bit so I can help it be straight, stay straight and hold it.

Bethany: Is that because of the Botox?

Mandy: Yes because it deadened the muscles on my thumb, fingers, the wrist that goes down, and the movement that goes like in I don’t know what it’s like.

Jeanette: Oh okay yeah.

Bethany: Yeah I know what you’re talking about but I don’t know what to call it.

Mandy: So when he did just relaxed it so I can just use it better.

Jeanette: Okay when’d you get that done?

Mandy: Last Thursday. And now we’re just doing the doctor told me how to do the exercises. Jordan went with me and so he is now helping me with the exercises each day.

Jeanette: Oh very nice. Do you have to do it every day? The doctor gave you stuff to do?

Mandy: Uhm a lot a lot, just any time it’s so hard he wanted me to grab like we use pots and that is so hard.

Bethany: So it’s this movement that you’re doing?

Jeanette: Ah the twisting.
Mandy: It’s so easy but when you don’t have it.
Jeanette: When you don’t have it you can’t do it.
Mandy: It like we do it for 30 minutes each night.
Bethany: Oh that’s a long time
Mandy: And then after it we take breaks and then we do back and forth and back and forth and I can feel the muscle burn. But I can feel it though! Like last time, a lot of the time every time before that I did the Botox I didn’t feel it much before and I was telling jokes you know nothing big. But now it really hurt! Until just one shot it didn’t hurt but the rest I just grabbed Jonathan’s hand and I just like broke his hand. I was like you should do it Jordan when we were driving to the doctor, I was like you need to do it I don’t want to do it it’s your turn. But yeah I can definitely feel it. It’s more like a hand than just an object or a thing.
Jeanette: Yeah I guess it’s kind of like a weird feeling.
Mandy: Although I can’t feel it, I can feel it a little bit. Like I don’t know that I have it. I don’t know where my phone is, it’s in my hand. I don’t know where my sunglasses is, it’s in my hand.
Jeanette: Yeah, huh.
Mandy: But other things, when people pinch me I can feel it.
Bethany: So it’s gotta be a more, pressure.
Mandy: Yeah so like when I hurt myself and I put ice I don’t feel the ice.
Bethany: Okay.
Mandy: Only some parts I feel a little bit.
Jeanette: Okay.
Mandy: But hotness I can feel.
Jeanette: That’s interesting.
Mandy: Yeah it’s weird.
Bethany: Are you sensitive to cold in general?
Mandy: Uh yes when I hold a cold water bottle it burns. Like it hot burns. When I eat ice cream it’s like a burn, ice cream this side burns and I can’t eat it on this side.
Jeanette: Hmm it’s something with the nerves.
Bethany: Yeah and I just find it interesting that some parts you don’t really feel it at all but then other times you’re super sensitive to it. Interesting. Okay I can’t think of any more questions. Is there anything else?
Mandy: I think the kids will like it.
Bethany: Yeah I'm excited!
Session 3 Transcriptions – Everest VR

Bethany: What do you see on the screen?
Mandy: I have to stand right over there.
Bethany: Do you want to stand or stay seated?
Mandy: Okay.
Bethany: I’m asking you what you prefer.
Mandy: Uhm.. Oh yeah! This is like the activity.
Bethany: Yay we picked the right one! Alright, sit or stand? Because have to move your chair if you want to sit.
Mandy: Uhmm we can. . . Sit. Woo! This is so cool. I think, I think, oh my gosh. Let me go over some more.
Bethany: Is it too loose or too tight or okay?
Mandy: I’m just close to the
Bethany: Okay.
Mandy: I think I need to stand because I’m so close to the snow.
Bethany: Let’s try that. Is that better?
Mandy: No.
Bethany: No, that was worse?
Mandy: Whoooa.
Bethany: It does look kind of funny.
Mandy: It’s making me really dizzy now.
Bethany: Oh sorry are you okay?
Mandy: Yeah.
Bethany: Oh that’s better.
Mandy: I need to go this way. Aww poop. Sorry.
Bethany: That’s totally fine.
Mandy: Go back to this?
Bethany: No do the ‘X.’
Mandy: Thank you.
Bethany: You’re welcome.
Mandy: It’s scary that all you got is the rope!
Bethany: Yeah.
Mandy: If you fall you’re falling.
Bethany: Yeah you’re falling.
Mandy: You’re gone, you’re gone. Oh my gosh as I’m holding on to the rope. Could you make the sound like louder?
Bethany: Probably let me see. Oh yeah I see it. Let me find my mouse first.
Mandy: Okay. Now it’s like mute.
Bethany: Is that better? More? How is that?
Mandy: I can’t hear it.
Bethany: You can’t hear anything? Do you hear anything now?
Mandy: No.
Bethany: Still nothing?
Mandy: No.
Bethany: Okay I turned it all the way up so I don’t know. How about now?
Mandy: Nope. . . Sorry I should have left it be.
Bethany: No it’s not your fault I just don’t know why it stopped. Was it working earlier?
Mandy: Yeah.
Bethany: Hmm.
Mandy: I just couldn’t hear what he was saying.
Bethany: Oh okay.
Mandy: With the other guy or whatever he was saying. Uuh what is that called? A uhmm a uhmm. . .
Bethany: That thing that’s falling? It looks their pack like their backpack.
Mandy: What is it called. . . Like is. . . Avalanche!
Bethany: Oh, when all the snow and everything is falling.
Mandy: Are you okay?
Bethany: Me?
Mandy: It stinks that they lost their backpack.
Bethany: I know because it has everything in it!
Mandy: The kids will like this.
Bethany: That’s good.
Mandy: Like climbing up here.
Bethany: Mhm.
Mandy: But there’s no sound.
Bethany: Yeah I’m not really sure off the stop of my head how to fix that.
Mandy: Okay.
Bethany: So you hear nothing?
Mandy: No.
Bethany: Hmmm.
Mandy: Oh it works now!
Bethany: Whaaat?
Mandy: Just don’t touch it, it works!
Bethany: Well I don’t know but I did but yay!
Mandy: Is it foggy?
Bethany: Yeah it looks like a snowstorm to me.
Mandy: Yeah, yes yes a snow storm.
Bethany: Yeah that’s what it looks like to me too.
Mandy: Oh the rope! The rope’s gone! Aww I like his voice though man. That’s kind of awesome! Keep going! Keep going!
Bethany: That’s so nice! Oh you have both hands this time!
Mandy: Yes I made it I think.
Bethany: Did you make it?
Mandy: Yeah because I don’t have those little thingys.
Bethany: You’re still in the snow storm though.
Mandy: Where are you guys? I can’t uhmm, I can’t uhmm.
Bethany: Can’t what?
Mandy: How do you say it? Get to, I can’t climb, it’s not letting me climb.
Bethany: Huh. Ooh, well I don’t know how to fix that.
Mandy: Like.
Bethany: If you wanted to go ahead and stop you can.
Mandy: Do you want to see like what I’m talking about?
Bethany: Sure.
Jeanette: So this thing has been acting up all day?
Bethany: Oh wow I’m all the way at the top!
Mandy: It’s saying hundreds of people have climbed and died. Have fun. I’m like that’s inviting.
Bethany: What? It said that on the screen?
Jeanette: Are you serious?
Mandy: Yeah like kids don’t want to hear that! While you’re climbing to the top!
Jeanette: Yeah that sounds awful!
Bethany: Yeah I see your hands are not.
Jeanette: I’m thinking, is that’s supposed to be an inspirational message by them?
Mandy: Realistic, it is realistic.
Bethany: I can jump closer but I’m not really like. . .
Mandy: I went back and then I went forward and you can’t get to it.
Bethany: Does the guy telling you what to do? Does he help you at all? I’m just wondering.
Mandy: Just keep climbing. Go back because they’re going my way.
Bethany: Oh so they’re supposed to be following me?
Mandy: Yeah.
Bethany: Oops.
Mandy: Yeah so I got stuck but then I don’t know how to aim it. Like you know what I mean?
Bethany: Yeah, I don’t know.
Mandy: We can like stop here and we can come back and I’ll see if I might know how to do it again. Can I take this off?
Bethany: Yes sorry.
Mandy: It’s okay it’s not that bad.
Jeanette: It’s funny because some people think it’s so comfortable. And I never thought that.
Mandy: It doesn’t bother me I just want to take it off. Oh I need to sit and talk to you.
Bethany: If you just kind of like want to talk about today because today was interesting so but yeah think about comparing the sessions, your arm movements, maybe how you felt during it, all those different things, emotional and physical.
Mandy: Okay uhmm. . . So physical. . .
Bethany: Mhm.
Mandy: I could my hand I could feel my muscles going. Like
Bethany: That’s different right?
Mandy: Going up the mountain. Like ugh. After so many times you’re like okay am I here yet? But yeah I felt that. When the rope fell and I had to use both hands. I could feel like this hand was going too. I could push and like get the snow in there and push it in. So I felt that in both my hands. Uhm what else. Mentally or like emotionally it was kind of funny, not funny, a little concerning.

Bethany: Okay.

Mandy: That the guy told me that people died right here and have fun, like I was little concerned about that for young kids.

Bethany: Yeah.

Mandy: But it was kind of cool seeing like what you were going to see.

Bethany: If you were really there.

Mandy: And doing it, fake doing it. Like seeing the like there’s two drops and a small path and you have to climb there.

Bethany: Yupp.

Mandy: And so I actually kind of did it. Oh yeah, I could see that.

Bethany: That’s cool. So it was almost like a feeling of success like you were just kind of proud of yourself that you did it.

Mandy: Yeah it was crazy, but yeah that’s kind of interesting.

Bethany: That’s good.

Mandy: And although that Everest is the most realistic out of all of them.

Bethany: Oh yeah, out of all the programs.

Mandy: When you have I don’t know what it’s called, the little forky thing I like to hit it and make the snow fall down. Like you did that. You could hit it and the snow falls.

Bethany: Right it has a real reaction.

Mandy: Yeah not just like oh!

Bethany: That’s true. So do you like that better because it looks real or is it a cool factor?

Mandy: Cool factor. Like the skiing if we actually do it that will be really cool. And the kids, you know like the kids watch cartoon television and they love it.

Bethany: Yeah.

Mandy: It’s the same thing as the skiing like the bear it’s a cartoon bear but they watch that on television.

Bethany: Okay yeah that’s a good perspective I didn’t think of that earlier.
Mandy: And so they would enjoy seeing the bear they would enjoy like, both sides both boys and girls would like baseball, like hitting the watermelon and those things. But yeah I like it. We need to get better earphones though.

Bethany: Okay yeah just for the kids because you like yours better the way that’s working out.

Mandy: I like the mufffs better. Like the little mufffs. You know it’s not the engineering, the VR building, the VR room, is not in the engineering it’s in the the Business admin building or business admin room.

Bethany: Yeah I know where that building is it’s by the engineering.

Mandy: Yeah by the Einstein’s. In that one. It’s not a VR game it’s another head thing. In that thing they had the little mufffs and I think that would be better because it’s not going to cause any issues.

Bethany: Right because it’s not going into the ears, it’s outside.

Mandy: Yeah outside.

Bethany: Do you know if the band part is the one that goes like this way or the one that goes over the head? Do you know?

Mandy: I don’t know but I think it’s already installed.

Bethany: Oh okay. In the headset.

Mandy: I think there’s a way that I can adventure and look.

Bethany: It’s okay.

Mandy: I guess there’s another thing you can just clip in like what I have and then put it on. Like there’s other ones.

Bethany: Yeah like different designs.

Mandy: Like the ones that go under your ear but yeah I got nothing else.
Session 4 Transcriptions – Pitch-Hit: Baseball

Bethany: Did you want your own headphones? This is the baseball one. I didn’t know if they said anything to you in it or not.

Mandy: They should make it, is there a one that’s like, like you can listen to music outside your earphones or in your earphones is there a way that you could just do it outside.

Bethany: Uuuh I have not figured that out yet. Yesterday when I was playing with it, it wasn’t. Let’s see, let me press. . .

Mandy: You know what I mean, so the kids can hear it.

Bethany: And I can hear it.

Mandy: Yeah and like so is there going to be more than one people, or is it just you and a person, or is there a lot of public like. . .

Bethany: Oh no there won’t be a lot of people there.

Mandy: Then yeah I think if we can make it work you don’t have to have the earphones is the sound is all around.

Bethany: The computer sound is all the way up but it’s not pulling the sound from. . .

Mandy: Well maybe we can start and see.

Bethany: Well while you are doing it I can mess around with it just so we’re not wasting our time.

Mandy: What about the music over there?

Bethany: It’s green so I feel like that’s saying it’s supposed to be on.

Mandy: Why do these not work? Because if you wanted to do ducks. . .

Bethany: Let’s see, can you click on it?

Mandy: It’s gray.

Bethany: That means you can’t select it.

Mandy: Yeah. Why do they have so many more of these?

Bethany: Why are the hoop red? Can you click on hoops?

Mandy: Hoops?

Bethany: Yeah, see?

Mandy: Yeah, I think it’s already, if it’s red that’s what we’re doing.

Bethany: Oh wait wait wait, keep your bat on it! Oh you have to do hoops first and then you can do catch!

Mandy: Yeah.
Bethany: Alright so it looks like. . .
Mandy: That’s what we’re doing it.
Bethany: Can you click on it? Ooh, you’ve gotta hit the balls into the hoops. Did you want me to click the balls again?
Mandy: Whoa!
Bethany: That was a lot of balls.
Mandy: Where do you get the. . . Oh it’s on that side.
Bethany: Alright.
Mandy: Whoa I got it.
Bethany: Why did it turn you back into a controller?
Mandy: I don’t know. See if yours is, I think I’m changing I don’t know why I’m changing.
Bethany: I know when you press those side buttons, you know which ones I’m talking about?
Mandy: Yeah.
Bethany: It changes it to a baseball bat so maybe I pressed the buttons? So I won’t press the side buttons.
Mandy: It’s yours.
Bethany: I wonder, okay let me stand on this side, I wonder if it’s just the placement of the. . . I think it was where I was standing that was messing it up.
Mandy: Oh I got it!
Bethany: Yay!
Mandy: Aww I needed to get.
Bethany: I wonder if that gives you more points or something because that one’s spinning and the gray one is staying still. That one’s moving so it’s kind of like a challenge.
Mandy: I like this is better, they would like this.
Bethany: Oh wow.
Mandy: Oh it’s timed!
Bethany: Oh you got that one, it turned pink!
Mandy: The kids, I think for me, I’m so focused on hitting it that I sometimes almost fall off the seat.
Bethany: Oh, yeah. . . Whoa!
Mandy: Whoa! Oh my gosh!
Bethany: That was good! To me, I think you’re just hitting the balls now not actually getting any points because of you look on the right it says ‘thanks for playing.’
Mandy: So I have to start over?
Bethany: Yeah so look behind you. Oh you can press replay if you want to do it again! At least then you’re getting the points.
Mandy: Yeah, you have to do it.
Bethany: Me? Okay. . . Oh you got it.
Mandy: No you got it.
Bethany: No that was you. You’re the bat. So just keep your bat on it. Alright we’re good to go!
Mandy: Counting down. . . So what, what is the purpose?
Bethany: Of this game?
Mandy: Yeah like because I got a white one.
Bethany: Some of them when you hit it you get points, and some of them it was taking away points which was what was confusing me because at one point you had 10 points. See you just got 5 points so you just did something. I think you have to get 18 points and then you can move on to the next. . . Oh see that just took away a point so now you’re at 4. So I think if you go through the hoop you get points but when you touch the hoop you’ll lose points. So you want to try to get in the middle. See you just when through the middle and you just got 2 points. Okay yeah. That makes it challenging.
Mandy: Did I hit you?
Bethany: Yeah it’s totally fine. I stepped in your way to try to get this to start. You’re fine don’t worry about it. I’m serious.
Mandy: Okay. Yes! Yes! ‘Thank you for playing’ How many points?
Bethany: I can’t see the dude’s standing in the way.
Mandy & Bethany: 4
Mandy: Oh my gosh that’s terrible. This is not good. This is horrible. Oh my gosh.
Bethany: I don’t think it’s supposed to be easy.
Mandy: You try! You try!
Bethany: I just said it’s not supposed to be. . .
Mandy: This is like uh uh. . .
Bethany: Is the head thing hurting you?
Mandy: No. I was like, uhm think about like this isn’t real life.
Bethany: Oh yeah.
Mandy: You wanna try?
Bethany: Not right now. You doing okay though?
Mandy: Yeah I’m okay. It helps when I, like this helps me stop from feeling sick.
Bethany: Right, because you’re not thinking about it.
Mandy: Yeah, I’m still like. . .
Bethany: Not perfect?
Mandy: Yeah but it. . .
Bethany: Well that’s good.
Mandy: Yeah.
Bethany: You got 5 points, that was a good one! Aww that was so close! Sometimes it looks like it goes through.
Mandy: Ugh, I’m losing. Zero! Come on!
Bethany: Oops that was my bad.
Mandy: Oh hi! I didn’t know who came in.
Bethany: Oh sorry I should have told you. I wasn’t thinking about you can’t see.
Kayla: I’m just coming in to check the HRV monitor.
Mandy: It’s really intense though. I’m good. You said 15?
Bethany: Yeah so you’re just going to let the time run out?
Mandy: Yeah.
Bethany: She’s been trying to beat this game!
Mandy: ‘Enter high score,’ yeah!
Bethany: ‘Personal best’ yeah! Let’s scoot to the left a little. Okay so are we going to try a new one? Are you good? I just want to make sure you’re feeling okay.
Mandy: Yeah!
Bethany: Alright which one is this one?
Mandy: Catch. It’s the next thing.
Bethany: Are you ready? Wait I thought we were doing catch?
Mandy: Mhmm. Whoa.
Bethany: Whoa it moved! Wait, we are playing catch! I think I’m the one holding the catcher’s mitt. That’s weird.
Mandy: I think I have the balls.
Bethany: Yeah I have the catcher’s mitt, but I’m confused at where the ball is coming from to try to catch. You know what I mean?
Mandy: ‘Replay’ maybe we need to replay it.
Bethany: Let’s see. . . I can’t get it.
Mandy: We can just exit.
Bethany: Hmm. You want to hold this one and see if you can get it?
Mandy: Wait we can exit and start over.
Bethany: I don’t know if I can click it. Nope mine’s literally just a screen to view I can’t do anything. That is weird.
Mandy: No come back here. Here, go this way.
Bethany: What’s funny is it’s not letting you do anything. Did I just press something? Oops! Hey look now I’m dropping balls from this hand.
Mandy: I’m patting you but I don’t see where the. . .
Bethany: We can play tee-ball again. It’s still weird though. Oh maybe turn your head to the score, not the score board, but the options menu.
Mandy: I’m blue, can you see blue? Can you see the blue one?
Bethany: No, what happened was you got out of range. You scooted too far over to the right.
Mandy: It’s still blue.
Bethany: It’s still blue on your screen? So the screen is just straight up blue?
Mandy: Yeah.
Mandy: Oh wow what is that?
Bethany: Wait, how did you get over there?
Mandy: This is weird. . . It’s over.
Bethany: Are you done? It’s been 25 minutes how do you feel?
Mandy: I’m okay. I’m lost. I’m not good at sports.
Bethany: Uhm, if . . . Does it look blurry to you? Because it looks blurry on my screen too.
Mandy: Yes.
Bethany: Okay, are you. . .
Mandy: Whoa.
Bethany: Oh you moved your head thing up. Do you want me to try to get it to the home screen or are you ready to call it a day?
Mandy: Oh it’s recording, why is that recording?
Bethany: I don’t think it’s actually for real recording.
Mandy: Oh I know that.
Bethany: It just says it is. What? Oh I can change views! Okay oh that’s you! Well you can’t see it but on my screen you look like a floating hat. So I can see what you see and... Alright. So since today you didn’t feel so well that would actually be interesting for you to talk about. Talk about how you felt before you came in, while you were doing it, and after and stuff like that because you’re not sick every day. You know that’s unique to today.

Mandy: Well yesterday I was sick but right now it’s... 
Bethany: You’re worse?
Mandy: Yeah I’m just... It’s not that bad.
Bethany: Yeah, did the virtual reality help you feel any better? Or?
Mandy: I lost... Uhm stopped me from thinking about it.
Bethany: Stopped you from thinking about it? That’s nice.
Mandy: This time I felt like a tiny bit it felt like a real life situation. I had to take it off for like one second it was just too much.
Bethany: It was too much for you?
Mandy: Just a little bit.
Bethany: Was it hurting you or making you sick at all or just?
Mandy: No it just, I was just getting to into it.
Bethany: Okay.
Mandy: And I like you know young kids they, if you have too much, we talked about it in class, if you have too much instruments too noise too much loudness.
Bethany: Oh overstimulation.
Mandy: It’s overstimulation, although we didn’t have the music or the music it was just too much so I had to like take it off and put it back on because it was just too much.
Bethany: Okay, that makes sense. Is there anything else you want to add?
Mandy: I’m just, I’m thinking about like because I am sick I think we should get costumes for the kids so they can be like real baseball. That would be awesome like real gear or like. Man that would be fun!
Bethany: That would something cool to do if it were a long term thing for each kid. But for each kid we will only be doing 6 sessions with them but if we had some program we were doing over a very extended period of time.
Mandy: Yeah if you had the Everest, the baseball, the skiing you could have like skiing clothes or like skiing costumes or costumes for whatever so the kids could get into it.
Bethany: That would be cool.
Mandy: Or just like a hat or something.
Bethany: Yeah just a little something.
Mandy: Or like uhm, what is like the different food for baseball, like popcorn?
Bethany: Oh yeah a lot of baseball players chew gum.
Mandy: Chew gum! Well the kids can’t have gum if they’re young. Or like if you go to Everest
you have to have water to drink because you get thirsty.
Bethany: Right.
Mandy: So like real life like, this is what you’re going to have because you’re going to do this.
Bethany: So you’re thinking like really fully immersed. Because you look like it, you’re just
everything about it seems real.
Mandy: Yeah exactly and like if you think about long term you want to do space exploration and
do space food.
Bethany: Like dried ice cream.
Mandy: Oh that’s so good!
Bethany: Awesome, awesome. Alright are you ready to take it all off?
Mandy: Yeah.
Bethany: I’m going to push you back this way.
Mandy: Whooa
Bethany: And then slide to the left so you’re in the middle of the base stations.
Mandy: Can I turn around and get the thing?
Bethany: In just a second. It got twisted.
Mandy: Yeah I feel it.
Bethany: Okay alright you can turn around now.
Mandy: So should we try the catch thing?
Bethany: It’s totally up to you.
Mandy: So we can try it for a little bit and then go back to the hoopy thing, it’s my favorite. I want to try the duck!
Bethany: Think you have to pass the other. This is very interesting music.
Mandy: I know it’s like. . . ‘catch 7 in a row to unlock the next level.’ That’s easy! NOT! Do you want to do the balls?
Bethany: Yupp, I’ll do the balls. Got it.
Mandy: Thank you. Ooo! Oh you have the thingy!
Bethany: I do, well okay.
Mandy: That’s so weird.
Bethany: Do you want to hold it?
Mandy: Are there any instructions?
Bethany: Well, you got one point!
Mandy: Okay I know how to do it.
Bethany: Okay.
Mandy: So. . .
Bethany: Which one do you want? Do you want to have this one?
Mandy: No.
Bethany: This one? Okay. So I have the one that has the mitt in the hand.
Mandy: Yeah.
Bethany: Oh well there we go. I don’t know how you did that! I’ll catch it! Aww I missed it I’m sorry.
Mandy: Oh I’m doing my own.
Bethany: So you’re pitching it to yourself? So how did you get back to the... somehow you got over back to the thing?
Mandy: I did the home-screen. Aww man!... I’m sorry.
Bethany: You’re totally fine!
Mandy: You hit the home thing.
Bethany: At least you figured out what it is.
Mandy: How do you do the... Sorry. I’m getting very attached to winning. Get it, get it, get it! Did you catch it?
Bethany: Almost! I’m not good at this catching thing.
Mandy: Me neither.
Bethany: I almost feel like maybe you should try to catch it, I can’t catch it... I tried.
Mandy: Yeah you did.
Bethany: Once you hit it pretty well it jumps over and tries to let me catch it... Nope I think I missed it. Yeah, no ball in my hand... Uh, oh no!
Mandy: That didn’t work very well.
Bethany: Whoa.
Mandy: Here you try, let’s switch.
Bethany: Okay. I’ll slide you over this way so you can be on this side.
Mandy: Don’t hit me though.
Bethany: I won’t hit you. I did not do that very well. I’m not hitting it very well. This is hard.
Mandy: Oh yeah. Go low to high.
Bethany: That one was a little better. Nope. nope. Oh! Catch it catch it! you did a little better than I did I feel like!
Mandy: I’m still bad.
Bethany: I need a ball. Oh gosh! There’s so many.
Mandy: Whoa!
Bethany: Are you okay?
Mandy: Yeah.
Bethany: That was pretty good. Oops that was backwards.
Mandy: Oh yeah I got that.
Bethany: Catch it! YESS! You got this!
Mandy: You have to get it and then throw it.
Bethany: I threw it, but I threw it over there. YES!
Mandy: I got it!
Bethany: Hang on. Okay. You are improving!
Mandy: Let me try to do it with both hands now. Because this is also therapy.
Bethany: Yes.
Mandy: If I can do it a little bit I can show the kids how to do it. . . This is kind of hard to do with just one thing.
Bethany: Mhm.
Mandy: Well I got it.
Bethany: Yeah you did hit that one pretty well!
Mandy: I think it is better. They would enjoy themselves more if somebody else could do the ball.
Bethany: Mhm.
Mandy: this is kind of hard. I don’t think the kids won’t like this one as much as the other ones.
Bethany: Right like the one where you can just hit it.
Mandy: Or just hit the, hit the holey one, the circle one. I want to try to get to the duck one. Aww I got a zero. That stinks. Okay this is not going to work out very well.
Bethany: You can keep trying as long as you want to.
Mandy: woo! Oh my gosh okay!
Bethany: That looks different. Is he pitching and you’re catching?
Mandy: No I’m throwing.
Bethany: You’re throwing?
Mandy: Come on! Oh that’s why this is very hard. I need your help.
Bethany: Okay so I’m throwing the ball, correct?
Mandy: Yeah.
Bethany: Oh I’m catching, okay.
Mandy: Yeah, you can do the home-screen too. Get it, get it, get it!
Bethany: Oh I got it!
Mandy: Woo! You got it!
Bethany: You threw better than I did. I just kept dropping it.
Mandy: Okay you can do the home-screen too.
Bethany: I don’t get what you’re talking about. What’s the home-screen? Oh okay, okay! Oh! I see!
Mandy: Now you know how to do it.
Bethany: Oh.
Mandy: Oh no!
Bethany: Do you need me to adjust it again or is it okay?
Mandy: Just a little dizzy, it’s just too real, you know what I mean?
Bethany: Yeah.
Mandy: How do you go back?
Bethany: Does it look blurry to you?
Mandy: Yeah... Is your screen blurry?
Bethany: Yeah my screen’s blurry I don’t know if these.
Mandy: Are not... Is my heart rate good?
Bethany: Yupp it’s collecting just fine.
Mandy: Awesome.
Bethany: I’m going to adjust these a little bit.
Mandy: Okay. It’s a little better.
Bethany: It still looks... Alright. It’s like all of a sudden it went blurry.
Mandy: I played for 80 minutes?
Bethany: Probably total out of all your times. Right now you’ve just been playing for 15 minutes.
   How does it look on your screen?
Mandy: It’s okay. A little blurry.
Bethany: Oh okay! So much better! Alright.
Mandy: Get it, get it, get it!
Bethany: Yes!... Whoa, aww I missed it. Wait, do we have to catch 7 in a row?
Mandy: Yes.
Bethany: Well that’s never going to happen!
Mandy: I know! Never in a million years!
Bethany: Ooo I caught it!
Mandy: Never going to get it, well you got one!
Bethany: Yeah it should be catch one in a row and you can move on.
Mandy: Woo! Homerun!
Bethany: Why didn’t it let me try to catch it?
Mandy: Because I did a homerun!
Bethany: Because you hit it way too far!
Mandy: See, zero. Sorry I’m getting too emotional in this game. I’m getting too like, when I play foosball I get violent. Not, you know what I mean.
Bethany: Yeah you just get really into it.
Mandy: Too into it, not, oh my gosh this is just too much. Ugh. Sorry. I still don’t know why I got a homerun and I should’ve like gone to the next game, come on! Catch that!
Bethany: Yes! We got one! Oh no. Man. I feel like we shouldn’t lose our scores.
Mandy: Get it, get it, get it! Oh you were that close! Zero! You were that close!
Bethany: What? Ugh. Oh yeah! That was just chance.
Mandy: Okay we got one.
Bethany: I can’t see the ball, oh there it is. Aww I missed it!
Mandy: You have to hit it and catch it.
Bethany: Yeah you have to hit it and catch it 7 times in a row!
Mandy: You know like some games like some games you can like search it up and you can like cheat sheets.
Bethany: Yeah.
Mandy: Aww you got it!
Bethany: Wow!
Mandy: That was impressive!
Bethany: Thanks! That should have been 7 points right there. . . Ugh! That was literally in my hand!
Mandy: I know! I’m getting too. . . Here you try to do this. Do you want me to switch sides?
Bethany: I’m switching sides because sometimes I think that does affect things. You’re fine I’ll just slide you over a little bit. I’m trying not to run over the cord. Okay it should be fine.
Mandy: Are you ready?
Bethany: Yupp! You got it!
Mandy: Yes! Alright! Aww, not that one. Oh yeah, I’m good! Ooo that was too fast.
Bethany: Yeah, that was so hard because I didn’t know when it’s going to let me try to catch it.
Mandy: Got it!
Bethany: Yes! I have to hit 7 good ones in a row too? Homerun! Aww sweet! Wait why did it get rid of all of our scores?
Mandy: This is too much!
Bethany: That was awesome!
Mandy: Oh my goodness. Uh okay.
Bethany: Are you ready to try something else?
Mandy: Yes!
Bethany: The menu is behind us. Am I the one that has to do it?
Mandy: Yeah, maybe someone else can beat that. It was so hard though.
Bethany: Okay I’ll give you this thing and I’ll work on untangling. Do I need to hold the other one? Is this the one where I drop the balls and you hit it?
Mandy: Yeah.
Bethany: Okay. You have 5 points!
Mandy: Really?
Bethany: That means you’ve gone through.
Mandy: Oh gosh!
Bethany: Oh man that was close!
Mandy: Oh.
Bethany: What?
Mandy: Oh you.
Bethany: Me? Oh I am making a ton of them.
Mandy: So how am I going to? Oh you have it!
Bethany: Oh, throw the bucket away!
Mandy: You try to press the circle button. ‘Thank you for playing.’
Bethany: Oh! This one is timed! So you have to press that at the end.
Mandy: You have the baseball bat.
Bethany: Okay.
Mandy: What is tee-ball?
Bethany: That’s where it’s on the tee.
Mandy: Where’s the tee?
Bethany: That thing that you put the ball on. So instead of having the pitcher.
Mandy: Oh okay.
Bethany: You have the pitcher now.
Mandy: Yes! . . . Oh!
Bethany: What? I guess it’s time. ‘Personal best’ oh you got your personal best!
Mandy: I can’t see. 14!
Bethany: 14! Cool!
Mandy: Thank you! I don’t know if the kids will like the time, beat the time.
Bethany: Mhm.
Mandy: I wanna try to sometime to get to passing the catching thing so we can get the duck thing.
Bethany: Mhm.
Mandy: Do I have it?
Bethany: Yes.
Mandy: Can you make it higher?
Bethany: Is that better? Oops.
Mandy: You have it.
Bethany: Why does it to that? Okay so I have the balls.
Mandy: I’m not doing very well. . . If the kids can stand, they should stand like they are actually playing baseball.
Bethany: Yeah.
Mandy: Am I standing like an actual like, or whatever?
Bethany: Yeah, looks like it to me.
Mandy: I don’t know how to play or watch football, baseball or whatever but you get into when you feel like you’re doing it.
Bethany: Uh huh.
Mandy: ‘Thank you for playing.’
Bethany: Okay so we’re just hitting it. Okay so we actually have to stop because it’s 11:55 and we only have the room until 12. So uhm. . .
Mandy: My hair’s a mess.
Bethany: So just like the other times debrief and talk about how you feel physically and emotionally. If it makes you feel better about life, happier or whatever.
Mandy: It made me want to come to the virtual reality.
Bethany: Yeah.

Mandy: Like very much. I didn’t really want to get up but I had to get up. It has really helped me not be tired. It was kind of annoying a little bit, I got a little mad at the catching thing because you can’t win and like I am not good at sports but I can win! I’m competitive and this is not letting me win! I can’t deal with it! Like I have to I have to do better I have to get that point I got a little aggressive like let’s win, I have to win! I feel that the kids will feel like that too.

Bethany: Do you like that feeling or is it stressful to you?

Mandy: Both. Like with foosball I’m the champ so when Jordan and I play, we he won like 3 times but I’m teaching him. So it’s like I'm competitive and I get the work done and I win. This I don’t know how to play baseball or know anything about sports so it’s more like I’m competitive but I can’t get it.

Bethany: Right, it’s being harder to be successful.

Mandy: Right but you know the kids will like it anyway. I think they will like the hoopy thing, they will like the throwing and hitting the little faces and like the fruit. You know what I mean?

Bethany: Yeah from like the first time? Yeah I remember.

Mandy: That will be fun and getting the points there.

Bethany: Mhm.

Mandy: But I was little annoyed the session about not getting to the next part.

Bethany: Right.

Mandy: But it’s not that bad it’s okay. I have to learn how to control and have a good teammate good.

Bethany: Oh sportsmanship?

Mandy: Yeah. Winning isn’t everything.

Bethany: That's true.

Mandy: But it, it was fun!

Bethany: How did you feel physically? Like with your arm movements?

Mandy: I can hold it better with this hand but it was hard to do both. Like, For instance when we were doing the catching thingy I couldn’t get the ball, grab the baseball, hit it, get the mitt, catch it with and throw it with the right hand. It was too much one handed.

Bethany: Do you feel like it was hard because your right hand doesn't work as well or just because it’s a hard game?

Mandy: I want you to try to see if you could do it with the catchy thing to see if a normal, both handed, person can do it on your own and see if it's hard.
Bethany: Okay it would be good to compare.
Mandy: Maybe next session you try and I try.
Bethany: Yeah.
Mandy: And just I am just slow recall like I can’t I don’t know like, get the ball, grab the thing, hit it, like it’s just. . .
Bethany: You have to do a lot of switching though right? That’s what I was thinking.
Mandy: It’s still good. It’s my favorite now I didn’t know if I liked it but because the skiing thing is giving us problems it’s my favorite so far. I still want to do the ducky thing, there’s a way that you can do a cheat sheet to get the ducky things.
Bethany: Oh I’m sure there's some way.
Mandy: Oh my gosh, or maybe one of the other kids can pass it and then we can do the ducky things, oh my gosh.
Bethany: You need to tell them that’s their a challenge. Your challenge is to figure this out and don’t tell them you don’t know how to do it, it’s just the challenge. Is there anything else you wanted to add?
Mandy: No I think I’m good.
Mandy: That rolly thing is a great idea but sometimes it’s still I don’t know if it’s still a bad idea because it’s so rolly that you can fall off like you know what I mean?

Bethany: Right.

Mandy: But they can just be careful.

Bethany: With the kids we will watch, I mean I watch what you do, but the kids we’ll watch much more closely and monitor. So I’m going to move this chair out of the way. If you need it just let me know.

Mandy: It looks like uhm star. . . How to you say it? Star?

Bethany: Star wars?

Mandy: Yeah the light. . .

Bethany: Oh the light sabers?

Mandy: I don’t know if you could see it but it was cool!

Bethany: I’m going to scoot you to the left.

Mandy: *sings cha cha slide* All I see is loading and a square.

Bethany: That’s all I see too. It’s okay I did that.

Mandy: Okay what happened to the skiing?

Bethany: I still have yet to figure out what was going wrong. I even googled the issue and google was not being help. Nobody I guess has really run into that issue before so it wasn’t something that was published so I kind of have no idea what to do about that problem.

Mandy: So is there a task that I have to do or just climbing?

Bethany: I think it has to do which.

Mandy: Getting to the top.

Bethany: What peak are you on? Because some of them you’re given the tools to climb. You see how they all have different names.

Mandy: I guess I can just try one.

Bethany: So you just have to click on it and see what happens.

Mandy: Yeah this one’s really cool.

Bethany: What can you see?

Mandy: Black.

Bethany: Okay all I can see it black too. . . Okay now I see some mountains.

Mandy: Can you turn the volume louder?
Bethany: Yeah I hear absolutely nothing on this one.
Mandy: I hear something.
Bethany: That’s the speakers.
Mandy: Go back to the lobby?
Bethany: The ‘X.’
Mandy: Thank you.
Bethany: You’re welcome. Do you want to try your headphones today?
Mandy: Yeah.
Bethany: Where are they? Are they in the pencil pouch?
Mandy: Yeah you can look in my backpack it’s okay. I don’t know where Jordan put it because he was using it yesterday so... 
Bethany: I found it. First pocket I opened. Hopefully they’ll work this time. Baseball worked yesterday.
Mandy: I know, yeah it worked really well... We can see if the music will start right now when we’re actually going to do it.
Bethany: Do you have that black flag in your hand again?
Mandy: Oh yeah... I can hear it. Can you hear it? Now it stopped.
Bethany: Yeah.
Mandy: Did you see it?
Bethany: Oh my goodness, how’d you get all the way up there?
Mandy: It’s okay I’m done it’s over.
Bethany: It’s over?
Mandy: Oh I did it!... Oh wow I can go I can like I moved past the person, you know what I mean? I went all the way.
Bethany: You jumped around him.
Mandy: I went inside of him and out... Whoa I’m lost. Where are we? I can’t... 
Bethany: Is it maybe the direction you’re facing? Like turn maybe to your left.
Mandy: Can you try to?
Bethany: I think maybe because you’re not looking at the base stations. It’s almost like it won’t let me go to the ‘X.’ Okay so let’s just turn a little bit this way. Now let’s see if you can hit it now. Can you click on go to lobby?
Mandy: Looks like... 
Bethany: Can you get back to the menu and just pick a different place.
Mandy: How do you get to?
Bethany: So yeah go to the lobby... Oh it’s the base station... It’s just the table.
Mandy: Oh okay. How long is it to get up and down?
Bethany: Hmm?
Mandy: How long is it to go up Everest and go down Everest? Like the total?
Bethany: Like the mileage?
Mandy: No like days or months?
Bethany: I don’t know I can look it up. On average it takes about 2 months.
Mandy: 2 months wow! That’s going up and going down?
Bethany: Yeah that’s what it says.
Mandy: I want to see if I can get... Bethany: To the top of that one?
Mandy: Yeah.
Bethany: Uhm it’s been 30 minutes do you want to keep going or stop?
Mandy: We can stop. I don’t know how to get this part. You know what I mean?
Bethany: Right that’s the one that you’re climbing on the side.
Mandy: Huh?
Bethany: That’s one that you’re climbing on the side.
Mandy: I can get a little bit, I can get a little bit but I can’t get to...
Bethany: Oh up.
Mandy: Yeah it’s not letting me. You know?
Bethany: Yeah.
Mandy: He said something but I can’t think of what he said.
Bethany: Oh so he gave directions?
Mandy: Like watch out for whatever. It’s not letting me. But yeah we can stop.
Bethany: Okay.
Mandy: I think next time we should make this a little bit looser it was a bit tight on my head.
Bethany: Oh okay... What are your overall thoughts on the VR training? Or like these past 6 sessions?
Mandy: I really enjoyed it. There is a lot of things that are better to use both hands than one. And because my right hand doesn’t work as well it’s kind of complicated I think do it, some of the activities. Like, going up the mountain with the little uh sharp thing like that goes up
the mountain. Sometimes I don’t position it and turn my hand to go up like your left hand does. But I learned how to use it to be able to do some of those things like help hold the baseball with it or the baseball bat. And that It made me feel like, it’s sort of lost, I’m sorry if I’m not making much sense.

Bethany: Nah, I’m totally following it’s fine.

Mandy: Like, what’s the question again?

Bethany: What are your overall thoughts on the training? The VR.

Mandy: I feel that I am less handicapped.

Bethany: Why?

Mandy: Because in that machine your hands are open and you don’t see that your hand is twisted you just learn and you help move it but your hand looks normal. And so you start thinking you’re going up the mountain, you’re doing baseball, you’re holding it with both hands you don’t think of ‘oh my hand is paralyzed, hey I am handicapped, I can’t do it.a I don’t think about that in that VR game. I think about trying to get the homerun or do, go up the mountain, and I think of I can do it. I think of what else could I do to get to that mountain, and also to get to that hula hoopy thing to get that point. So although the, I don't know if my hand is I don’t know if because of the VR that my hand will come back it helped to realize hey my hand’s normal in there I can do things in real reality that you can do in here like open the door or try to eat yogurt because you can do it here.

Bethany: Right that was a wonderful response. Good job. Are you ready for the next one?

Mandy: Yes.

Bethany: Do you feel that you gained any benefits from this training, such as improved hand-eye coordination?

Mandy: Actually, kind of yeah, I’m not good at doing the hand-eye coordination as is but as I was doing the baseball I got pretty good at like not getting outside of the little square thing I got it inside the square thing and that was impressive. I really am not good at any sports though like when I play tennis, I love tennis, I go out of the fence and into the traffic. But in that it’s better because I don’t cause any issues. And I think, I don’t know about the hand-eye coordination.

Bethany: Or just benefits, any other benefits that was an example. So movements or being able to do things better.

Mandy: Yeah I don’t know if the help of the Botox but I can, my hand I can stretch it better, I can I can I now can get it to go up and down with both hands stretching like this way and turning but it’s not like the VR is all I need to get it back it’s also real life doing it and that like self-therapy, or therapy, this it’s not just that.

Bethany: Right you’re saying it’s a combination of everything that you do.

Mandy: Everything, like right now I’m trying to hold my lunch box with it for real not just holding it like this. I can hold it and it drops because I can’t hold it for extended time.
Like I can’t like you know what I mean like I have some strength but it’s still weak.

Bethany: Mhm. Did you feel any psychosocial benefits, so that’s emotions just well-being, less anxiety or a better mood?

Mandy: Yeah, it did.

Bethany: Can you explain that a little bit, like how or why that helped you.

Mandy: Because like when I was sick I just didn’t really want to come and when you put it on I got distracted with doing the activity and less of ‘my throat hurts, my sinuses, hurt, I want to sleep, I have homework.’ Like all those things I worry about. I have anxiety I can’t, I think too much about things and those disappear and it gives me, it just makes me happy. It’s like you’re in a kind of like life real like television. You’re in the television doing the things, climbing up the things, doing baseball. And you don’t think about ‘oh my hand hurts, my leg is sore, like I had a bad day.’ That sort of went away. And then other times it is frustrating trying to do virtual reality, because your hand is not normal. The hand is not normal for me it’s not going be when I take it off my hand is not going to be normal. So you can’t you can’t sometimes be able to be normal going up the mountain because your hand isn’t normal you just have to realize that that’s just the fact and you need to be creative on how to get to the top with doing it with both hands.

Bethany: Do you feel that the VR training programs improved your ability to engage in activities of daily living so that’s like putting on socks, eating a cup of yogurt, those things that you do every single day?

Mandy: Uhmm I didn’t before, I didn’t do socks some of the things I already started doing but I didn’t stop doing it after I was doing the virtual reality. It’s still progressive getting the hand back. It’s not like because I’m doing the virtual reality that I need to get better to be able to do the virtual reality. It’s more you want to do better with your hand in real life. And it’s easier in, it’s easier after you do well with your hand to do it in reality. It’s not it’s not, I never really thought about that like trying to get a paper towels with it and turning to do better in virtual reality.

Bethany: I guess the question is asking did the virtual reality help what you do in the daily living not what you do daily helps virtual reality.

Mandy: I didn’t think about that, I didn’t think about virtual reality helping me getting back with the hand. It’s just I didn’t think about that specifically. I thought about getting my hand back with the VR but I never thought about the VR helping me get, you know what I mean?

Bethany: Mhm. You weren’t thinking about virtual reality with specific tasks you were just thinking about it in general.

Mandy: Like really I’m working with getting my hand back as is. So the virtual reality is just a I can do this, I can hold it, I can do that. It’s not the virtual reality is oh, it made me open my hand in real reality because it’s already open you know? But the Botox helped. But the kids might could think it could help. I don't know.
Bethany: Is there one program that seemed more effective than the other thinking about your movements was one more beneficial in helping your arm movements?

Mandy: I think it’s kind of even. Uhm, baseball it was good because you have to hold the baseball bat with it and do it with both hands with the arm movements. That’s kind of, I didn’t think about that. Like holding it, it’s hard to go this way like I’m pushing it but it’s hard to go. I didn’t think about that. That could help the kids stretch out their elbow, yeah, and that motion when you do the Everest you’re doing this side and it’s a different muscle and it just it just, what’s the question? I’m sorry.

Bethany: Totally fine, it was is there one program that seemed more effective than the other?

Mandy: I think it’s even and both activities work with different muscles. And for standing sometimes kids have a hard time standing that’s even helpful just moving a tiny bit. You get into it so you don’t know you’re standing for a long time. And that kind of helped.

Bethany: Overall, did you enjoy the different VR programs? Which did you like the most and why? Which did you like the least and why?

Mandy: Baseball the best because it’s it’s, there’s a real task in a sense, they told you you have to do the hula hoops and you kind of know, if you hit it you lose points if you go in it you gain points, there’s a task. In Everest it’s real life and you are trying to survive in this horrible climate and you have to reach the top of this mountain and it’s more like oh you can see that there’s an avalanche you can hit the snow and the snow falls. It’s like real hard labor. Everest was not my favorite as much as the baseball because the baseball was, everybody knows baseball and people watched it or played it in some some type of play like Wii and real life. So they kind of know the purpose of baseball. It just, I think older kids may like Everest a little bit more because it’s a little harder to do than baseball because baseball you just hit or you throw and you for the hula hoops I didn’t get to the duck part, but the hula hoops it’s kind of, the kids can see you have to go in it to get the points, you have to hit the watermelon to get the points. It’s more simple and fun than a real mission that the Everest has. I just don’t know the age groups I know like kind of younger kids but I don’t know what age groups. That’s what I think is the best in my mind.

Bethany: Would there have been another VR program that you think would have been helpful that wasn’t available? Could you describe that type of program?

Mandy: I have a lot of them.

Bethany: You don’t have to tell me all of them.

Mandy: Yeah yeah, do you want sports or? Or something else?

Bethany: Whatever you want, there’s not a particular, like I’m not looking for a certain thing it’s just your thoughts.

Mandy: I think football, because if you’re playing in a real fake team somebody might be throwing it to you so you need eye-hand coordination to see oh it’s coming to me I have to hold it I have to put my hands in this motion to catch it and then throw it. And for
soccer too, but that feet but that’s just for the hands, it would be cool to have the slippers. Yeah but I think that could help with the hand-eye coordination. Uh, or you know the game, the duck game, or the hen game where you have to, there’s a maze with like the cars going and you gotta cross.

Bethany: Is it a video game?

Mandy: They have it, let me just show you. Younger kids might enjoy that game a little I don’t know. Maybe not. Crossy Road!

Bethany: It’s called what?

Mandy: Crossy Road.

Bethany: I’ve never seen it before. So it’s on the phone?

Mandy: They also have it at the student union where they have the pool and foosball. They have a little arcade game that has like Pacman and those things. I don’t know if this would work, but you have to wait and I don’t know if that would work. Ooo another game!

Bethany: I mean it may not be the exact same one but something that’s similar to it.

Mandy: Another one is Cooking Mama because the kids have to use both hands to get the sugar get the bread get the flour, move it, turn it, stir it. You can use your less dominant hand to stir and get the spices I don’t know. Younger kids may like it better than older kids. Like football the older kids would like it a little bit better. And skiing also because anybody could do the skiing also. I don’t know. I don’t know if it will work but.

Bethany: You’ve kind of answered this a little bit already, but I will ask it anyway. Do you think this could be helpful to other populations? Why? So do you think the VR would be helpful to different types of people?

Mandy: With disabilities or anybody?

Bethany: That’s for you to answer. So if you think it would help somebody that has a certain disability you could tell me that or what populations you feel like it would help.

Mandy: I guess normal would enjoy it but specifically people who have brain damage because not being able to use your one of your hands or both hands or your legs, learning how to stand while doing it or uhm Cerebral Palsy can help with that. People who are paralyzed that can see that your hand is normal. And you can learn how to help hold the bat with it and hold it tight and learning to regain some of the motions with it. People who have general anxiety or depression.

Bethany: Why would that necessarily help them?

Mandy: Because you’re not in the real reality and you’re in this reality and the stress level goes down because you are focused on baseball or skiing, or snowboarding or Everest or anything. And when you take it off you are still in the virtual reality mode and while you’re still you’re here you take it off it makes you feel better and happier because the stress went down.
Bethany: So when you mentioned people of various disabilities you said it’s helpful because when you’re in the world you see that your hand is normal. Is there any other benefit that you see by using the virtual reality other than just the appearance that your hands work appropriately?

Mandy: It’s like besides the hand you enjoy being a kid again. You enjoy trying to do the baseball. Like a lot of people played video games growing up and it’s like a real life video game and that motivates themselves to reach that goal like getting to the next level for baseball and getting your high score up and seeing what you can do climbing up Everest or skiing. If both hands work it doesn’t even matter it’s just having fun in virtual reality. Another things is I thought about it people with ADHD they have to focus and be more attentive, that the right word?

Bethany: Mhm.

Mandy: In doing baseball like hitting the bat you like instead of wandering off like ‘oh, oh look at the sky . . .’ instead of doing many different things you have to do focus on playing baseball. Is that is that, that could help them in school, paying more attention in school, looking outside, drawing, waiting for lunch. I think my friend has that she can’t stay still at all. But I think that could help them.

Bethany: What improvements could be made to the training programs that could make the experience better overall (i.e. longer duration, more variety in programs)?

Mandy: I think they should get something to put gloves on your feet or a bracelet to use your legs too. Because then you can do skiing for real by moving your legs by standing or stepping. Or like playing soccer or moving your leg to hit the ball. That’s strengthening your leg to be able to walk. Those kind of things that you can’t do right now.

Bethany: What is your height?
Mandy: 5’ 3”

Bethany: What is your weight?
Mandy: 105 lbs

Bethany: What is your race?
Mandy: Caucasian
APPENDIX C: IRB LETTER OF APPROVAL
Approval of Human Research

From: UCF Institutional Review Board #1
FWA00000351, IRB00001138
To: Megan Nickels and Co-Pls: Bethany Diane Fralish, Jeanette Garcia, Rebecca A. Hines
Date: April 28, 2017

Dear Researcher:

On 04/28/2017 the IRB approved the following human participant research until 04/27/2018 inclusive:

Type of Review: UCF Initial Review Submission Form
                Expedited Review
Project Title: Examining Physiological Response, Quality of Life, and Educational Gains through Virtual Reality Immersion for Children with Critical Illness
Investigator: Megan Nickels, Ph.D.
IRB Number: SBE-17-12921
Funding Agency: n/a
Grant Title: n/a
Research ID: n/a

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30 days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form cannot be used to extend the approval period of a study. All forms may be completed and submitted online at [https://iris.research.ucf.edu].

If continuing review approval is not granted before the expiration date of 04/27/2018, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in IRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

All data, including signed consent forms if applicable, must be retained and secured per protocol for a minimum of five years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained and secured per protocol. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

IRB Chair

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