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Comparison Between Standard HABIT and HABIT-VR: Hand-Arm Function and Patient Acceptability Differences

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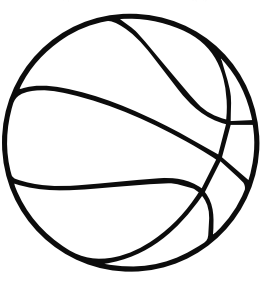
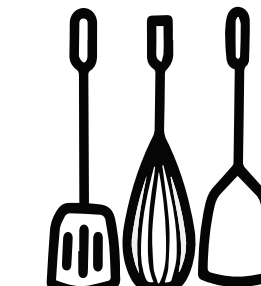
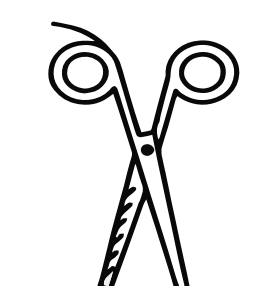
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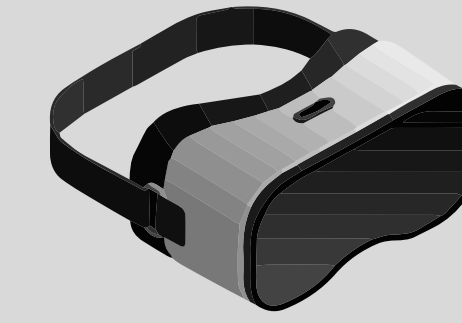
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Background

- Cerebral Palsy (CP) is a disability that stems from an injury to the brain early in development that can lead to movement impairments. 
- In Unilateral CP, the impairments can be localized to one side of the body, making everyday activities such as getting dressed or playing sports difficult.
- Hand-Arm Bimanual Intensive Therapy (HABIT) is for children with Unilateral CP; the goal of HABIT Camp is to improve motor control of the affected arm through participating in bimanual activities (Fig. 1). 
- HABIT-VR has the same goals as HABIT but includes placing a VR headset on and playing virtual games by moving both hands (Fig. 2).
- HABIT Camp activities are self-selected and include games or crafts that require two hands. HABIT-VR Camp also includes self-selected, fun, bimanual activities, but in virtual reality.
- The limitations of HABIT Camp include the need for one-on-one supervision, cost, lack of accessibility, participant exhaustion, and reduced motivation. 
- Virtual Reality was selected as the alternative to standard HABIT, because it is relatively inexpensive, portable, scalable, and engaging (Fig. 3).

Purpose

We want to determine if HABIT-VR will increase bimanual coordination and hand-arm function comparably to HABIT, as well as be accepted comparably with HABIT by children with CP. 

Methods

Pre- and Post- Assessments

- Assisting Hand Assessment (AHA) - bimanual skill
- Box and Blocks Test - gross motor
- Nine Hole Peg Test - fine motor

One HABIT Camp and one HABIT-VR Camp will be run

- Each will be 10 days for 40 hours total.
- Each will have approximately 10 participants (ages 7-15).
- Each participant will have a one-on-one interventionist there to assist, scale, and record information.

If HABIT-VR improves bimanual use as well as or more than HABIT, then HABIT-VR can be distributed to patients in homes and schools.



Figure 1. Standard HABIT Camp activities include playing card games, enjoying time at the splash pad, and volleyball.



Figure 2. HABIT-VR Camp consists of children using both hands to play virtual games.

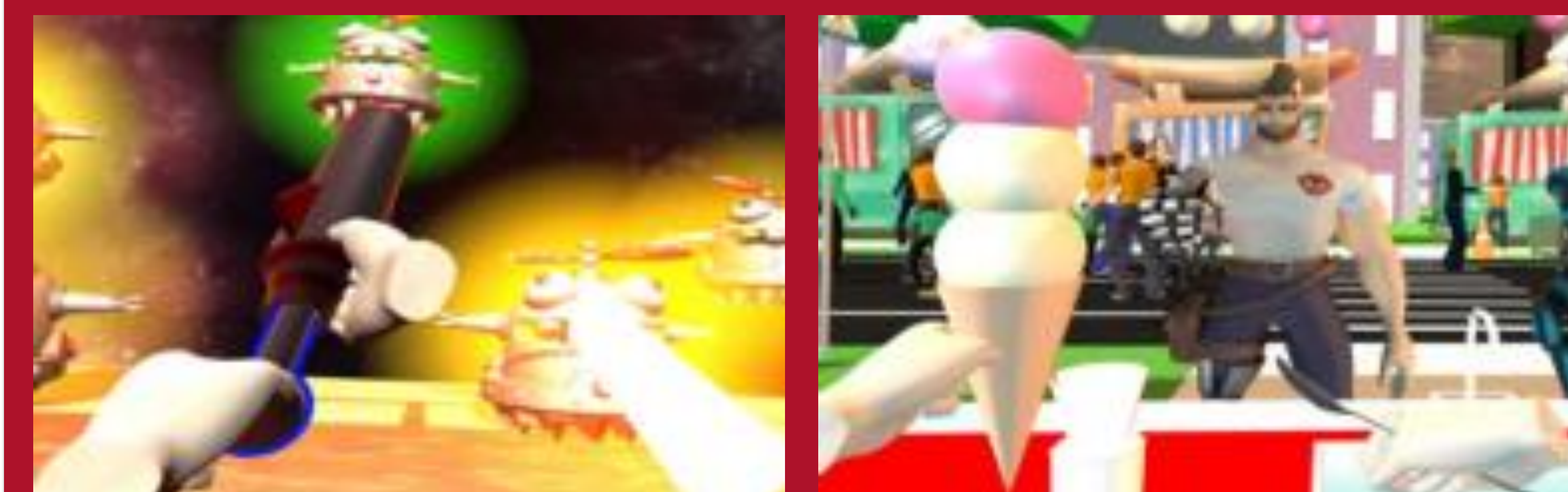



Figure 3. Launching rockets and serving ice cream are two of the games that can be played in virtual reality.

Methods (cont.)

- 1 We will assess changes in hand-arm function using 3x2 mixed ANOVAs (HABIT-VR/HABIT x pre/post-treatment x unaffected/affected arm). It is crucial to show that HABIT-VR increases hand-arm function in order for it to be deemed a valid therapy modality.
- 2 We will determine the acceptability of the camps with a daily post-camp survey assessing enjoyment, physical fatigue, and mental fatigue with a pictorial Likert scale. Measuring acceptability is necessary, because children will not continue with the therapy unless it is enjoyable.
- 3 We will validate the camp surveys with data collected from Empatica E4's, which are devices worn on the wrist that collect physiological responses such as heart rate, skin temperature, galvanic skin response, and acceleration. 

Expected Results

- We want to determine if HABIT-VR produces improvement in hand-arm bimanual use at an equal to or higher level than standard HABIT. We should only utilize this software if it produces similar successful outcomes to standard HABIT.
- We want to assess if HABIT-VR is accepted at an equal or higher level than standard HABIT. Children are less likely to play the virtual reality games if they do not enjoy them or are not motivated by them.
- If it is shown that HABIT-VR improves bimanual use and acceptability at an equal to or higher level than standard HABIT, then HABIT-VR could be distributed so that patients have access to a therapy modality in home or school settings.

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