# Software Requirements Specification

Version 4.0
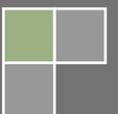
# Revision Signatures

In signing below, each team member acknowledges that he/she has read the following document, given feedback as to the completeness of the document, and checked the document for grammatical and typographical errors.

| Member Name | Signature | Date Signed |
|---|---|---|
| Kevin Lawhon | | |
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# Revision History

The chart below demonstrates revisions on the current document:

| Version | Changes Made | Date Edited |
|---|---|---|
| **Version 1.0** | *Initial  Version* | *10/11/2011* |
| **Version 1.1** | *Updated page numbering, added information to reflect client meeting, added updated use cases, prototypes etc.* | *11/6/2011* |
| **Version 1.2** | *Updated use cases and left justified the section to reflect recent changes following the review of the Design Document. Removed references to Sequenced Sessions* | *11/12/2011* |
| **Version 1.3** | *Updated use cases and Web Application Prototypes. Made many minor edits to the text.* | *12/13/2011* |
| **Version 2.0** | *Minor edits to the text. Removed System Architecture diagram to the Design Document. Added activity requirements.* | 2/10/2012 |
| **Version 3.0** | *Updated naming conversions and minor text changes.* | 4/26/20122 |
| **Version 4.0** | *Modifications to the Use Cases. Modifications to the functional and activity requirements. Minor editing on the Purpose, Intended Audience and Scope and Objectives sections.* | 5/7/2012 |

# Contents

*TheraTouch*

# 1.Introduction

## 1.1. Purpose

This document contains the functional and non-functional requirements for the TCU Computer Science Department 2012 Senior Design project, *TheraTouch*. The sections included outline the technical requirements of the project and are based on the needs of the rehabilitation therapists at Texas Health Resources.

## 1.2. Intended Audience

This specific document is intended to give the *TheraTouch* development team a reference as to the needs of the project, as well as provide Texas Health Resources with a set of verifiable requirements. Our main client providing feedback regarding all requirements is Jeanie Parsley, the Director of Physical Medicine & Rehabilitation Clinic at Texas Health Harris Methodist -HEB. In addition, Mike Skupien and Dr. Malcom Stewart will provide a necessary knowledgebase that will greatly benefit the success of the project.

## 1.3. Scope and Objectives

The objective of *TheraTouch* is to work with representatives from Texas Health Resources in order to develop a system that utilizes the multi-touch technology of the Microsoft Surface in a therapy setting to rehabilitate patients and track their progress. Not only can positive physical results be expected from the use of this system, but also cognitive and physical growth and improvement. By using activities that capture accuracy, speed, and other measurable actions, statistics will be collected and gathered into reports for Physicians and Physical Therapists to review. The software created by *TheraTouch* will provide an interesting way for patients to heal using latest technologies.

The Fall Semester will have a focus on creating a common framework and web application, as well as creating the initial documentation to facilitate future development.

In the Spring Semester, the complete focus shall be on activity development, followed by testing and integration into a THR Therapy Clinic. Each activity completed, whether created for cognitive or physical therapy use, will allow for a wider range of patient use and benefit.

## 1.4. References

Healing Touch Project
    http://brazos.cs.tcu.edu/1011

Microsoft Surface SDK 1.0 Surface
    http://msdn.microsoft.com/en-us/library/ee804767%28v=surface.10%29.aspx

Microsoft XNA Framework Class Library
    http://msdn.microsoft.com/en-us/library/bb203940.aspx

Microsoft SQL Server Database API
    http://msdn.microsoft.com/en-us/library/dd206988.aspx

Wall Street Journal Tablet Therapy Article

    http://online.wsj.com/article/SB10001424053111903461104576460421541902088.html

YouTube Video-Interactive Video Games for Rehab

    http://www.youtube.com/watch?v=J5WIMoJm5Kc

Wall Street Journal Video on Multi-touch Therapy for Autistic Children

    http://online.wsj.com/video/using-multitouch-therapy-to-reach-autistic-kids/C91DDB68-7F42-4229-A7ED-58314672130B.html

## 1.5. Overview

*TheraTouch* will consist of a Microsoft Surface unit with a framework to support multiple software activities developed to support a wide range of therapeutic practices. Each activity will gather reaction information and allow the client to analyze results for diagnostic and treatment purposes.  The Surface will be connected to a database that will store all relevant information for the activities, along with partial patient information and past visit results.  A clinician web application will be connected to the system for entering information into the database.

The project shall be given to Texas Health Resources upon completion with the goal of integrating the database with their existing system. The *TheraTouch* team will work closely with THR to ensure a smooth incorporation of the completed system into actual therapeutic practice.

*TheraTouch*

# 2. Glossary

| | |
|---|---|
| **Activity** | A task on the Surface used to assess a patient's cognitive and physical condition. |
| **Clinician** | The staff member that is expected to assist users during a Session. |
| **Cognitive** | Scientific term for a mental process |
| **Freeplay** | An activity mode in which no information is collected or saved to the database. No user login required. |
| **HIPAA** | Health Insurance Portability and Accountability Act |
| **Manager** | The staff member that can perform all the actions the other staff members can perform, as well as Manager only functions. |
| **Microsoft Surface** | A multi-touch tabletop hardware device developed by Microsoft used as the device for therapeutic activities to be performed on. |
| **Practice Mode** | An activity mode that can be selected from a session before that activity is played in Session Mode. No information is gathered or saved to the database. Activities launched in practice mode run under the same settings that they would in Session Mode. |
| **Session** | A set of pre-determined activities on the Surface that will be used during patient therapy. |
| **Session Controller** | The class used to handle sessions in the Surface framework. |
| **Session Mode** | An activity mode that is used to generate and gather data from session activities that are then stored to the database. Launches with settings that were specified in the web application when the session was created. |
| **Staff** | A category of actors that includes Manager and Clinician. |
| **TheraID** | An auto-generated number assigned to each user by the TheraLink web application. |
| **TheraLink** | The Clinician Web Application that is used to control the TheraTouch framework. |
| **Therapeutic** | Relating to the treatment of disease, injury, or disorders by remedial methods |
| **TheraTouch** | The TCU Computer Science 2012 Senior Design Project and framework. |
| **THR** | Texas Health Resources is the client for this project. |
| **User** | The actor that will be on the Surface playing the activities |
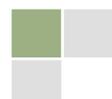
# 3. General Description

## 3.1. Product Perspective

*TheraTouch* is being designed for use in a clinical environment at Texas Health Resources. It will be used in the treatment of physical and cognitive therapy patients. The framework will be composed of three interconnected systems; a database server to contain patient information and results, a Microsoft Surface unit to perform activities, and a clinician web application to analyze the resulting information and control settings for each therapy session.

## 3.2. Product Functions

The focus of *TheraTouch* is to aid the recovery of physical and cognitive therapy patients by allowing them to perform engaging activities on the Microsoft Surface unit and measuring their performance for analysis by a medically licensed professional. This performance information will be collected and stored in the database. The clinician can access this information through a web interface, and check the resulting information. Different reports can then be generated to assist the clinician in diagnosing and treating their patients.

## 3.3. User Characteristics

There are two major categories of users for the *TheraTouch* system; users and staff. A minor category includes the information technology support staff at Texas Health Resources.

### 3.3.1. Users

Users may be a diverse group, but have a slight tendency towards being elderly. Since users will likely be recovering from a physical or cognitive injury, their morale may be low, necessitating a fun and engaging system to facilitate recovery.

### 3.3.2. Staff

There are two categories of staff members at THR: Manager and Clinicians.

#### 3.3.2.1. Manager

The manager role has access to all capabilities of the clinician web application, including administrative functions such as adding other staff members.

#### 3.3.2.2. Clinician

Initialization will be performed by the clinician before users begin their activities, as well as analyzing the resulting data after therapy sessions. Therapists often must work with various complex systems, and therefore the *TheraTouch* user interface should be relatively simple to operate with minimal training.

### 3.3.3. THR Technical Support Staff

A third category of users will be the supporting IT department at Texas Health Resources. Since the goal of *TheraTouch* is to provide a fully functional system to be used in an actual clinical setting, the IT department will likely have a large role in the deploying, maintenance, and potential future upgrades of the system.

## 3.4. Operating Environment

The *TheraTouch* framework will be distributed over several systems that will be connected via Texas Health Resource's computer network:

**Activity Framework**

- Microsoft Surface Unit (Version 1.1)
- Microsoft Windows Vista 32bit

**Database Framework**

- Microsoft SQL Server 2008 R2

**Clinician Framework**

- Networked computers with modern browser
- Microsoft IIS 7.5
- Microsoft .NET Framework 4.0

## 3.5. General Constraints

| | |
|---|---|
| **Resource Constraints** | - Team members will only be available on a part-time basis due to employment and other class obligations<br>- Contacts are intermittently unavailable during project specification<br>- Too many contacts can lead to lengthy response times<br>- Working with multiple customers from different backgrounds and goals<br>- Technical issues may occur with Microsoft Surface or Development Workstations<br>- Equipment used at THR is unfamiliar |
| **Delivery Constraints** | - Project deadline is limited to May 2012<br>- Deliverables may require working days for review |
| **Environmental Constraints** | - Development environment is unfamiliar to team members<br>- Must incorporate former framework<br>- Compatibility of *TheraTouch* system with THR system may be an issue |
| **Functionality Constraints** | - Microsoft Surface has a limited response time due to hardware limitations<br>- Reports on clinician web application may be vague due to lack of access to user's full medical history<br>- Part of project depends on receiving patient information from THR system<br>- Activities must be user-friendly for many different types of patients |

## 3.6. Assumptions and Dependencies

**Microsoft Surface**

- We are assuming the Microsoft Surface unit that is donated by Radio Shack will be configured similarly to the units used for development.

**Texas Health Resources Network**

- The network at Texas Health Resources will be configured to allow all necessary database communication between the different *TheraTouch* components.

# 4. System Architecture



**Network Printer**

**TheraTouch Backend**

TheraLink Web Server    Database Server

User Tag Data

User Data

Session Data

Activity Results

**WAP**

**WAN (Internet)**

User Data

Session Data

Activity Results

User Tag Data

Session Data

Activity Results

**TheraLink Staff Workstation (Frontend)**

Wired    Wireless

**TheraTouch (Microsoft Surface v1.1)**

*TheraTouch*
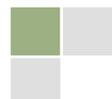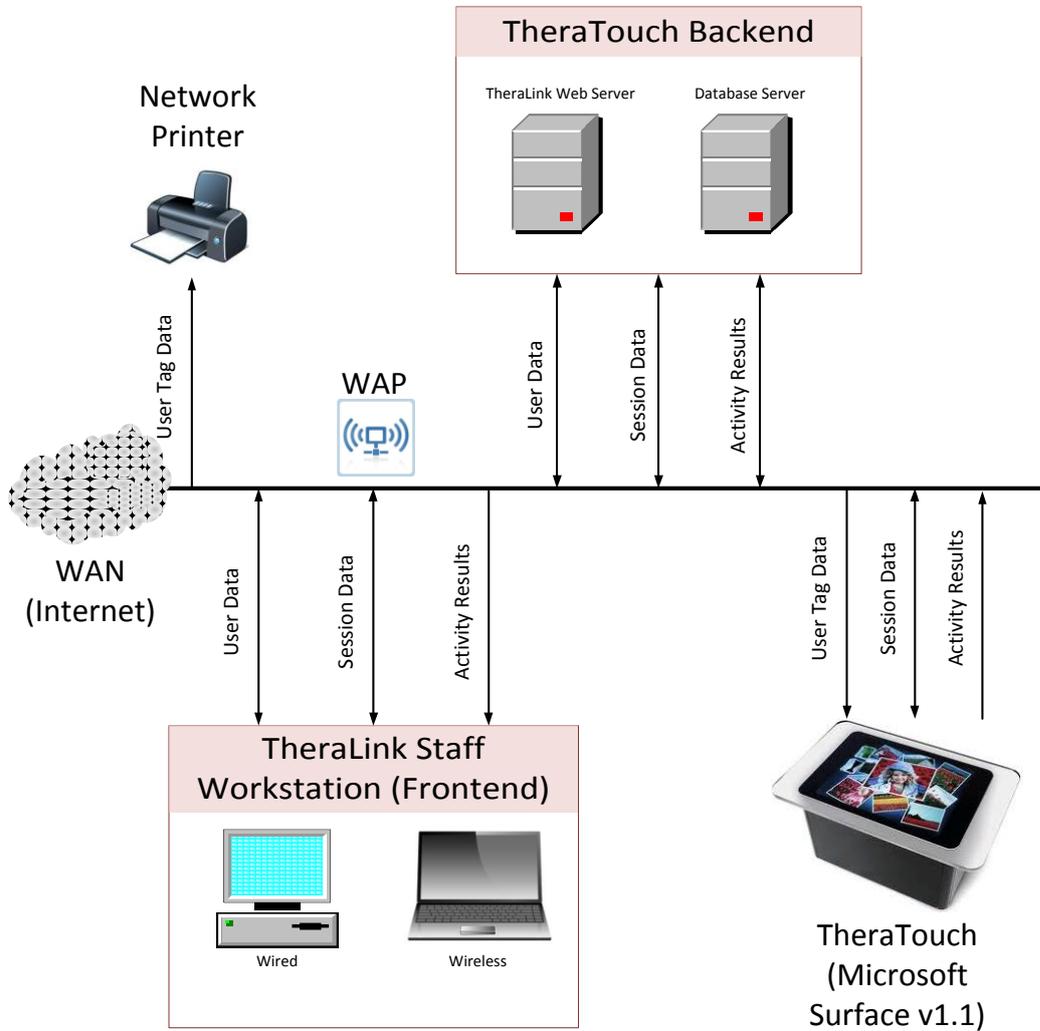
## 4.1. Clinician Web Application

The Clinician Web Application shall connect to the database to store and retrieve all information pertaining to the user. The application shall also be able to create and edit the configuration information for all activities deployed on the Microsoft Surface through the database.

During user setup, the clinician will have the ability to insert user information such as name, date of birth, and other patient-specific attributes. Only the *TheraID* and medical record number will be stored in related tables in the database for recall later. The *TheraID* number will remain assigned to the user, and will act as their "login" key for the Microsoft Surface. This identifier is the only method of associating an actual patient to their records in the database.

For each therapy session, the clinician will use the application to choose activities to be utilized based on user needs. After the activities have been selected, there will be options available to personalize, such as speed, difficulty level, and other activity specific options.

Another feature of the Clinician web application shall be the ability to run reports based on particular user information. This information can be used for analysis such as tracking user progress, diagnosing, and formulating treatment plans.

## 4.2. Database

The database shall store user *TheraID*, medical record number, activity configurations, and activity results. The database will act as the link between the Clinician web application and the framework on the Microsoft Surface. Staff credentials and access levels will also be stored in the database.

## 4.3. Microsoft Surface

The Microsoft Surface shall contain all activity software and shall connect to the database for activity settings and user-specific activity instructions. The Surface framework will have several different modes. In Freeplay Mode, no information is collected or returned to the database. Sessions specified by the Clinician web application are loaded by the framework. The activities will gather information about the user's responses. This statistical data will be submitted to the database for storage, allowing the Clinician Web Application access to the information for analysis by the clinician.
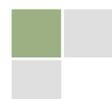
# 5. External Interface Requirements

## 5.1. User Interfaces

### 5.1.1. Surface

There will be two main modes that the framework can run in; Free Play and Session Mode. See Appendix B.

In Freeplay, activities will be accessed by starting the activities framework and selecting a game. No user needs to be logged in, and no information will be sent to the database. The user can also select and change any of the options that the activity defines.

In Session Mode, a user must be logged in. The user can select and perform activities in the order that they so choose.  Activities available to the user are specified by the staff therapists in the Clinician web application prior to the therapy session. Information gathered during each activity is sent to the database.

### 5.1.2. Clinician Web Application

The Clinician interface will be a web application written in ASP.NET. It will provide capabilities to Add New Users, View and Modify User Data, View Individual Reports and Overall Reports, modify all activity settings, and create sessions. See Appendix C.

## 5.2. Hardware Interface

The Activities framework will be hosted on a Microsoft Surface (Version 1.1) unit. The Clinician web application will be accessible through a PC with a network connection.

## 5.3. Software Interface

Clinician workstations that are expected to connect to the Clinician Web Application will need a modern web browser that supports JavaScript and Ajax.

## 5.4. Communication Interface

The Surface unit will connect to THR's computer network. The Clinician Web Application and database will also be on THR's network.

# 6.Functional Requirements

## 6.1. General Requirements

GEN01

The system shall allow a user to practice and perform activities in a game format for the purpose of rehabilitation and monitoring by a clinician.

GEN02

The system shall create reports of statistical data pertaining to tests.

GEN03

The system shall use a multi-touch Microsoft Surface device.

GEN04

The system shall be designed generically to allow for additional activities.

## 6.2. Clinician Web Application (*TheraLink*) Requirements

### 6.2.1. Login

CLI01
All *TheraLink* users shall be able to login to the application.

CLI02
Staff will be classified under two different roles – clinicians, and managers. Each role will have varied functionality

### 6.2.2. Add User

CLI03
*TheraLink* shall provide the ability to register a new user with Name, Date of Birth, Gender, and Medical Record Number.

CLI04
*TheraLink* shall provide an area to add additional information about a user such as notes.

### 6.2.3. Print

CLI05
Managers shall have the functionality to re-print user tags if necessary.

CLI06
Clinicians and managers shall have the ability to print reports over user progress.

### 6.2.4. Reports

CLI07
The clinician shall be provided with pre-packaged reports.

### 6.2.5. Create Session Modes

CLI08
*TheraLink* shall provide clinicians with the ability to choose activities for a user therapy session.

CLI09
Activity options shall be configured in *TheraLink* after selecting activities.

CLI10
Staff shall have the ability to lock the order of the activities to be played in the session.

### 6.2.6. Manage *TheraLink*

CLI11
Managers shall have administrative rights to *TheraLink* to enter credentials for new managers and clinicians.

CLI12
Managers shall be able to activate/deactivate users

CLI13
Managers shall be able to restore an interrupted session

## 6.2.7. Logout

CLI14
All staff shall have the ability to logout of the *TheraLink* after use.

## 6.3. Database Requirements

DBA01
The database shall store all of the resulting data from activities in Session Mode.

DBA02
The database shall store the settings associated with the resulting data from activities.

DBA05
The database shall store credentials and access levels for staff members.

## 6.4. Surface Requirements

SUR01
The Surface Framework shall allow access to Freeplay mode without the need to log in.

SUR02
The Surface Framework shall require users to login before accessing session or practice modes.

SUR03
The Surface Framework shall load the next session for a user, if it exists, upon login.

SUR04
The Surface Framework shall throw an error if a valid open session is not in the database for a user.

SUR05
The Surface Framework shall allow staff members to interrupt a session with an ID tag.

SUR06
The Surface Framework shall handle database connectivity for the activities.

## 6.5. Activity Requirements

ACT01
Activities shall have a demo that can be viewed before starting.

ACT02
Each Activity shall offer options for preferences – eg. Easy/Hard, Color/B&W

ACT03
Activities shall capture statistical information on user's responses.

## 6.6. Alternate Trail Making Requirements

ATM01
Functionality
User shall draw a path by selecting objects in order from smallest to largest while following the pattern (i.e. small circle > small triangle > medium circle > medium triangle > large circle > large triangle…). Activity is complete when Submit button is pressed.

ATM02
Activity Options
ATM shall implement Total Number and Path Type as activity options. Total Number will be an even number option between 2 and 10 and Path Type will be a choice between number/letter and shape/shape.

ATM03
Information Recorded
ATM shall return Time Elapsed, Shapes Found, Correct Path, Patients Path, Possible Paths, Correct Paths, and Accuracy. Time Elapsed will be returned in seconds, Shapes Found will be an integer, Correct Path consists of pairs indicating the correct path to take, Patient Path consists of pairs indicating which path that the patient took, Possible Paths will be an integer, Correct Paths will be an integer, and Accuracy will be the percentage of correct path segments.

## 6.7. Block Bash Requirements

BB01
Functionality
User shall match three-dimensional blocks placed in the bottom tray to shapes shown on the screen based upon color, shape, and rotation. Medium and Hard levels of activity present a tanagram that the user shall solve using blocks placed in bottom tray. Activity is complete when Submit button is pressed.

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BB02

Activity Options

BB shall implement Difficulty as the only activity option. Difficulty will be easy, medium, or hard, where easy consists of randomly placed blocks, medium is a filled in tangram, and hard is the outline of a tangram.

BB03

Information Recorded

BB shall return Time Elapsed, Average Error, Correct Blocks, and Accuracy. Time Elapsed will be returned in seconds, Average Error will be the average error of all correct blocks in inches, Correct Blocks will be the number of blocks that are fairly close to their targets, and Accuracy will be the percentage of correct blocks to total blocks.

# 6.8. Bubble Pop Requirements

BP01

Functionality

User shall use their finger to "pop", or touch, only the bubbles on the screen. Activity is complete when all bubbles have been successfully popped.

BP02

Activity Options

BP shall implement Bubble Size and Number of Bubbles as activity options. Bubble Size will range from x-small to x-large, and Number of Bubbles will be a multiple of 5 between 10 and 30.

BP03

Information Recorded

BP shall return Time Elapsed and Accuracy. Time Elapsed will be returned in seconds and Accuracy will be the percentage of bubble hits compare to all hits registered by the Surface.

# 6.9. Card Match Requirements

CM01

Functionality

User shall select 2 cards at a time while attempting to find a match. Cards revealed with matching images will disappear. Activity is complete when all matches have been found and all cards have disappeared.

CM02

Activity Options

CM shall implement Grid Size, Shape Types, and Timer Enabled as activity options. Grid Size will be 2x2, 4x4, or 6x6, Shape Types will be either fruits, basic shapes, or random, and Timer Enabled will be True or False.
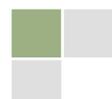
CM03

Information Recorded

CM shall return Time Elapsed, Accuracy, Total Tries, and Number of Wrong Selections. Time Elapsed will be returned in seconds, Accuracy will be correct tries over total tries, Total Tries will be an integer, and Number of Wrong Selections will be an integer.

## 6.10. Find The Way Requirements

FTW01

Functionality

User shall navigate the character through the selected floor plan using the arrow buttons. The therapist can assign goals for the user to achieve as they move around the screen (i.e. "Find the fastest way to the bathroom"). Activity is complete when the Quit button is pressed.

FTW02

Activity Options

FTW shall not implement any activity options

FTW03

Information Recorded

FTW shall not return any results

## 6.11. Maze Requirements

MZ01

Functionality

User shall draw a path to solve the maze displayed. Activity is complete when Finish is reached.

MZ02

Activity Options

MZ shall implement Difficulty as the only activity option. Each difficulty (Easy, Medium, and Hard) will have 10 different mazes.

MZ03

Information Recorded

MZ shall return the Time Elapsed and the number of Wall Hits when the activity finishes. Time Elapsed will be returned in seconds and the number of Wall Hits will be an integer count.

## 6.12. Metronome Requirements

MT01
Functionality
User shall tap dots as they cross into the dotted circle at the bottom of the screen. Dots appear in steady rates set prior to start. If user correctly hits a dot within the target area, the hot air balloon with rise. If a dot is missed or hit too early/late, the hot air balloon with gently fall. Activity is complete when the pre-defined time limit has been reached.

MT02
Activity Options
MT shall implement Speed and Total Time as activity options. Speed is an integer between 1 and 6 and Total Time is a multiple of 15 between 15 and 120.

MT03
Information Recorded
MT shall return Time Elapsed, Accuracy, Correct Hits, Wrong Hits, and Total Buttons Created. Time Elapsed will be returned in seconds, Accuracy will be correct hits over total hits on the Surface, Correct Hits will be an integer, Wrong Hits will be an integer, and Total Buttons Created will be an integer.

## 6.13. Odd One Out Requirements

OOO01
Functionality
User shall select the image that does not properly belong within the set of images they are presented. Activity is complete when previously set number of rounds has been reached.

OOO02
Activity Options
OOO shall implement Number of Tiles, Number of Rounds, Shape Types, and Timer Enabled as activity options. The Number of Tiles will be an integer between 4 and 8, the Number of Rounds option will be an integer between 3 and 10, Shapes Types will be either shapes or random, and the Timer Enabled option will either be true or false.

OOO03
Information Recorded
OOO shall return Time Elapsed, Accuracy, Number of Tries, and Number of Misses. Time Elapsed will be returned in seconds, Accuracy will be correct selections over total selections, Number of Tries will be an integer, and Number of Misses will be an integer.

## 6.14. Path Track Requirements

PT01
Functionality
User shall recreate the path displayed for them on the following screen containing a blank grid. Activity is complete when all rounds are submitted.

PT02
Activity Options
PT shall implement Size, Turns, Rounds, Length, and Show Errors as activity options. Size options include 4x4, 5x5, and 6x6, Turns is an integer between 0 and 5, Rounds is an integer between 1 and 8, Length is an integer between 5 and 10, and Show Errors is either yes or no.

PT03
Information Recorded
PT shall return the Time Elapsed, Path, Misses, Accuracy, and Incorrect Tiles. Time Elapsed will be returned in seconds, Path will be a list of integers, Misses will be an integer, Accuracy will be the percentage of correct tiles over total selected tiles, and Incorrect Tiles will be an integer.

## 6.15. Seek Shape Requirements

SS01
Functionality
User shall identify and select all instances of the shape originally displayed to them. Activity is complete when Submit button is pressed.

SS02
Activity Options
SS shall implement Number of Distinct, Total Shapes, and Shape Type as activity options. Number Distinct will be an integer value between 2 and 5, Total Shapes will be a multiple of 5 between 10 and 50, and Shape Type will be either shape, letter, or number.

SS03
Information Recorded
SS shall return Time Elapsed, Shapes Found, Wrong Hits, Quad 1-4, Total Shapes, and Accuracy. Time Elapsed will be returned in seconds, Shapes Found will be an integer, Wrong Hits will be an integer, Quad 1-4 will be four values with each value representing the ratio of correct selections in a quadrant (Lower/Upper, Left/Right), Total Shapes will be an integer, and Accuracy will be the percentage of total shapes found to total hits.

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## 6.16. Sequence Requirements

SQ01
Functionality
User shall drag images to their appropriate place in the ordered set. Once submitted, user will have the opportunity for additional attempts until correct. Activity is complete when the sequence is correctly submitted.

SQ02
Activity Options
SQ shall implement Words, Highlight, and Sequence Type as activity options. Words shall be a Boolean, Highlight shall be a Boolean, and Sequence Type will be either get dressed, mail a letter, make pasta, or brush teeth.

SQ03
Information Recorded
SQ shall return Time Elapsed, Accuracy, and Number of Attempts. Time Elapsed will be returned in seconds, Accuracy is [Undefined], and Number of Attempts will be an integer.

## 6.17. Shape Match Requirements

SM01
Functionality
User shall identify if the previous object displayed matches the current object displayed using the "Match" and "Not a Match" buttons.  Activity is complete when sequence is finished.

SM02
Activity Options
SM shall implement Sequence Length, Number of Shapes, and Shape Type as activity options. Sequence Length is an integer between 5 and 25, Number of Shapes is an integer between 2 and 5, and Shape Type is either Shapes, Numbers, or Letters.

SM03
Information Recorded
SM shall return the Time Elapsed, Accuracy and the Number Correct. Time Elapsed will be returned in seconds, Accuracy will be number correct over total tries, and the Number Correct will be an integer.

# 6.18. Vending Machine Requirements

VM01
Functionality
User shall drag money from the money tray to purchase items from the vending machine using exact change. Activity is complete when the number of rounds is reached.

VM02
Activity Options
VM shall implement Display Total, Number of Rounds, and Limited Supply as activity options. Display Total is either on or off, Limited Supply is either on or off, and Number of Rounds will be an integer between 4 and 9.

VM03
Information Recorded
VM shall return Time Elapsed, Accuracy, and Change. Time Elapsed will be returned in seconds, Accuracy is rounds with exact change over total rounds, and Change is a monetary amount for each round.

# 6.19. What Time Is It Requirements

WTII01
Functionality
User shall set either a digital or analog clock based upon the time displayed on the opposite clock. Activity is complete when the number of rounds has been reached.

WTII02
Activity Options
WTII shall implement Type and Number of Rounds as activity options. Type is either digital to analog or analog to digital and Number of Rounds is an integer between 4 and 10.

WTII03
Information Recorded
WTII shall return Time Elapsed and Accuracy. Time Elapsed will be returned in seconds and Accuracy will be number of rounds over total attempted rounds.

## 6.20. Wipe the Table Requirements

WTT01
Functionality
User shall use a sponge or hand to wipe away blobs that appear on the screen in chronological order (if ordered option specified). Activity is complete when the numbers of blobs defined have been successfully wiped away.

WTT02
Activity Options
WTT shall implement Color, Wipe, Ordered, Number of Blobs, Wait Time, and Fade Time as activity options. Color will be a Boolean, Wipe will be a Boolean, Ordered will be a Boolean, Number of Blobs will be an integer between 5 and 25, Wait Time will be an integer between 1 and 5 and Fade Time will be an integer between 5 and 20.

WTT03
Information Recorded
WTT shall return Time Elapsed, Accuracy and False Hits. Time Completed will be returned in seconds, Accuracy will be correct wipes over total wipes and False Hits will be returned as an integer count.

# 7. Non-functional Requirements

## 7.1. Product Requirements

NFP01
The activities must respond in a timely manner to user input, approximately $1/60^{th}$ of a second.

NFP02
Information that can be used to discover a user's identity shall not be stored in the database.

## 7.2. Organizational Requirements

NFO01
The Surface framework and activity software shall be developed with a .NET language inside the XNA framework by Microsoft.

NFO02
All logo graphics must be approved through THR and TCU.

## 7.3. External Requirements

NFE1

All information transmitted over the network will be encrypted to ensure the security of user information.

# 8. Domain Specific Requirements

DOM01

The *TheraTouch* project will conform to all applicable HIPAA rules and regulations. Sensitive patient information shall not be stored within the database.
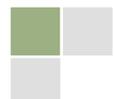
# 9. Appendix

## 9.1. Appendix A: Use Case models
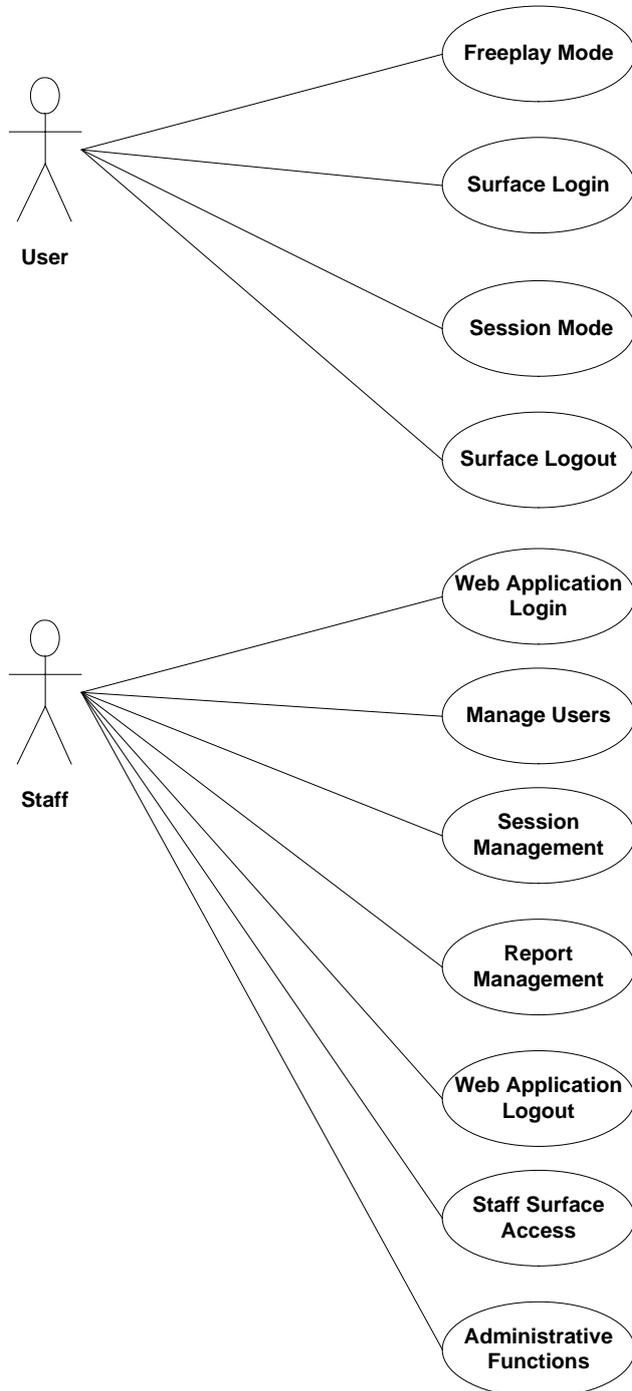
## 9.2. Freeplay Mode

| Freeplay Mode | |
|---|---|
| **Actors** | User |
| **General Goal** | To let the user play any activity for an unlimited time or until the activity finishes. No information is stored in the database. |
| **Pre-Conditions** | The framework needs to be running on the Surface, and the framework should be at the main menu screen. No database connectivity or login is required. |
| **Triggers** | The user selects Freeplay from the main menu screen. |
| **Course of Events** | 1. A list of all available activities is displayed to the user on the Freeplay menu screen.<br>2. The user selects an activity from this screen, and then can choose to play that activity.<br>3. Options for the selected activity can be changed within the application both on the home screen as well as from within the activity's menu screen<br>4. The activity can be played until the user selects the quit button from within the activity's menu screen.<br>5. The user is returned to the Freeplay menu screen. They can choose to play another activity, or exit to the main menu screen. |
| **Alternate Paths** | There are no alternate paths. |
| **Post Conditions** | The Surface will return to the main menu screen. No information is saved to the database. |

## 9.3. Surface Login

| Surface Login | |
|---|---|
| **Actors** | User |
| **General Goal** | To authenticate a user's ID tag and verify they have a session available. |
| **Pre-Conditions** | The user must be set to active in the database, have a valid identification tag, and have a current open session defined. The Surface must be at the main menu screen. |
| **Triggers** | A user identification tag shall be placed on the Surface at the main menu screen. |
| **Course of Events** | Surface validates identification tag and checks to see if a valid session exists for the user. |
| **Alternate Paths** | If there is no network connection to the database, an error message is displayed.<br>If the identification tag is not valid, an error message is displayed.<br>If no session is defined, an error message is displayed. |
| **Post Conditions** | The session home screen is loaded for the user. |

## 9.4. Session Mode

| Session Mode | |
|---|---|
| **Actors** | User |
| **General Goal** | Present a pre-defined set of activities to the user for the purposes of evaluating their performance. Information gathered from playing the activities is saved to the database. |
| **Pre-Conditions** | The user is logged in and at the session menu screen. |
| **Triggers** | A valid Surface Login is the trigger to start the session. |
| **Course of Events** | The session menu screen is displayed to the user. It contains the set of activities predefined for the session. The user can choose to play an activity from the session, practice an activity from the session, or logout of the session.<br><br>If the user wishes to practice an activity:<br>1. The user selects an activity from the displayed set of activities. Only the current activity is selectable if the staff member has specified that the activity order be locked.<br>2. The user presses the Practice button.<br>3. The activity is launched in practice mode. The options in this mode are identical to the options that have been specified for this activity by the staff.<br>4. After the activity has completed, or the user chooses to quit the activity, they are returned to the session menu screen.<br>If the user wishes to play an activity:<br>1. The user selects an activity from the displayed set of activities. Only the current activity is selectable if the staff member has specified that the activity order be locked.<br>2. The user presses the Launch button.<br>3. The activity is launched in Session Mode. Session Mode collects user's activity results.<br>4. After the activity is completed, information gathered from Session Mode is saved to the database.<br>5. The user is returned to the session menu screen. The activity that was just played is disabled so that the user can no longer play that activity. |

| | |
|---|---|
| | If the user wishes to logout:<br>  1. The user presses the logout button.<br>  2. The framework is returned to the main menu screen. |
| **Alternate Paths** | If at any time database connectivity is lost during a session, the session will end, an error message be displayed to the user, and the user will be returned to the main menu screen.<br><br>While the activity is running in session mode, an authorized staff member may use their tag to interrupt the session. This falls under Staff Surface Access use case. |
| **Post Conditions** | After the user is logged out, the user is returned to the main menu screen. |

## 9.5. Surface Log Out

| Surface Log Out | |
|---|---|
| **Actors** | User, Staff Member |
| **General Goal** | To log out the user from Session Mode. |
| **Pre-Conditions** | A user is logged into Session Mode. |
| **Triggers** | There are several possible triggers:<br>• All activities in the session have been completed.<br>• The user selects the logout button from the session menu screen.<br>• The network connection is lost during a session. |
| **Course of Events** | If all the activities in the session have been completed, the database is updated to reflect that the session is complete, a notification message is displayed, and the user is logged out from the session menu screen, and returned to the main menu screen.<br><br>If all the activities have not been completed the framework is returned to the main menu screen and no information is sent to the database |
| **Alternate Paths** | No alternate paths exist. |
| **Post Conditions** | The main menu screen shall be displayed with no user logged in. |

## 9.6. Web Application Login

| Web Application Login | |
|---|---|
| **Actors** | Staff:<br>• Manager<br>• Clinician |
| **General Goal** | To authenticate the staff member's login credentials. This will allow access to the staff web application. |
| **Pre-Conditions** | The user is not logged in, but has network connectivity to the server for the web application. |
| **Triggers** | The user attempts to view any page within the web application when they are not already logged in, or they navigate directly to the login screen. |
| **Course of Events** | 1. The login page is displayed to the user.<br>2. The user enters their username and password.<br>3. The web application verifies the login information with the database.<br>    a. If the login information is valid, the requested web page is displayed to the user. If the requested web page is the login screen, the default web application page is displayed to the user.<br>    b. If the login information is not valid, an error message is displayed to the user. The user remains at the login screen. |
| **Alternate Paths** | If the server can't connect to the database, an error message is displayed. |
| **Post Conditions** | The requested page within the web application is displayed to the user. If the requested page was the login page, then the default web page is loaded. |

## 9.7. Manage users

| Manage Users | |
|---|---|
| **Actors** | Staff:<br>• Manager<br>• Clinician |
| **General Goal** | To add and view user information as well as print identification tags. |
| **Pre-Conditions** | A valid database connection must be present.<br>The staff member must be logged into the web application with the appropriate permissions. |
| **Triggers** | The staff member selects the User Management option from the navigation menu. |
| **Course of Events** | A set of options is displayed to the user including an Add New User button and a View User button.<br>If the Add New User button is pressed:<br>1. Add User page is loaded.<br>2. The staff member shall enter demographic information, initial scores, and assessments.<br>3. The staff member shall press the print tag button to generate a new identification tag.<br>4. Appropriate user information will be saved to the database.<br>5. The staff member shall choose to Save & Return. If the user's tag was not printed, a warning message is displayed to the staff member with the option to print the tag. Otherwise, the staff member is returned to the Manage Users screen.<br>If the View User button is pressed:<br>1. View User page is loaded.<br>2. The staff member enters a TheraID corresponding to the user they wish to view.<br>3. Demographic information about the user is displayed |
| **Alternate Paths** | If the user presses the cancel button from the Add User page, they are returned to the Manage Users page. All modified information is discarded. |
| **Post Conditions** | The database will be updated accordingly with any information that the staff member saved. |

## 9.8. Session Management

| Session Management | |
|---|---|
| **Actors** | Staff:<br>• Manager<br>• Clinician |
| **General Goal** | To add sessions, edit sessions, and view session data. |
| **Pre-Conditions** | The staff member must be logged in to the web application and have valid credentials for session management.<br>A valid database connection must be present. |
| **Triggers** | The Session Management option is selected from the navigation menu. |
| **Course of Events** | If the Add Session button is pressed:<br>1. The Add Session page shall be loaded.<br>2. The staff can add activities and select options for the activities.<br>3. Configure session options such as locking the order of activities.<br>If the View Session button is pressed<br>1. The View Session page shall be loaded and information displayed about that session.<br>2. If the Edit button is pressed, the displayed information can be edited such as modifying or removing activities, adjusting the activity order, or configuring Session options. |
| **Alternate Paths** | The Add Session option will not be visible if the user already had a Current Session defined.<br><br>Editing of non-current sessions is disabled, these can only be viewed. |
| **Post Conditions** | The database will be updated accordingly with any information that the staff member saved. |

## 9.9. Report Management

| Report Management | |
|---|---|
| **Actors** | Staff:<br>• Manager<br>• Clinician |
| **General Goal** | Report Management allows staff members run reports to view information collected from sessions in TheraTouch. |
| **Pre-Conditions** | A valid database connection must be present. |
| **Triggers** | Manage Reports is selected from the navigation menu in the *TheraLink* web application. |
| **Course of Events** | The Report Management page is loaded which displays the reports that can be generated. |
| **Alternate Paths** | No alternate paths exist. |
| **Post Conditions** | No post conditions exist. |
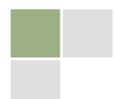
## 9.10. Web Application Logout

| Web Application Logout | |
|---|---|
| **Actors** | Staff:<br>• Manager<br>• Clinician |
| **General Goal** | To log off a staff member from the web application. |
| **Pre-Conditions** | A staff member must first be logged in to the web application. |
| **Triggers** | The staff member shall press the "Logout" button. |
| **Course of Events** | The web application shall return to the Login screen. |
| **Alternate Paths** | No alternative paths exist. |
| **Post Conditions** | The web application shall show the Log In page. If the staff member wishes to access a page within the web application, they must login again. |

## 9.11. Staff Surface Access

| Staff Surface Access | |
|---|---|
| **Actors** | Staff:<br>• Manager<br>• Clinician |
| **General Goal** | The staff member has the ability to control certain actions during a session, such as pause an activity, stop an activity without saving data. |
| **Pre-Conditions** | A User shall be logged into a session.<br>A staff member shall have an identification tag and sufficient credentials. |
| **Triggers** | A Staff member places a tag on the Surface unit. |
| **Course of Events** | 1. Staff member places an identification tag on the surface.<br>2. If an activity is in progress it will pause.<br>3. A menu screen will appear.<br><br>If a user is in an activity, the staff member can resume or quit the activity. |
| **Alternate Paths** | There are no alternate paths. |
| **Post Conditions** | If stop activity is selected, the Surface will return to the session menu screen.<br>If resume activity is selected, the surface will resume the current activity. |

## 9.12. Administrative Functions

| Administrative Functions | |
|---|---|
| **Actors** | Staff:<br>• Manager |
| **General Goal** | The Manager shall be able to add, edit, and remove other staff member accounts. |
| **Pre-Conditions** | The Manager must be logged into the web application. |
| **Triggers** | The Manager selects the Administrative Functions option from the navigation menu. |
| **Course of Events** | A list of current staff is displayed, along with options to Add Staff, Edit Staff, and Remove Staff.<br><br>If the Manager wishes to add a staff member:<br>1. The Manager selects the Add Staff option.<br>2. The Add Staff page will be displayed. The Manager fills out the username, full name, password, and staff access level Clinician or Manager).<br>3. The Manager selects the Save & Return option. The created staff member is added to the database, and the Manager is returned to the Administrative Functions page.<br><br>If the Manager wishes to edit a staff member:<br>1. The Manager selects a staff member from the Administrative Functions page.<br>2. The Manager clicks the Edit Staff option.<br>3. A page is displayed with the current information for the selected staff member, along with the ability to edit the staff member's role.<br><br>If the Manager wishes to remove a staff member:<br>1. The Manager selects a staff member from the Administrative Functions page.<br>2. The Manager selects the Remove Staff option.<br>3. A confirmation page is displayed to the Manager with the option to Confirm Deletion. If they choose Confirm Deletion, the Manager is returned to the Administrative Functions page and the staff member is removed from the database. |

| | |
|---|---|
| | If the Staff Member wishes to Reprint Tags: <br> 1. The staff member selects the user (by TheraID) that they wish to reprint tags for. <br> 2. The staff member is taken to a page similar to the Add User page where they add the appropriate information, and then print the tag. |
| **Alternate Paths** | A Manager cannot remove their own. If they try, then an error message will be displayed. <br><br> A Manager can press the cancel button while adding staff, editing staff, or deleting staff, which will return the manager to the Administrative Functions page. All modified data will be discarded. |
| **Post Conditions** | There is no post condition. |
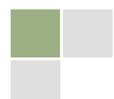
## 9.13. Appendix B: Surface Paper Prototype

| Main Menu Screen | MM_1 |
|---|---|

- Logo -

| Free Play | Tutorial |
|---|---|

- Free Play Button → FP_1
- Tutorial Button (Surface Tutorial) → ST_1
- Valid User/Patient Surface Tag = Login → S_1

Session Controller (Free Play Mode) | FP_1

| Activity 1 | Activity 2 | Activity 3 | Activity 4 | Activity 5 |

Launch | Exit
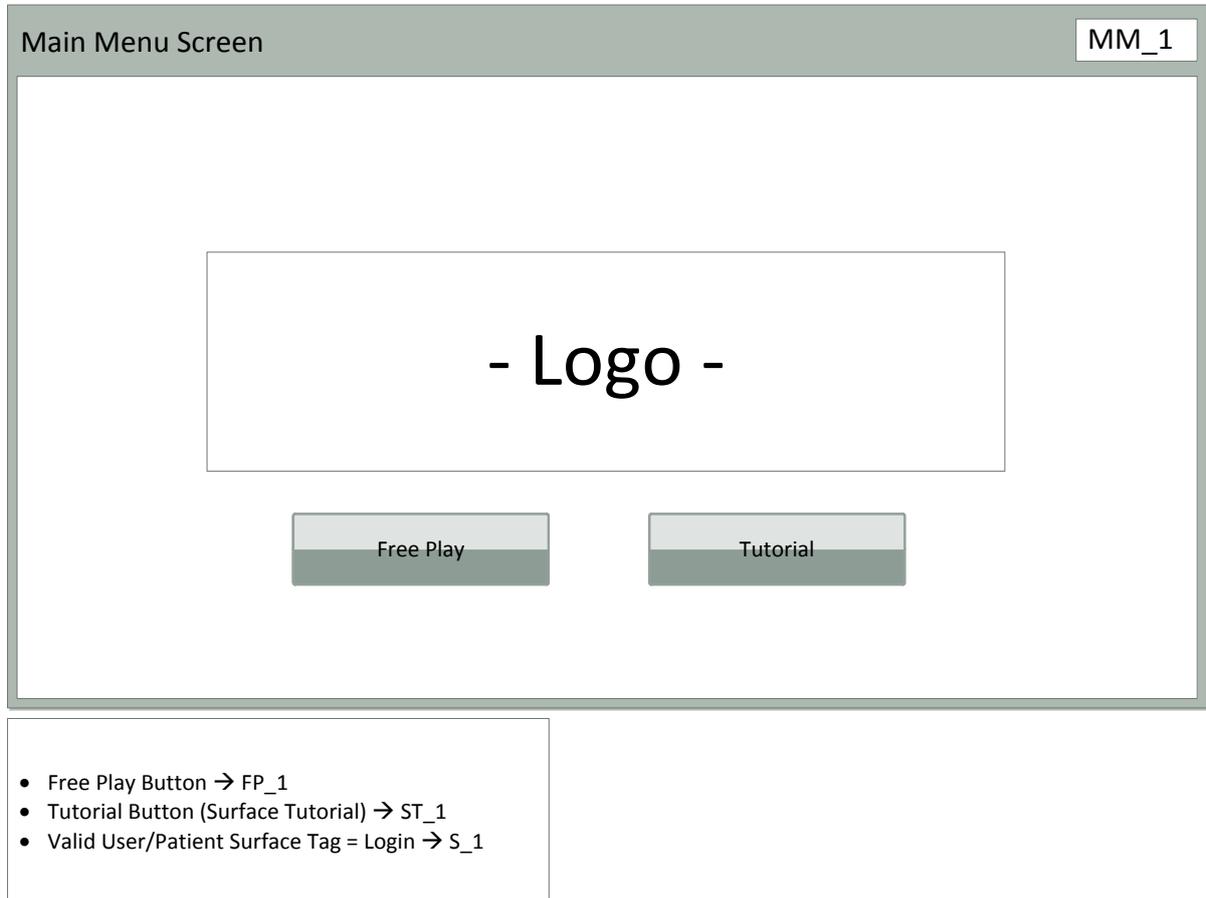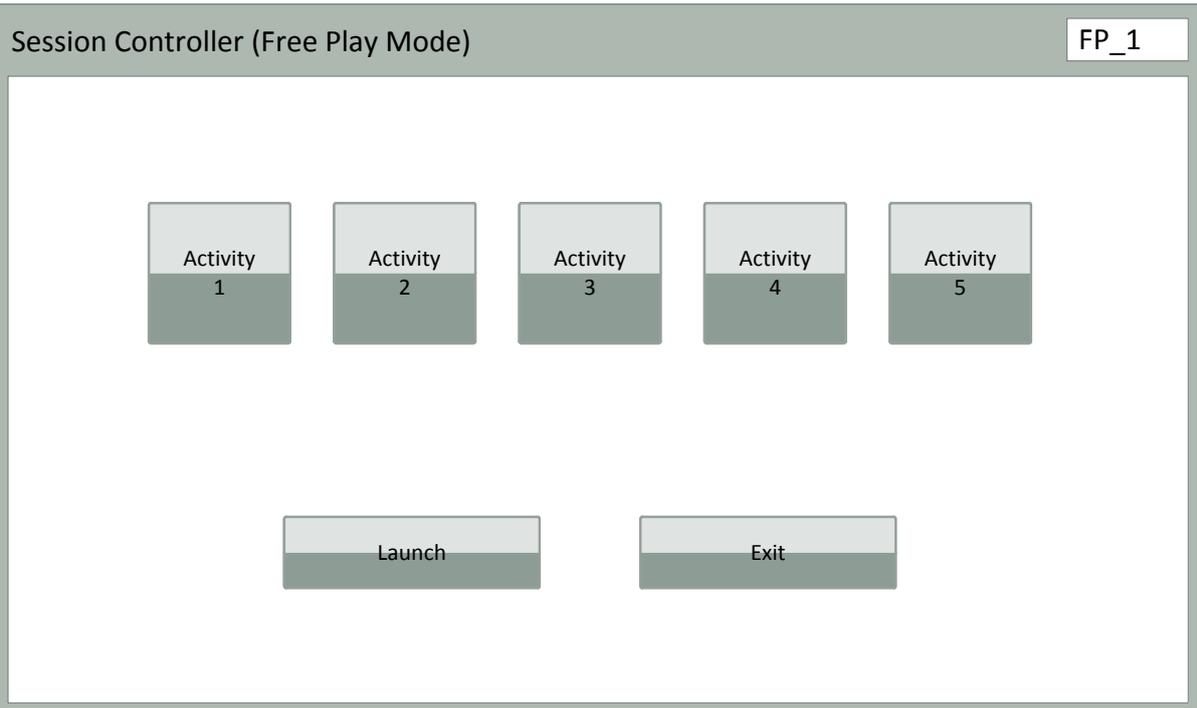
- Select Activity → Press Launch Button
- Launch Button → FP_2
- Exit Button → MM_1

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Activity (Free Play Mode)                                          FP_2
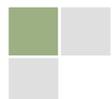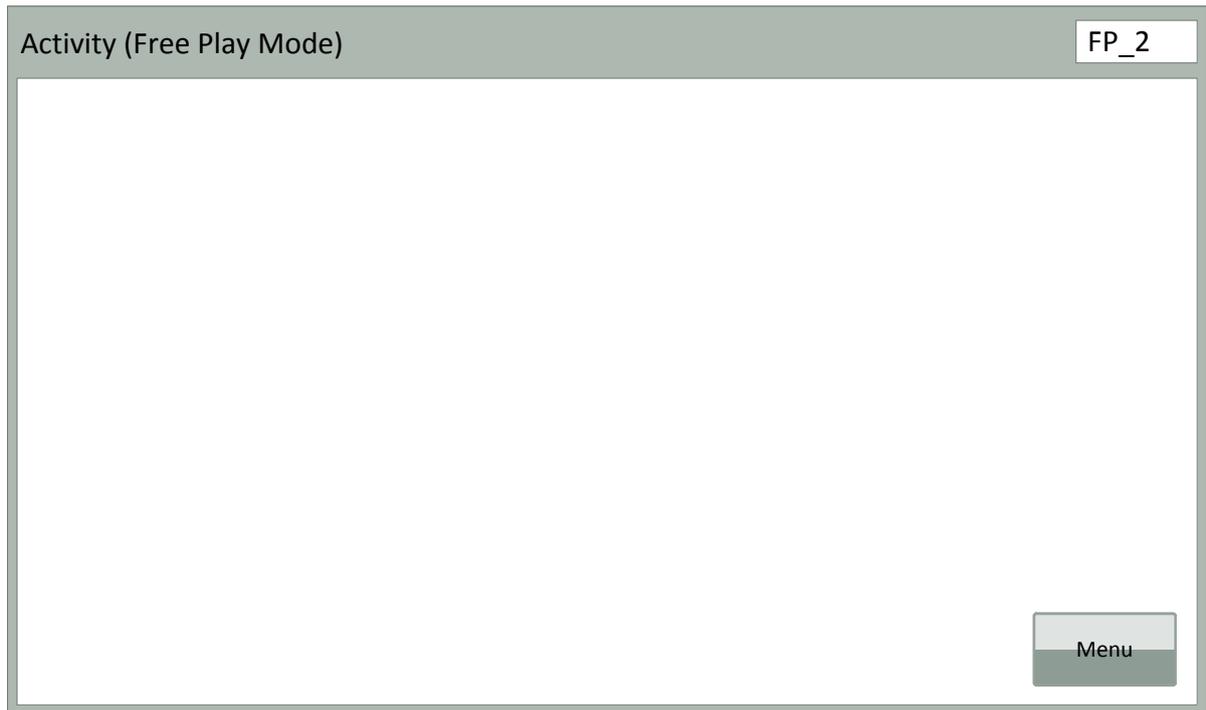
Menu

- Activity Finishes → FP_1
- Menu Button → Pauses activity and menu appears → FP_3

## Activity Menu (Free Play Mode)                                                    FP_3

Resume

Restart

Quit

- Resume Button → Starts activity from point when Menu button pressed
- Restart Button → Restarts the current activity
- Quit Button→ FP_1

| Surface Tutorial | ST_1 |
| --- | --- |

Quit

- Quit → MM_1

## Session Controller (Logged In)    S_1

| Activity 1 | Activity 2 | Activity 3 | Activity 4 | Activity 5 |

| Practice | Launch | Logout |
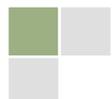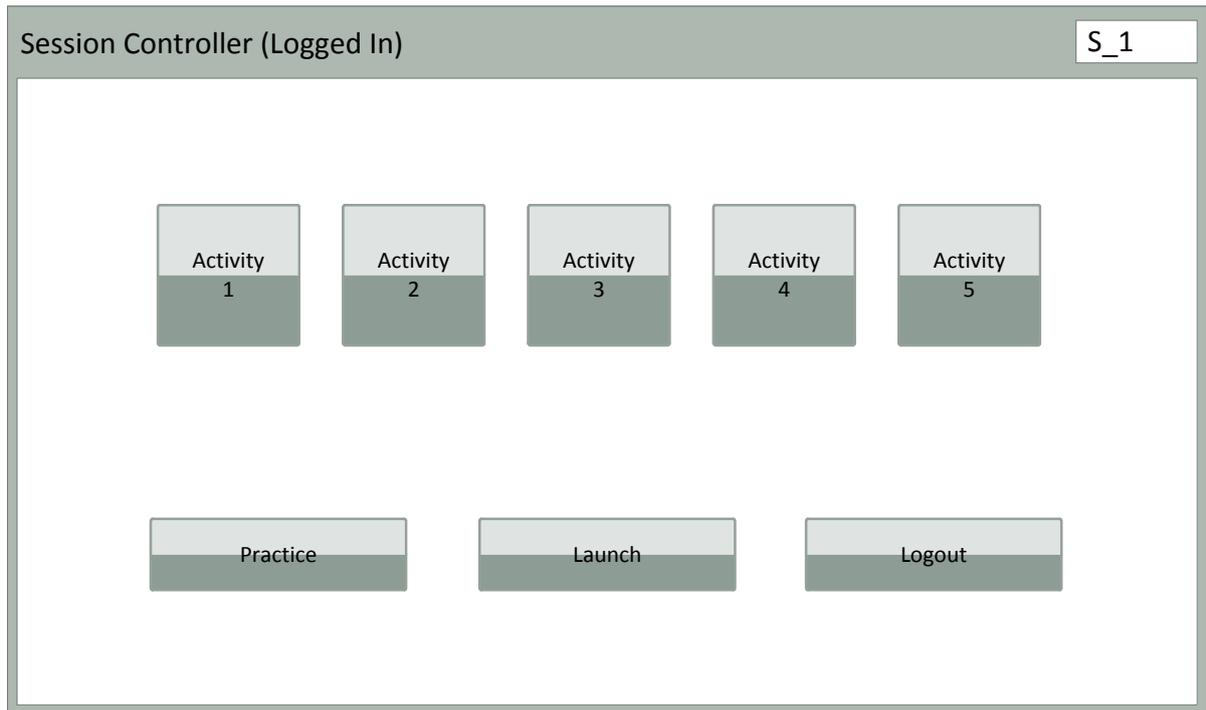
- Select Activity → Press Practice Button or Launch Button
  - Only certain activity with be selectable if session has been setup as "Locked"
- Practice Button → S_2
- Launch Button → S_3
- Logout Button → MM_1

Activity (Practice Mode)                                                  S_2
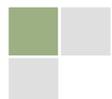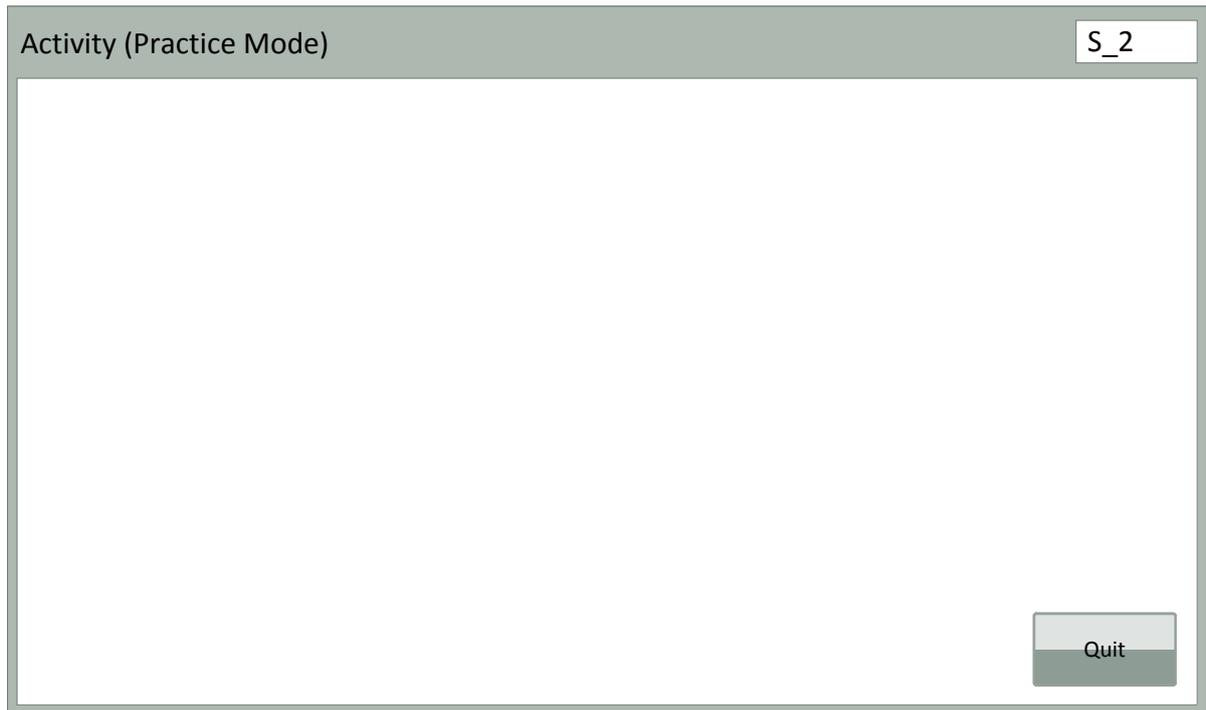
Quit

- No data stored in database during practice mode
- Quit Button → S_1

| Activity | S_3 |
|---|---|
| | |

- Data stored in database once activity completes
- Staff Therapist Surface Tag → Pauses activity and menu appears → S_4

**Activity Menu (Staff Therapist Menu)** S_4

[ Resume ]
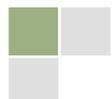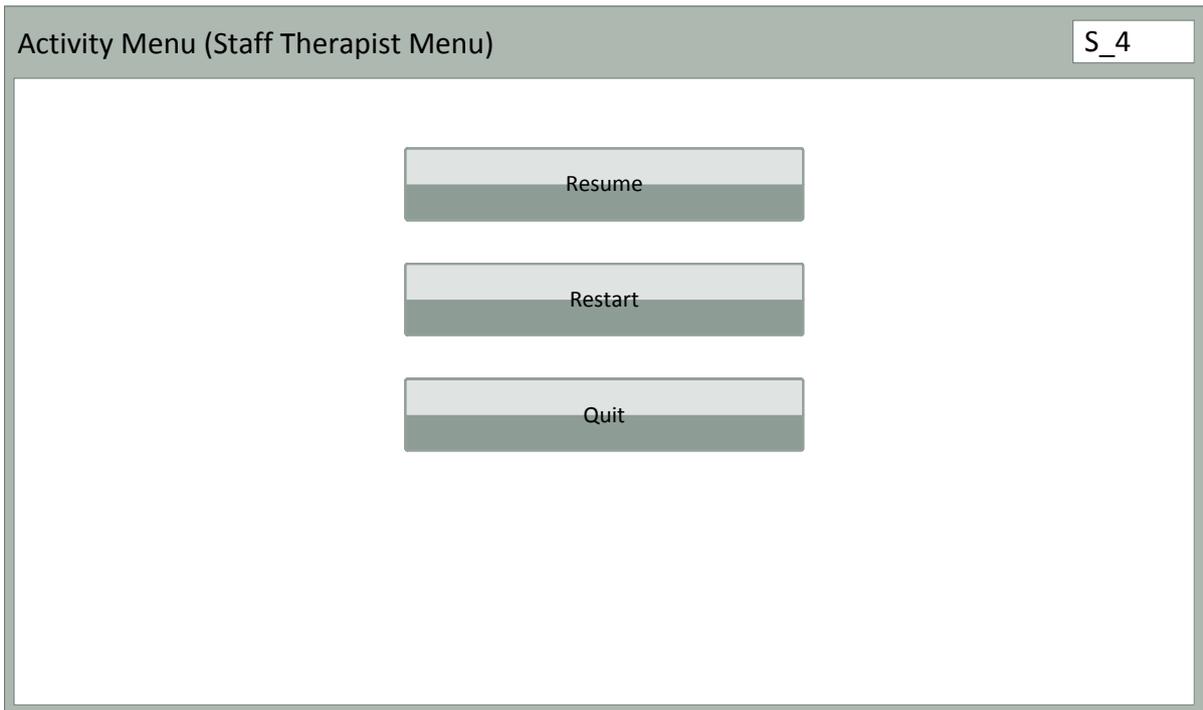
[ Restart ]

[ Quit ]

- Resume → Starts activity from point when Menu button pressed (S_3)
- Restart → Restarts the current activity (wipes collected data for that specific instance of activity to start fresh)
- Quit → S_1

## 9.14. Appendix C: Staff Web Application Prototype

Page-1

# Login Screen

- Clinician logs into application
- Three different roles
  - Manager
  - Clinician

On successful log in, go to application home screen (Home Page)

Home Page

# Home Screen

- Navigate application
  - Manage users (patients)
  - Manage sessions
  - Admin tools

Log out of application (automatic logout after timeout to protect user data?)

To manage users, begin at User Screen 1.
To manage sessions, begin at Session Screen 1.
For Admin tools, go to Admin Screen.

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# Add User

- Add new user
  - Insert any necessary demographic information (medical record number and tag ID will be only personal information stored in DB)
  - Insert initial scores/assessments (be able to choose which scores to track when setting up patient)
  - Print card with tag, medical record number, name, bdate (possibly encounter number and or start date)

Save or cancel to return to Home Screen (Home Page).

Once user has been added, authorized staff can edit/update users (User Screen 2)

# Edit Users Screen

- Update demographic information
- Add/setup new encounter (if maintaining encounter numbers)
- Make user inactive/change user status

Save or cancel to return to Home Screen (Home Page).

Authorized staff can also view user data (User Screen 3).

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# View User Data

- User specific data
  - By user
  - Cumulative
  - By activity

Save or cancel to return to Home Screen
(Home Page).

◀

# Add Session

- Select activities
- Add notes
- Configure session options

Save or cancel to return to Home Screen
(Home Page).

◀          ▶          Once activities selected, clinician can
configure each activity (Session Screen 2).

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## Add Session (cont.)

- Configure activities

Save or cancel to return to Home Screen (Home Page).

◀    ▶

Clinicians can edit sessions that have not been completed (Session Screen 3).

## Edit Session

- Add/Remove activities
- Adjust activity options
- Re-order activities

Save or cancel to return to Home Screen (Home Page).

◀    ▶

Once a session/activity is complete, authorized staff can view data (Session Screen 4).

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# View Session Data

- Session/activity specific data
- By user
- Cumulative

Save or cancel to return to Home Screen (Home Page).

◀

# Administrative Functions

- Manage logins/roles
- Reprint tags (since the tags will be maintained along with the patients paper file, tag reprints will likely require assignment of a new ID and deactivation of the "old" id, or some other measures based on what protocol is involved concerning PHI)

Save or cancel to return to Home Screen (Home Page).

◀