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Database of Video Games and Their Therapeutic Properties

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Title

Database of Video Games and Their Therapeutic Properties

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Abstract

There are reported to be 2.96 billion video game players in the world as of 2021 and this number is expected to grow to 3.32 billion by the year 2024. Of that total, 215.5 million video game players live in the United States with a reported average age of 33 years old. Thousands of commercial video games are released every year. There is evidence to support video game technology use as therapeutic media however it predominately utilizes outdated technology or technology designed for a specific purpose also called “serious games.” The problem is that OT practitioners are unaware of the potential therapeutic properties of video games they have not played, so are unable to integrate unfamiliar video games as therapeutic media in clinical practice. The purpose of this capstone project is to develop an online database of commercial video games, and their therapeutic properties, to facilitate their use as therapeutic media in OT practice. To address this problem a webpage was developed in partnership with the Family Gaming Database that cataloged 10 commercial video games from commercially available video game subscription services and the Nintendo Switch. The 10 games were subject to an activity analysis based on the AMPS to determine their therapeutic potential. The resulting webpage contains three main lists in which filters can be applied in order to display games that meet a specific desired criterion. Applicable filters include platform, age rating, difficulty, and specific accessibility features.

Keywords: database, occupational therapy, video game, video games

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Database of Video Games and Their Therapeutic Properties

Chapter 1: Needs Assessment

The purpose of this paper was to present a proposal for a doctoral capstone project to create an online database of commercial video games and their therapeutic properties.

Background

Video games are one of the most popular entertainment mediums in the world today and their popularity is expected to grow. According to a survey conducted from 2015 to 2021, the number of video game players, or those who play a video game for a minimum one hour each week, has steadily increased year over year ranging from 2.03 billion gamers in 2015 to 2.96 billion gamers in 2021 (Clement, 2022a; Entertainment Software Association [ESA], 2022). This number is expected to grow to 3.32 billion gamers by 2024 (Clement, 2022a). In 2021, the Entertainment Software Rating Board (ESRB), assigned ratings to over 4,800 video games in 2021 alone (ESRB, 2023; Jay, 2021). This only accounts for a portion of the prevalence of video games though as not all games are required to be submitted to the ESRB. Only titles seeking to be published on game consoles such as Nintendo Switch (Nintendo, 2023), Sony PlayStation (Sony Interactive Entertainment, 2023b) and Microsoft Xbox (Microsoft, 2023a) and those seeking to have copies sold in U.S. retail stores must be submitted to the ESRB for review (ESRB, 2022). There was a total of over 10 thousand games released on Steam in the year 2021 (Clement, 2022b; Valve Corporation, 2023). Steam is a popular digital game distribution storefront used by the majority of personal computer (PC) gamers that launched in 2003 and is owned by Valve Corporation (Clement, 2021; Valve Corporation, n.d.).

Since playing video games is a widely practiced leisure occupation, video games have the potential to be used as a therapeutic medium in occupational therapy (OT). However, evidence to

support the use of video games as therapeutic medium in OT is limited (Gillen & Watkins, 2011). Research on the use of video game technologies as a therapeutic medium is emerging and continues to expand (Colder Carras, Van Rooij, et al., 2018; Ferreira-Brito et al., 2019; Fitzgerald & Ratcliffe, 2020; Griffiths et al., 2017)**.** However, the rate of new video game development vastly outpaces the rate at which their therapeutic properties can be studied (Colder Carras, Van Rooij, et al., 2018). Many recent studies utilized outdated video game software and hardware (Pallavicini et al., 2021). The Nintendo Wii and the Xbox Kinect are two of the most prevalent devices referenced in the literature originally releasing in 2006 and 2010 respectively (Dietz, 2010; Metacritic, 2022). Other studies utilized games designed for a specific clinical purpose, referred to as "serious games" (Zyda, 2005, p. 26). A number of recent studies utilized outdated software and hardware and or serious games instead of recent commercial video games, (Aramaki et al., 2019; Ferreira-Brito et al., 2019; Fitzgerald & Ratcliffe, 2020; Garcia-Agundez et al., 2019; Hutchinson et al., 2016; Kable et al., 2017; Li et al., 2016; Rolle et al., 2017)

Due to the rapid pace of video game development, studies on the use of video games as therapeutic media are likely to reflect outdated video games by the time they are published (Colder Carras, Van Rooij, et al., 2018). There is also a lack of continuity in the research. Terms used to describe aspects of video games and their use in therapy are varied and non-standardized (Colder Carras, Van Rooij, et al., 2018). This makes discerning the literature more difficult. Of the current research that does exist, majority of it focuses on software specifically designed for therapy use (Colder Carras, Van Rooij, et al., 2018; Griffiths et al., 2017). The research is scattered. There is no standard way of evaluating how video games could potentially be used as therapeutic interventions. This outlines the need for there to be a standardized system in which videogames can be evaluated and documented for their therapeutic value. As of 2021, there are

many other potential video game technologies that could be used in therapeutic intervention in addition to the Nintendo Wii and Xbox Kinect such as the Nintendo Switch, recent PC titles, and the Xbox family of consoles with the added benefit of the ability to use the Xbox Adaptive Controller (Microsoft Corporation, Redmond, Washington).

In terms of deciding whether or not video games have therapeutic potential, occupational therapy (OT) practitioners have the necessary skills to accomplish this through activity analysis. Activity analysis is defined by the American Occupational Therapy Association (AOTA) as a "generic and decontextualized analysis that seeks to develop an understanding of typical activity demands within a given culture" (AOTA, 2020, p. 74). The fact that all OT practitioners possess activity analysis and grading skills makes them uniquely qualified to determine the therapeutic potential of video games (Gillen & Watkins, 2011).

OT practitioners use theoretical models to guide their practice. The two models that have utility to frame video gaming as a therapeutic occupation are the Model of Human Occupation (MOHO), which plays on clients' motivations, and the technology acceptance model (TAM) was used to guide this project (Davis, 1993; Taylor & Kielhofner, 2017b). The three main pillars of the TAM, perceived usefulness, perceived ease of use, and behavioral intention or motivation to use, will influence how the database is constructed (Holden & Karsh, 2010).

Commercial video games are seen as a potentially cheap alternative that can be used to augment a therapist ability to provide service; as well as enabling clients to continue to care at home (Garcia-Agundez et al., 2019; Li et al., 2016; Mioto & Ribas, 2014; Prahm et al., 2018; Synofzik et al., 2013). Video game-based interventions are inherently motivating and have the potential to engage clients more so than traditional methods (Gustavsson et al., 2021; Prahm et al., 2018; Synofzik et al., 2013).

Robert Ferguson is one example of an occupational therapist who has utilized video games as part of his therapeutic practice (Collins, 2019). He was the Neurorehabilitation & Therapeutic Technology Clinical Specialist and the virtual reality (VR) Therapy Program Coordinator at Michigan Medicine (Michigan Medicine, 2022). During Ferguson's (2022) presentation "Game On!: Therapeutic Gaming For the Win!" as part of the Rehab Tech Summit 2022, Ferguson was asked multiple times some variation of the question "Which games should be used?" or "How do you know which games to use?" His response was "…play the games" **(**Ferguson, 2022). Meaning, to know if a game can be used as part of therapy, the therapist must first play the game themselves in order to analyze the properties within the game. Mioto and Ribas (2014) described which client factors can be addressed with each game within the Wii Sports software. This is similar to what I accomplished with my project but on a much smaller scale; evaluating only one game, and it is done with older gaming technologies. I accounted for newer gaming technologies with my project. To date, no such source exists that describes the characteristics of commercial games useful for therapeutic intervention on current hardware.

Problem Statement

OT practitioners are unaware of the potential therapeutic properties of video games they have not played, so are unable to integrate unfamiliar video games as therapeutic media in clinical practice.

Purpose Statement

The purpose of this capstone project is to develop an online database of commercial video games, and their therapeutic properties, to facilitate their use as therapeutic media in OT practice.

Rationale

Because of the large number of video games currently available on the market, it is difficult for OT practitioners to be aware of the therapeutic properties of these games, thereby making it difficult for them to apply video games as therapeutic media in OT practice. The increased use of video games by the general public drives the need for technology to be increasingly considered in therapeutic practice.

Significance

The completed project with the proposed database solution provides a resource for OTs to contribute to and update as a means of increasing access to knowledge of which commercially available video games have therapeutic potential. This project brings to the forefront baseline information on the properties of recent commercial video games. This information can be used by therapy practitioners to streamline the process of integrating commercial video game use into their own practice and or spark new studies related to the therapeutic properties of the games listed in the database. This solution acts on "[playing] the games" but then also shares any relevant data with other clinicians so that they themselves do not have to play the games (Ferguson, 2022). It is a tool that practitioners can benefit from, enabling them to include video game interventions in their practice more easily. This allows occupational therapists to meet many of their clients where they are in their recovery or development and provide a more personable, engaging form of treatment that many will benefit from.

Objectives

The objectives for this project are as follows:

Learning Objectives

- Describe the use of video games as therapeutic media in OT practice.

- Understand the inherent therapeutic potential of video games for different client populations.
- Analyze current literature on video game use in therapy to identify gaps in the literature.
- Evaluate 10 commercially available video games by performing a task analysis to their potential therapeutic properties.
- Apply occupational therapy ideas to videogames creating a standardized evaluation process.
- Understand the principles of database development to catalog data for ease of extraction and analysis.

Outcome Objectives

- Develop an online database of video games, and their therapeutic properties, to facilitate their use as therapeutic media in OT practice.

Assumptions

It was assumed that clinicians are interested in integrating video games in their practice. It was assumed that clinicians will seek out and use a database of video games and their therapeutic properties. It is assumed that the proposed database will be sought out by clinicians when they are working with individuals who have an interest or their identity within video games.

Limitations

There are some potential limitations that may impact this project, such as:

- The amount of time available to complete the project
- The type of database technology I had access to
- The gaming platforms I had access to

Delimitations

There are several potential delimitations that may impact this project, such as:

- The games I had chosen to include in the analysis
- The method of analysis

Chapter 2: Literature Review

Population

According to the ESA (2022) there are 215.5 million gamers in the United States; of that number 76% are above the age of 18 years old. The average age of gamers in the United States is 33 years old. Gender across gamers is relatively equal, 52% being male and 48% being female. Although the majority of gamers are from a younger age group, approximately 40% are from the Baby Boomers (ages 58-76) and Generation X (ages 42-57) populations (Cable News Network, 2022; ESA, 2022). The Baby Boomer and Generation X populations have been exposed to and using computer and video game technology for most of their lives (Gillen & Watkins, 2011). This trend can only be expected to increase with each passing generation.

Video Gaming as an Occupation

Occupation is defined as, "everyday personalized activities that people do as individuals, in families, and with communities to occupy time and bring meaning and purpose to life" ((American Occupational Therapy Association, 2020, p. 79). All occupations are divided into nine categories: activities of daily living, instrumental activities of daily living, health management, rest and sleep, education, work, play, leisure, and social participation (AOTA, 2020). For the purposes of this paper video gaming will be classified under, play, leisure, work, and social participation.

Video Gaming as Play & Leisure

Play is defined as, "active engagement in an activity that is intrinsically motivated, internally controlled, and freely chosen and that may include the suspension of reality" (Skard & Bundy, 2008 as cited in AOTA, 2020, p. 81). The difference between play and leisure is that leisure is a nonobligatory activity during time that it is not committed to other occupations. One

of the most common reason an individual chooses to play games is that they provide a, "…brief distraction from the stresses of daily life they offer as a form of recreation/entertainment," (Colder Carras, Kalbarczyk, et al., 2018, p. 3). According to stats gathered by the ESA (2022) the top three reasons individuals cited for playing video games was "to have fun" (63%), to "unwind" (57%), and that it is a means of "escape" (46%); 73% of parents surveyed said that video games provided them with a break from their child (ESA, 2022, p. 5).

Video Games as Work

Although a very small percentage of people who play video games get paid to do so, there is still a population of people out there that play video games as part of their job. Work is defined as "labor or exertion related to the development, production, delivery, or management of objects or services; benefits may be financial or nonfinancial" (Christiansen & Townsend, 2010; Dorsey et al., 2019 as cited in AOTA, 2020, p. 84). The eSports League, a league that hosts several professional video game tournaments around the world, generated a worldwide revenue of 1.36 billion dollars in 2021 (Gough, 2022). The top one thousand eSports players all have revenues over two hundred thousand dollars in a 30 day time period (Esports Earnings, 2022).

Streaming is another avenue in which individuals can earn a living playing video games. Streaming or live streaming, is a social media feature on various platforms that allows users to broadcast unedited content in real time to their audiences over the internet (Influencer Marketing Hub, n.d.). There are a total of approximately 27,000 Twitch Partners (Twitch, n.d.), Twitch is the most popular streaming platform with a reported 73% of the market share (StreamScheme, 2022). In order to become a Twitch partner certain viewership and subscription marks must be met. A conservative estimate is that at least those Twitch partners earn a living wage from streaming without including potential ad revenue (Business of Apps, n.d.). The live streaming

market is only expected to continue growing year over year.

Video Gaming as Social Participation

Video gaming is often viewed as a singular activity, but for many, gaming is a social activity. According to the ESA (2022) 83% of individuals interviewed play video games with others online or in person. The average play time per week is 13 hours; 41% of that time is spent playing socially (ESA, 2022). A major theme identified in one study was that playing video games helped players to build confidence and connect socially with others (Colder Carras, Kalbarczyk, et al. 2018). Subjects identified playing video games as a means to connect with their families or facilitate their ability to connect with others online. Playing video games fosters a sense of brotherhood among some individuals (Colder Carras, Kalbarczyk, et al., 2018).

History of Video Gaming as an Intervention

The earliest report of video gaming being used as therapeutic intervention was of a study that investigated the effectiveness of computer games as intervention with people with spinal cord injuries (White et al., 1984). They discuss modifications such as modified paddle switches, chin operated switches, and mouth switches that can be done to promote the user's engagement with an Atari video game console. White et al (1984). noted that video game use is under appreciated and not yet used to its full potential. At the time, video gaming was viewed video games as a way to promote participation and to bring a sense of fulfillment to individuals who had experienced a high-level spinal cord injury. The investigators observed that not every game is suited to the clinical needs of every client, and indicated that games "must be paced with the player's endurance level" (White et al., 1984, p. 208). Clark et al. (1987) used the video games titled Donkey Kong (Nintendo Research and Development Number 1, 1981) and Pac-Man (Namco, 1980) as an intervention to reverse the decline of reaction time (RT) in elderly adults.

Over a seven-week period, Clark et al. (1987). observed a significant improvement in RT of the experimental group over the control group. As stated by Clark et al. (1987), these results are contrary to other studies at the time, demonstrating a generalizability of the improvements gained rather than only with a specific task.

Evolution of Video Gaming Use as an Intervention

At first, video games were only seen as an entertainment medium, a way to provide less capable individuals with a sense of enjoyment (Clark et al., 1987; Stride, 1982). Clark et al. (1987) and Stride (1982) sought to provide access to computer systems or consoles, but they did not analyze their potential any further.

Next came the advent of custom video game software was developed for many specific purposes. The first of such games, dubbed “serious games” (Zyda, 2005) was developed by phycologists at the University of Illinois at Urbana-Champaign called “Space Fortress” (Mané & Donchin, 1989) Space Fortress was specifically developed to research the acquisition of complex skills (Mané & Donchin, 1989). While using the Space Fortress game, it was determined that in order for players to master the game they must possess adequate perceptual, cognitive, and motor skill as well as knowledge of the rules of the game (Mané & Donchin, 1989). The game had so much success that it was adopted into the training program for the Israeli Air Force (Pallavicini et al., 2018). A recurring theme is custom games are more costly than simply using commercial video games (Griffiths et al., 2017; Li et al., 2016; Pallavicini et al., 2021; Prahm et al., 2018). Video game use in therapy has been shown to be more motivating than standard methods of therapy such as the use of the MyoBoy in stroke rehabilitation (Gustavsson et al., 2021; Prahm et al., 2018). The MyoBoy is a device utilized during upper limb rehabilitation training and prosthesis training that uses electrodes to measure muscle strength (Ottobock, 2023).

Therapeutic Benefits of Video Gaming

Research on video game use as an intervention is an evolving process due to the vast number of treatments it can be applied to. One study of children with cerebral palsy playing a video game interface while using the RAPAEL Smart Glove (Brooks Rehabilitation, n.d.) saw improvements in five domains of the Quality of Upper Extremity Skills Test when compared to a conventional occupational therapy group (Chang et al., 2020). A feasibility study conducted by MacIntosh et al. (2020) saw significant improvements in either active wrist extension, grip strength, or both. Individuals who sustained bilateral upper extremity burns saw improvements in limb function after using a leap motion controller (Wu et al., 2019). The leap motion controller is a small motion tracking device that can be plugged directly into a computer (Ultraleap, n.d.). Microsoft Kinect was used to improve task-oriented outcomes in youths with juvenile idiopathic arthritis (Arman et al., 2019).

Griffiths et al. (2017) conducted a selective review of video games use as interventions. Many populations where video game could be applied were explored such as with "stroke patients, people with traumatic brain injuries, burns victims, wheelchair users, Erb's palsy individuals, children undergoing chemotherapy, children with muscular dystrophy, and autistic children" (p. 73). Other areas explored were use in OT use as distractors, pain management, cognitive rehabilitation, use in development of social and communication skills, impulsivity and attention deficit disorders, effective use with the elderly, and in psychotherapeutic settings (Griffiths et al., 2017). Video games have also shown potential to boost well-being, life satisfaction, and self-efficacy according to the review (Griffiths et al., 2017).

Fitzgerald and Ratcliffe (2020) concluded that the success of using serious games as intervention for mental illness came down to user engagement and showed even greater results

when the user was involved in the design processes of the game. Fitzgerald and Ratcliffe (2020) concluded that methodologies among studies were inconsistent and that the results should be interpreted carefully with the understanding that research using video games to treat mental illness is a new, emerging area of study.

Not all research on gaming has focused on serious games. Some studies utilized commercially available technology as the intervention. Some studies examined the effectiveness of commercial video games in treating various conditions. Prahm et al. (2018) modified the input for commercial video games to receive biofeedback such as length of contraction and strength of contraction from prosthetic rehabilitation clients in order to control the game. Subjects that participated in the video game-based intervention achieved increased muscle isolation capability and endurance control with the exception of one participant out of a total of 27 (Prahm et al., 2018). Prahm et al (2018) also found that participants enjoyed the game-based interventions more than the MyoBoy which is a more traditional visualization tool in rehabilitation. Most participants found one of the three games to be less engaging. The authors attributed the game's younger target audience as the reason for participants not enjoying the intervention (Prahm et al., 2018).

Mioto and Ribas (2014) used the Nintendo Wii and Nintendo Wii Sports games to address motor delays associated with down syndrome. Their study studied five individuals aged eight to 14. The results showed that post-test scores of the Assessment of Psychomotor Functions had improved from the pre-test scores by varying amounts for each individual (Mioto & Ribas, 2014). The most significant improvement was observed from “Individual 4” who completed 35.5% of the assessment items without difficulty in the pre-test to 82% of the assessment items without difficulty in the post-test (Mioto & Ribas, 2014, p. 2).

A systematic review found that the use of the Nintendo Wii, Xbox Kinect, and Leap Motion Control were effective interventions for Parkinson's Disease (PD) stating that none of the included studies showed those technologies performed worse than traditional therapy for PD (Garcia-Agundez et al., 2019). However, Garcia-Agundez et al. (2019) cited inconsistencies in the outcomes of the studies made it difficult to determine which technology was the best. They concluded that these technologies were safe to use and as effective as traditional treatment methods for those with PD matching or surpassing outcomes of traditional methods (Garcia-Agundez et al., 2019).

A case study used five commercially available Nintendo Wii video games as an intervention to combat the progression of multi-systematic degenerative ataxia in a 10-year-old boy (Synofzik et al. 2013). They used the Scale for the Assessment and Rating of Ataxia (SARA) to assess the child. After a 12-week program, one week in the lab and 11 weeks at home, the child's SARA score improved by 4.4 points from the initial score of 26.5, which is equivalent to a regression of three or more years of disease progression (Synofzik et al., 2013). From these examples we can see that video game-based interventions have potential to impact areas of OT in a positive way bringing improved outcomes to several individuals.

Some key takeaways are that the sample sizes are small. Two of the three studies use software from the Nintendo Wii which came out in 2006 (Metacritic, 2022). As stated previously, video game technology progresses quickly (Colder Carras, Van Rooij, et al., 2018). As of 2022, there are many other potential video game technologies that could be used in therapeutic intervention other than the Nintendo Wii and Xbox Kinect.

The vast majority of video game use during intervention remains being custom games or "serious games" and older systems such as the Nintendo Wii and Microsoft Kinect (Colder

Carras, Van Rooij, et al., 2018; Griffiths et al., 2017; Pallavicini et al., 2021). Pallavicini et al. (2018, 2021) systematic reviews compiled data on majority commercial video games and their effectiveness as potential interventions for specific conditions. Those conditions being stress and anxiety; the other being cognitive and emotional training**.** There is evidence to support commercial video game use as cognitive training tool effecting aspects such as RT, processing speed, memory, multitasking, and mental spatial rotation (Hutchinson et al., 2016; Pallavicini et al., 2018). Action games were found to be effective tools to train processing speed and reaction times. One study observed improvements in visuomotor control and precision after five hours of playing action games (Li et al., 2016). Puzzle games had a positive effect on task switching and inhibitory control. Simulation games showed potential to improve spatial working memory and RT. First person shooter games were found to decrease RTs and improve processing speed. Playing adventure games was identified to boost gray matter in the brain thereby improving special navigation and visual working memory.

Brain training games were shown to have greater improvement than puzzle games in task switching, short term memory, processing speed, and RT. Pallavicini et al., (2018) referenced two studies that suggested puzzle video games do not possess any greater potential to enhance cognitive abilities over other video game genres. Overall, studies identified suggest that action games, adventure games, puzzle games, and first-person shooter games can be used to improve processing speed and RTs. Action and adventure games demonstrated potential in improving visual working memory. Puzzle games showed success in improving task switching abilities. Exergames and driving games were found to improve mental spatial rotation.

With regard to emotional regulation, exergames at a self-prescribed intensity have been shown to facilitate more positive emotional responses. A commercial horror game was used in

conjunction with arousal reduction strategies was shown to decrease stress levels. Commercial games have been shown to produce superior results when compared to control procedures and traditional methods at reducing stress (Pallavicini et al., 2021). Pokémon Go players had significantly reduced stress than that of non-players (Watanabe et al., 2017). Exergames were identified as good candidates to use as interventions to reduce stress and anxiety (Pallavicini et al., 2021).

There is evidence to support the use of commercial video games, specifically VR as an effective intervention for stroke rehabilitation (Aramaki et al., 2019; Gustavsson et al., 2021). However, methodologies used were inconsistent across studies so results must be interpreted with care (Aramaki et al., 2019).

Activity Analysis

Activity analysis is a foundational skill that occupational therapists develop as part of their education and experience to the extent that it can become automatic (Forsyth et al., 2019; Neistadt et al., 1993). An activity analysis is a "generic and decontextualized analysis that seeks to develop an understanding of typical activity demands within a given culture" (AOTA, 2020, p. 74). It is a critical skill to ascertain the therapeutic potential of activities including video games (Schell et al., 2019). The use of activity analysis on potential technology-based interventions is not a novel concept in OT. Okye (1988 as cited in Creighton, 1992) created a template by which to analyze computer-based treatments. Client-centered models such as MOHO, incorporate activity analysis as a fundamental aspect of their process, to understand the relationship between valued occupations of an individual and the actual performance, demands, and contexts of those occupations (Forsyth et al., 2019; Law, 1998 as cited in Schell et al., 2019; Thomas, 2015). The performance skills to be analyzed during this process are outlined in the Occupational Therapy

Practice Framework: Domain and Process, which is a tool published by the AOTA for occupational therapists to use to guide their practice (AOTA, 2020). However, these performance skills originated from the Assessment of Motor and Process Skills; which is further derived from the Occupational Therapy Intervention Process Model (Fisher & Jones, 2010). The performance skills are divided into motor skills and process skills (AOTA, 2020; Fisher & Jones, 2010). The Assessment of Motor and Process Skills provides a step-by-step process that occupational therapists must follow in order to properly administer a standardized assessment of an individual's performance of a given task.

How to Perform an Activity Analysis

The overall objective of an activity analysis is to identify requisite activity demands and performance skills (Forsyth et al., 2019). This is accomplished via a series of steps. The steps are as follows: identify what activities are being analyzed; determine the significance to the client; identify key steps within the activity; determine if there are any specific tools or properties; identify space demands; determine if there are any social demands within the activity; outline the body structures and minimum required body functions to perform the activity; and determine the minimum required performance skills; or the smallest units that make up occupational performance, the client must possess in order to successfully engage in the activity (Fisher & Griswold, 2019; Fisher & Jones, 2010; Thomas, 2015). The coalescence of this data is what makes up an activity analysis.

Databases

A database is a set of data that is stored electronically but can be accessed externally in a myriad of ways (Merriam-Webster, n.d.). The ways in which data is collected is inconsequential to the database itself. The impact a database has is on the input, organization, and retrieval of

data. A basic example of a database would be using a consumer level program such as Microsoft Excel, to create multiple spreadsheets to store desired data within (NetworkChuck, 2022). However, this approach is very limited and does not provide the tools necessary for the amount of data accumulated by large corporations. Larger corporations use database management systems (DBMS). There are two types of DBMS for the two primary types of databases: relational databases or SQL databases and non-relational databases or NoSQL databases (MongoDB, 2022b; Vetter & Smith, 2022). There is a third emerging type, referred to as "NewSQL," that is beyond the scope of this discussion (Vetter & Smith, 2022, p. 100).

The acronym SQL stands for structured query language and is what is referred to as a database language (NetworkChuck, 2022; Vetter & Smith, 2022; Web Dev Simplified, 2018). The most commonly used database language is SQL (NetworkChuck, 2022; Web Dev Simplified, 2018). A database language is similar to a programing language used to communicate with a database. It utilizes a series of structured commands to create, read, update, and delete information within a database (NetworkChuck, 2022; Web Dev Simplified, 2018). Relational databases consist of rigid datasets that have shared information whereas non-relational databases do not use rigid datasets for data organization system like relational databases (MongoDB, 2022b; Vetter & Smith, 2022). Some examples of prominent relational DBMS are Microsoft SQL Server, Oracle Database, MySQL and Postgre SQL, each using their own iteration of SQL (NetworkChuck, 2022). Examples of prominent NoSQL DBMS are MongoDB, Cassandra, and NeoJSON (Williams, 2022).

Each type of database comes with their own advantages and disadvantages. The advantages to using a SQL database are superior data accuracy through the use of unique primary and foreign keys that are generated when data is input into the datasets (MongoDB,

2022b; Web Dev Simplified, 2018). Another advantage to SQL databases is the standard atomicity, consistency, isolation, and durability (ACID) compliance (MongoDB, 2022b). This ensures that any transactions conducted within the database have to be without error; if any singular change within a transaction is faulty, the whole transaction fails (MongoDB, 2022b). There is data normalization meaning there are few to no anomalies in the data stored within the database (MongoDB, 2022b). Many resources and tools exist for SQL databases because the technology has been in use for so long, this inherently makes them easier for those without a developer background to start up and use when compared to NoSQL databases (MongoDB, 2022b). The disadvantages to a SQL database are its flexibility, scalability, and performance (MongoDB, 2022b). The rigid nature in which data must be introduced into a SQL database makes them inherently less flexible because if the data does not fit the predefined parameters, then the data cannot be added to the database as it is presently constituted (MongoDB, 2022b). Changing parameters after the fact is a difficult process that requires the database to be taken offline and the restructuring of all the data within the database (MongoDB, 2022b). Scalability and performance are two factors that affect each other because SQL databases are meant to be hosted on a single machine (MongoDB, 2022b). As the amount of data or number of simultaneous inquiries within a database increases the performance decreases meaning inquiries will take longer unless the specifications of the host machine are scaled to match the demand which can be costly and eventually impossible (MongoDB, 2022b).

The advantages and disadvantages of NoSQL databases are essentially the inverse of SQL databases. The advantages being that it can be more easily horizontally scaled. Meaning NoSQL databases can be hosted on multiple and or low-cost devices including the cloud (MongoDB, 2022b; Pandora FMS Team, 2022; Vetter & Smith, 2022). This also means that

NoSQL databases can handle larger amounts of data without a decline in performance (MongoDB, 2022a). The inherent unstructured nature in which NoSQL databases store data makes it so that these databases can store a variety of types of data and the datasets can more easily be updated when compared to SQL databases (MongoDB, 2022a). The disadvantages when considering NoSQL databases is that the initial startup and administration of these databases can be more difficult (Merenych, 2019; Pandora FMS Team, 2022). The unstructured nature of NoSQL causes a lack of standardization across different implementations and not all NoSQL databases require ACID compliance (Pandora FMS Team, 2022). The lack of ACID compliance can lead to manger issues if exchanges within the databases are faulty.

Database Use in Healthcare

Databases in healthcare are a foundational element to its daily operation. Every piece of data that healthcare practitioners generate is logged and stored inside of a database (DNSstuff, 2021). Healthcare organizations use databases for several reasons: to improve efficiency, for information exchange, and data analytics (DNSstuff, 2021).

Databases improve the efficiency of hospitals by providing a way to accurately organize and store vast amounts of information but then allows clinicians swift retrieval of desired data (DNSstuff, 2021). Databases enable different healthcare facilities to quickly exchange information with each other making it so that standards of care are consistent across many locations (DNSstuff, 2021). Clinicians can perform a healthcare quality assessment for a given region through data analytics by retrieving relevant information such as: healthcare cost, healthcare availability, barriers to healthcare, and treatments provided by healthcare (DNSstuff, 2021). Data analytics also provides healthcare facilities with various statistics to inform decision making processes (DNSstuff, 2021).

Two major databases that are utilized by the healthcare industry in the United States are the Healthcare Cost and Utilization Project (HCUP) and the Medicare Provider Analysis and Review [MEDPAR] (DNSstuff, 2021). The HCUP is an umbrella database that consists of eight smaller databases that are primarily used for research purposes (Agency for Healthcare Research and Quality [AHRQ], 2022). The HCUP contains over 30 years of hospital administration data including emergency department visits, hospital stays, and ambulatory surgery care from 48 states and Washington D.C. (AHRQ, 2022a, 2022b; Mutter & Stocks, 2014). The MEDPAR "consolidates inpatient hospital or skilled nursing facility claims data from the National Claims History files into stay level records" (Centers for Medicare & Medicaid Services [CMS], 2022, para. 1) The MEDPAR was created in 1983 to allow researchers to gather and study data on inpatient and skilled nursing facilities (CMS, 2021; Research Data Assistance Center, 2016).

Other Types of Databases

Databases have been used in the area related to videogames to showcase a variety of different data. They provide fast access to relevant information that the user is seeking. One example is a database produced by Game Accessibility (2022). Their database has cataloged information on the accessibility of many games including a brief synopsis of what the game entails. Another smaller example was shown in a presentation titled "Implementing Adaptive Gaming Equipment for Individuals with Disabilities" by Drew Redepenning (2022) In his presentation, he presents a slide where video games are divided out by difficulty of accessibility implementation and displayed in a table. Although this sample is small it provides evidence to support how databases can be used to showcase data about video games. The table shown can easily be incorporated or expanded into a database. This next example, although it does not directly feature video games, is related to video games, and can be easily translated into how

video game data can be distributed within a database. Australia's National Equipment Database is a database that users can use to find assistive technology (National Equipment Database, 2022). Users can enter key words into the search bar such as a condition or product type and they will be provided with several products that match the search criteria. Results can then be filtered by various aspects to provide a more precise match. When selecting a result, the user is then provided with a product description and links to known providers. When using video gaming as therapeutic intervention the accessibility features and the types of assistive technology available should be considered in order to match client factors thereby promoting successful engagement with the videogame.

Another example is a database that catalogs the accessibility features in video games and is presently maintained to be up to date with current titles. The database is titled "The Family Gaming Database" or the "Taming Gaming Database" (Family Gaming Database, 2023b). It has many features including curated lists, filters for specific accessibility features, and individualized advice for specific game titles.

Theoretical Models

The Model of Human Occupation is an occupation-focused, client centered model consisting of four parts volition, habituation, performance capacity, and the environment (Taylor & Kielhofner, 2017a). Each aspect of MOHO can dynamically influence another. Therefore, any change in one aspect (i.e., volition, habituation, performance capacity, and environment) can change an individual's doing, thoughts, and feelings of occupations (O'Brien & Kielhofner, 2017). An occupation-focused model is one that uses occupational participation and engagement as the catalyst for change while other models may focus specifically on the impairment (Taylor & Kielhofner, 2017a). When engaging in MOHO-practice then, a clinician makes an effort to

understand, respect and support the client holistically including their interests, roles, habits, occupation specific performance, performance capacity and personal environment (Taylor & Kielhofner, 2017a). Through this process a clinician will discover a client's volition or what motivates them to want to engage in occupations, their habituation, or semi-autonomous behavioral patterns one has depending on temporal, physical, and social habits that are familiar to them, and performance capacity, or the physical and mental capabilities one possesses (Yamada et al., 2017).

The Technology Acceptance Model (TAM) will be used to assess the effectiveness of the proposed technology solution. The TAM aims to predict the successful adoption of new technologies by individuals or organizations (Holden & Karsh, 2010; Venkatesh & Bala, 2008). The model considers many factors, depending on the type of technology being analyzed, that influence a given technology's chance at success (Holden & Karsh, 2010). TAM is comprised of three factors: ease of use, perceived usefulness, and motivation to use (Holden & Karsh, 2010). Ease of use is described as how challenging the user perceives the new technology to be (Davis, 1989). Perceived usefulness is how beneficial the user believes the technology will be (Davis, 1989). Behavioral intention is the users' attitude or motivation toward the use of the technology (Davis, 1993; Holden & Karsh, 2010).

Discussion

The Model of Human Occupations (MOHO) is an excellent model to support incorporating the use of video games as therapeutic media. All change that occurs when using MOHO is client initiated (Forsyth et al., 2019). With MOHO-based practice, the client's choice, action and experience are used to increase the likelihood of engaging in therapeutic activity (Taylor & Kielhofner, 2017a). Fitzgerald and Ratcliffe (2020) came to a similar conclusion when

examining the effect of serious games on mental illness; client involvement in the process increased the likelihood of success.

When using MOHO, video gaming is the medium that plays into a client's interests which improve the client's desire to participate and in turn can promote an individual's volition if they have the option to use video gaming as part of their therapeutic treatment. Thereby allowing them to be a part of the therapeutic process. Clients can also take on the role of a gamer which leads to the development of habits. Based on the statistics outlined at the beginning of this chapter, it is likely people will have an interest in video games. This likelihood is likely to increase in the future. As such, video games may be a medium of interest to clients with potential for use as a therapeutic intervention. Based on the rapid growth in popularity of video games, outlined at the beginning of this chapter, if a clinician is not aware of video games as a tool for therapeutic intervention or know how to implement them into practice then they are lacking a potential effective method for that client.

The aspect of gaming as a therapeutic intervention that is more challenging is getting clinicians to adopt video games as interventions into their practice. Clinicians may believe that the use of gaming as a therapeutic medium is expensive since that is the case with serious games (Colder Carras, Van Rooij, et al., 2018). However, consumer video games have a comparatively low entry price (Gustavsson et al., 2021; Pallavicini et al., 2021; Prahm et al., 2018). Another barrier clinicians face in adopting video games into their practice is the learning time.

The average age for an occupational therapist in the United States is 40 years old (Zippia, 2021). According to the ESA (2022), 13% of Americans who play video games are between the ages 35-44. Twelve percent of gamers are between the ages 45-54 years old, 9% of American gamers are ages 55-64, and 6% are ages 65 and above (ESA, 2022). To put that into perspective,

approximately 40% of gamers in the United States are age 35 and above while 36% of gamers in America are between the ages 18-34 alone (ESA, 2022). The games played by the 45-65+ age group tend to be casual games or arcade games such as pinball and Pac-Man (ESA, 2021). Less than a third of this age group engage with newer titles (ESA, 2021). Most older Americans do not engage in video game play; those who do, play older game titles (ESA, 2021). This means that the average occupational therapist is not likely to be familiar with the range of video games available for potential use in clinical practice. The time required to personally explore the range of games to understand their inherent properties is expected to be so high as to be impractical. The process of learning the properties of commercial video games needs to be made as easy as possible for the clinician. Thereby improving the ease of use of the system, which is one pillar of the TAM.

With a database, all relevant information is easily searchable. A database can eliminate a vast amount of the learning required to adopt video games into therapy practice. Thereby, improving the perceived usefulness of the technology which is the second pillar of the TAM. If both perceived usefulness and perceived ease of use are adequate for a given user, the users' motivation to use the technology increases. Two avenues can be addressed to ensure the highest probable success of the proposed database: design characteristics and user participation (Venkatesh & Bala, 2008). Design characteristics of a technology influence a user's perceived usefulness and perceived ease of use of a technology (Davis, 1993). User participation in the development of a technology specifically in prototype testing can provide insight on the perceived usefulness of a technology (Venkatesh & Bala, 2008). Utilizing TAM will aid in the development of this project by providing insight on how clinicians view this proposed database. With that data the database can then be tuned to provide the most clinician friendly user

experience.

Activity analysis is an effective skill that can be utilized to collect all pertinent information regarding commercial video games and their use as therapeutic intervention. Such information can include what performance skills are utilized while playing the game, which video game titles can potentially be used to treat which conditions, the equipment required, and how to set up the intervention. The ability to perform an activity analysis is ingrained into the OT practice and framework (Forsyth et al., 2019; Neistadt et al., 1993). This makes occupational therapist qualified to utilize activity analysis to analyze a myriad of tasks including video games (Schell et al., 2019).

Conclusion

Video game media is constantly changing and evolving. Due to the fast pace of video game evolution, and the relatively slower pace of research, the outcomes of studies may already be obsolete by the time they are published (Colder Carras, Van Rooij, et al., 2018; Pallavicini et al., 2021). There is also a lack of continuity in the research, in that terms used to describe aspects of video games, and their use in therapy, are varied and non-standardized (Bediou et al., 2018; Colder Carras, Van Rooij, et al., 2018). This makes analysis of the literature more difficult. Much of the literature that address video gaming as a therapeutic medium, has focused either on software specifically designed for therapy use or utilized outdated hardware that is no longer commercially available to the consumer, rather than looking at the therapeutic potential of presently available commercial video games (Colder Carras, Van Rooij, et al., 2018; Griffiths et al., 2017; Pallavicini et al., 2021). There is no standard way to assess the therapeutic potential of commercial video games making it difficult for clinicians to utilize video games as therapeutic interventions. This demonstrates the need for a database that catalogs the properties of

commercial video games so that occupational therapists can better assess their potential therapeutic value.

Chapter 3: Methods

The purpose of this capstone project was to develop an online database of commercial video games, and their therapeutic properties, to facilitate their use as therapeutic media in OT practice. In order for this to happen, the games must first be played. This is a daunting task considering how many commercial video games there are available, and the significant time investment required for a clinician to personally evaluate each desired title. However, the continued rise in popularity of video games within the general public necessitates the need to consider the use of video games in therapeutic practice. Therefore, the database solution provides an ever-expanding resource that clinicians can use to guide them on how commercial video games can be applied in their own practice. With this database solution, the data one clinician gains from playing a video game are then shared with many. Thus, eliminating the significant time investment required to learn the therapeutic potential of a given commercial video game for any other clinician that uses the database and makes adopting commercial video games into therapeutic practice much easier. This solution also benefits clients because having another potential therapeutic medium available to them while receiving OT services makes their service potentially more personable and engaging.

Processes

Development of this project occurred in five phases: the selection phase, the analysis phase, the design phase, the input phase, and polishing phase. Some phases may overlap with another, but each phase has its own distinct objectives.

The selection phase consisted of selecting which commercial video games would be subject to activity analysis during analysis phase. This was based on resources available to the researcher during the development of the project as well as feedback from key stakeholders and

mentors. Services used in the development of the project included Xbox Game Pass and PlayStation Plus Premium (Microsoft, 2023b; Sony Interactive Entertainment, 2023a). These services provide access to hundreds of titles available with one subscription. The Nintendo Switch was included because it is a console that key stakeholders are interested in using in clinical practice. During this phase, 10 games were selected for the analysis phase. The 10 games were, Active Arcade (NEX Team Incorporated, 2021), Arms (Nintendo, 2017), Ring Fit Adventure (Nintendo, 2019), Nintendo Switch Sports (Nintendo, 2022), Cuphead (Studio MDHR, 2017), Death Squared (SMG Studio, 2017), Good Pizza, Great Pizza (TapBlaze, 2018), Tetris Effect: Connected (Resonair, Monstars, Stage Games, 2018), Unpacking (Witch Beam, 2021), and It Takes Two (Hazelight Studios, 2021).

During the analysis phase the selected games were played for a minimum of two hours and a modified activity analysis based on the Assessment of Motor and Process Skills (See Appendix A) was applied to each game in order to determine the therapeutic potential of the selected video games. Data was recorded and stored in the researcher's cloud storage account until the input phase began. Data points included within the analysis are the game title, a brief description of the game, the objects, and the properties thereof to play the game including the platform and accessories; and time to play. A sequencing of events that take place within the game was outlined when applicable. Some of the chosen games do not have a set sequence of events. This made it difficult to outline the sequence of events that take place in the game. It was decided to instead describe the actions the player must take to successfully participate in gameplay in leu of a sequence of events when it did not apply. Therapeutic aspects described include potential client factors and performance skills. Such body functions include specific mental functions, global mental functions, sensory functions, neuromusculoskeletal and

movement-related functions, muscle functions, movement functions cardiovascular functions, respiratory functions, and voice and speech functions (AOTA, 2020). Performance skills included in the analysis are divided into three categories motor skills, process skills, and social interaction skills (AOTA, 2020). Lastly, possible areas of application informed by the activity analysis and interest tags were noted at the end of the activity analysis. This was done to concisely inform the clinicians on how they could apply a client-centered approach in their specific use case more easily. Areas of application are recommendations on areas of intervention a video game might be best suited for such as: balance, range of motion, and mild cognitive impairment. Interest tags are characteristics of the game that clients might enjoy such as: sports, cars, or animals.

The design phase was completed in collaboration with the Family Gaming Database (Family Gaming Database, 2023b). Much of the database framework already existed on the Taming Gaming Database including a description of the game, which platforms a game is available on, and playtime. However, in leu of legal concerns, it was decided to keep the therapeutic perspective data separate from the preexisting framework until proper compensation could be made for the work involved in expanding the Taming Gaming database. Because of this, three curated lists were produced containing the 10 video games included in my project. These lists were categorized based on the client factors and performance skills they are assumed to influence most predominately based on the information recorded in the activity analysis.

Collaboration with the Family Gaming Database took place when writing the paragraphs that are included on the webpage and within the lists. The paragraphs are meant to describe the purpose of the lists as well as provide a surface level education to readers on different areas the games could influence. It was decided to keep the vocabulary and description more general so as

to not alienate the broader audience the website has who are not clinicians. These three lists were then posted on the Taming Gaming website under the “therapy” tag.

Once both parties agreed on the data that is contained within the lists and on the webpage, the input phase began. All therapeutic perspective data collected during the analysis phase was synthesized into a single document (see Appendix B) whose link is posted within the therapy webpage and within each list itself. The document provides a brief description of how the given game can be used therapeutically along with its respective full activity analysis.

The polishing phase is when testing of the database occurred. Database inputs were tested to ensure the accuracy of data entry. Volunteer clinicians interacted with the database and provided feedback based on their own user experiences. All volunteers were key stakeholders such as my mentor and those I worked with during my capstone experience. Any significant suggestions made were considered and implemented based on the time remaining for project completion. Thus, real user participation and feedback influenced the design characteristics of the database. If possible, volunteer clinicians were asked to reassess the database after changes have been implemented. The goal of the process is to increase overall perceived usefulness and perceived ease of use of the database.

Conclusion

In this chapter, the process that occurred during development of the therapeutic properties of video games database was described. The development process consisted of six phases the selection phase, the analysis phase, the organization phase, the design phase, the input phase, and polishing phase. A timeline for completion of each phase was included.

The grand scheme of this project is for it to become open source so that others can contribute to it and maintain it. Within the scope of this project, the fact that there are too many

games for any one person to evaluate still exists so in actuality this is a proof of concept. More platforms and more analysis criteria need to be included in order for this tool to adequately provide a more complete understanding on how to use commercial video games in therapeutic practice to clinicians.

Chapter 4: Results

This chapter contains a summary of the capstone project intended for the OT practitioner audience. This chapter is formatted for submission to AOTA's *OT Practice* magazine standards for submission. *OT Practice* magazine aims to provide the members of AOTA with practical information for clinical practice. This article is intended to support that aim.

Database of Video Games and Their Therapeutic Properties

Since the advent of the television-based video game Pong (Atari, 1972) in the 1970s, commercial video game software and technology have advanced to the point where it can become difficult to distinguish a video game from reality. The potential benefits to occupational therapy (OT) practice that commercial video games can provide have also grown along with the technologic advancement. For example, one study showed that the use of the commercial video games Donkey Kong (Nintendo Research and Development Number 1, 1981) and Pac-Man (Namco, 1980) as therapeutic media resulted in a significant increase in reaction time (RT) among elderly adults when compared to the control group (Clark et al., 1987).

However, it was not until the release of the Nintendo Wii in 2006 that the use of video games began to gain popularity as a therapy intervention tool (Metacritic, 2022). Fast-forward almost two decades and clinicians still predominately reference the Nintendo Wii and the Xbox Kinect, which first released in 2010 (Dietz, 2010). The problem is that these older technologies are no longer readily available to the public because they are no longer in production (Good, 2017; Matulef, 2013). There is paucity of research on current commercial video games and the sheer volume of commercial video games released every year makes it difficult for OT practitioners to know which video games have utility in clinical practice. In 2021, 4,800 video game titles were assigned a rating by the Entertainment Software Ratings Board (ESRB) and

over 10 thousand video game titles released for the personal computer (PC) digital distribution storefront Steam (Clement, 2022; ESRB, 2023; Jay, 2021; Valve Corporation, 2023). The amount of video games available makes it virtually impossible for an OT to play every commercially available video game and assess it for therapeutic value. As such OT practitioners may be unaware of the therapeutic potential many commercial video games may have, therefore, they are unable to implement them into their own OT practice. To address this problem, a database was created to provide OT practitioners with a resource that can be referenced to inform them on the therapeutic potential of commercially available video games.

Database Development

Development of the database was divided into five phases (a) the selection phase, (b) the analysis phase, (c) the design phase, (d) the input phase, and (e) the polishing phase. In the first phase, 10 video games were selected for activity analysis. The selection criteria for the 10 games were that each one was commercially available through either Xbox Game Pass or PlayStation Plus Premium subscription services (Microsoft, 2023b; Sony Interactive Entertainment, 2023a). Commercial video games available for the Nintendo Switch were also included because of the perceived interest from key stakeholders in using the console in clinical practice. The selection of games includes, Active Arcade (NEX Team Incorporated, 2021), Arms (Nintendo, 2017), Ring Fit Adventure (Nintendo, 2019), Nintendo Switch Sports (Nintendo, 2022), Cuphead (Studio MDHR, 2017), Death Squared (SMG Studio, 2017), Good Pizza, Great Pizza (TapBlaze, 2018), Tetris Effect: Connected (Resonair, Monstars, Stage Games, 2018), Unpacking (Witch Beam, 2021), and It Takes Two (Hazelight Studios, 2021).

During the analysis phase, the 10 selected games were subject to an activity analysis in which the games were played for a minimum of two hours and relevant findings were recorded

in the modified activity analysis template. The modified activity analysis is based on the Assessment of Motor and Process Skills (Fisher & Jones, 2010). Game characteristics were related to performance skills and client factors found in the activity analysis.

The design phase occurred in collaboration with Andy Robertson, CEO of Meaningful Media, and host of the "Family Gaming Database" or "Taming Gaming" database website (Family Gaming Database, 2023b). A dedicated webpage was created to contain all material related to this project. Three subpages were created. Each subpage features a category of the performance skills contained within the activity analysis template, namely, "Motor Skills," "Process Skills," and "Social Interaction Skills." A description providing general definitions and basic applications of the therapeutic relationship for each category is featured at the top of each subpage. The paragraphs were purposely composed in such a way so as to not alienate the majority audience of the Taming Gaming website which is general population.

Once the design phase concluded the input phase began. During the input phase, the 10 games chosen to be subject to the activity analysis were added to three curated lists unique to each of the subpages created during the analysis phase. The games were added to a list based on the therapeutic aspects the given game would potentially influence most. These lists can be filtered based on criteria preexisting on the Taming Gaming database. Filters include game genre, platform, age rating, age of player, how many players, cost, and a variety of accessibility features. When selecting a game, a new page opens that provides more in-depth information about the game. This includes a trailer, a synopsis of the game, time to play, details about the game, a list and description of accessibility features, and a sub list displaying other curated lists the game is featured in on the website.

After the created webpage went live it was shown to key stakeholders and clinicians

provided input on the content, perceived usefulness, and perceived ease of use of the webpage. Usefulness and ease of use are two elements of the Technology Acceptance model that influence the users' motivation to use the given technology. Any feasible suggestions made during the input phase were implemented if there was enough time before the project deadline to do so.

Inspiration For the Database

While working with Craig Hospital I had the opportunity to utilize commercial video games as therapeutic intervention. One example was with a client recovering from a spinal cord injury who regained the ability to walk but had balance impairments and reduced function in one of their upper extremities. During their session his therapists and I utilized Ring Fit Adventures on the Nintendo Switch as intervention to challenge the client's balance, endurance, coordination, and bilateral integration skills (Nintendo, 2019). The client participated in several mini games that required the use of both arms as well as full body movements such as squatting and walking in place. These activities were made more tolerable first because the client identified as a gamer and the gamified nature of the movements made the therapy session fun for the client. So much so that the parent of the client immediately purchased the game for themselves from Amazon. This would not have been possible if the session utilized older hardware and software.

Therapy intervention does not have to be as drastic as the previous example though. Many other clients I worked with during their recovery from spinal cord injury were able to facilitate postural control and hand function through the use of video games. Beyond that, many of these clients were made happier given the idea that they could play video games with their friends or family again like they did before their injury. However, not every game was beneficial when working with clients. One consideration is the state of the individual in their recovery and

coping with whatever condition they are facing. Clients with newly acquired injuries or impairments playing their favorite game on their first attempt at playing video games again can be a frustrating experience Thus, causing the individual to not want to participate in an activity they previously loved. What I learned is to take it slow with these clients and explain that even though they would like to play their favorite game we need to work up to it. It becomes another goal in a way, to eventually play the client's favorite game with success.

As a gamer and OT practitioner, this project is meaningful to me because it has allowed me to shine a new light on video games as a therapeutic medium. For many individuals, video games are not a solitary activity where hours are spent sitting alone in front of a screen. Instead, playing video games often carries with it a social context in which relationships are maintained and where new relationships are formed. This makes playing video games a meaningful activity in which clients may identify with. Clients who identify as gamers will only increase as video games continue to grow in popularity. It is an OT practitioner's duty to provide service utilizing activities a client enjoys whenever possible as long as there is benefit in doing so. This fact necessitates the existence of this database.

Conclusion

This database is a resource for clinicians that may not be as knowledgeable about video game technology but are still interested in using video games in therapy practice. The project is meant to inform these clinicians about any therapeutic potential the wide variety of video games possess. Thus, making it more feasible for more clinicians to add video games to their OT toolbox. The webpage "Therapeutic Lists" is live (Family Gaming Database, 2023a). More games will be added as the database continues to grow. This database was initiated as part of the doctoral capstone process, therefore, there was no compensation for the creation and

implementation of it. Taming Gaming is a website that is hosted and sponsored by Meaningful Media.

Chapter 5: Discussion

The purpose of this capstone project was to develop an online database of commercial video games, and their therapeutic properties, to facilitate their use as therapeutic media in OT practice. It was determined through examining the literature that previous studies are focusing on which genres are effective as various interventions for specific conditions. However, this is not the most effective approach as the lines that define specific genres are increasingly blurred (Bediou et al., 2018). A more in depth analytic approach for each specific game is necessary focusing on traits within each game (Chandra et al., 2016; Pallavicini et al., 2018). This project succeeds in providing background information about the capstone population, examined the literature, provided a plan for project development, using MOHO and TAM as the theoretical frameworks as a guide for its development, summarized the development of the development, and contents of the database webpage. The database webpage provides data on the therapeutic potential of various video games through the use of an activity analysis and other informative data that existed on the Taming Gaming website prior to this project beginning. Other data includes a summary of the video game, which platforms the game is playable on, age ratings, play time, and accessibility features. The remainder of the capstone examines the impact and future considerations for this capstone and other researchers.

OT Practice

The literature pertaining to the use of video games in OT practice and therapy in general is emerging (Colder Carras, Van Rooij, et al., 2018; Ferreira-Brito et al., 2019). The research that does exist is either outdated or utilizes outdated hardware, software, or utilized serious games (Griffiths et al., 2017; Pallavicini et al., 2021). A number of studies identified within the literature review utilized outdated hardware, software or serious games: (Aramaki et al., 2019;

Ferreira-Brito et al., 2019; Fitzgerald & Ratcliffe, 2020; Garcia-Agundez et al., 2019; Hutchinson et al., 2016; Kable et al., 2017; Li et al., 2016; Rolle et al., 2017) However, that does not mean that the findings contained within these studies are useless. It just means that application needs to be carried over and applied to modern titles. Many games have traits that are present in one another. An easy example is to look at shooter games. They have not changed much over the years. This means that carryover is possible. A Call of Duty game (Activision Publishing, 2023) today has many, if not all, of the same traits that an older Call of Duty title might have (GameSpot, 2022; IGN, 2009). The only major difference, outside of graphical fidelity, is that the newer games are readily available while the older titles are not.

There is also a lack of organization and consistency throughout the different studies (Bediou et al., 2018; Colder Carras, Van Rooij, et al., 2018). The lack of organization and inconsistencies exist in how the video games are defined and in how the video games are applied (Ferreira-Brito et al., 2019). The inconsistencies range from how the games are identified and categorized, to the methodologies used to study the games. These inconsistencies and lack of organization make it difficult for OT practitioners to apply the findings from the literature in their own OT practice. The aim of this project is to provide data on the properties of commercial video games in an organized and standardized manner. The database brings organization to the data through the use of filters that can be applied to the project lists to help the practitioner to find a game that meets their needs. The standardization arises through the use of an activity analysis template where the data is presented in the same way for every game within the project. By using the database webpage any OT practitioners who want to apply commercial video games therapeutically in their own practice can now inform themselves as to what games are available on current hardware without the need to play the games themselves (Family Gaming Database,

2023a). As this is the most effective method to tell if a game has therapeutic potential (Ferguson, 2022). The effectiveness of how any technology is in any application starts with the professional's own understanding of it (Stallard, 1982). This project was done to make it easier for more OT practitioners to apply a widely popular activity for many individuals in their own practice. Some forty years ago as video game technology was just emerging, its potential to improve quality of life of people with spinal cord injuries was recognized by OT scholars (White et al., 1984). As such, OT practitioners should be aware of the therapeutic properties of video games and their potential application as a therapeutic medium with clients with an interest in video games. Otherwise, they may miss an opportunity to provide an intervention that may be well suited to the client.

OT Scholarship

The problem this database webpage aimed to address was that OT practitioners are unaware of the therapeutic properties of commercial video games they have not played and because of the sheer amount of commercial video games released every year it is impossible for any one OT practitioner to critically analyze every commercial video game. Academic research on video game technologies as therapeutic interventions gets outpaced by the rate at which video games are developed (Colder Carras, Van Rooij, et al., 2018). This means that by the time research is released, it is already outdated in the world of video games. This capstone project provides a resource that more quickly analyzes commercial video games for their therapeutic potential and thus can be used to inform other OT practitioners decisions when utilizing video games as an intervention.

Recommendations for the Future

This project does not have a definite end point because as time passes more video games

are released and thus need to be analyzed for their therapeutic potential. The ultimate goal is for this resource to become open source so that other OT practitioners and other clinicians can contribute to the analysis effort because as stated before, it is impossible for any one individual to critically analyze every commercially available video game. Due to limitations of this project, VR games were excluded from the process. It is the author's intention to expand the database to include VR games in the future. For now, it would be best to disseminate this capstone project to as many resources as possible. An article that describes this project will be submitted to *AOTA's OT Practice* magazine and the University of St. Augustine School for Health Sciences research database, Scholarship and Open Access Repository ([SOAR]; University of St. Augustine for Health Sciences, n.d.). The database webpage will continue to expand and evolve as feedback is received. This is all done in an effort to make a product that is useful and easy to use for any OT practitioner or other clinician.

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Appendix A

Activity Analysis Template

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). *Occupation-based activity analysis*. [Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game:

Description of the Game:

Objects and Their Properties Required

Which Platform:

Time to Play:

Sequencing and Timing:

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight		
Attention: sustained		

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
attention and concentration; selective, divided, and shifting attention		
Memory: short-term, working, and long-term memory		
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive		
Thought: control and content of thought, awareness of reality, logical and coherent thought		
Sequencing complex movement: regulating speed, response, quality, and time of motor production		
Emotional: regulation and range of emotion, appropriateness of emotions		
Experience of self and time: appropriateness and range of emotion, body image, self-concept		
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		
Orientation: orientation to person and self, place, time, and others		
Temperament and personality: extroversion, introversion, agreeableness, and		

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
conscientiousness; emotional stability; openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite		
Energy and drive: motivation, impulse control, appetite		
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		
Hearing; sound detection and discrimination; awareness of location and distance of sounds		
Vestibular: position, balance, secure movement against gravity		
Proprioceptive: awareness of body position and space		
Touch: feeling of being touched, touching various textures		
Pain: localized and generalized pain		
Temperature and pressure: thermal awareness, sense of force applied to skin		
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		
Joint stability: structural integrity of joints		
Muscle Functions		
Muscle endurance: sustaining muscle contraction		
Movement Functions		

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Involuntary movement reactions: postural, body adjustment, and supporting reactions		
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		
Gait patterns: movements used to walk		
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm		
Respiratory system: rate, rhythm, depth of respiration		
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity		
Voice and speech: rhythm and fluency, alternative vocalization functions		

Performance Skills Required

SKILL	**N/A**	**Context of Skill Within the Game**
Motor Skills		
Aligns		
Stabilizes		
Positions		
Reaches		
Bends		
Grips		
Manipulates		
Coordinates		
Moves		

SKILL	**N/A**	**Context of Skill Within the Game**
Lifts		
Walks		
Transports		
Calibrates		
Flows		
Endures		
Paces		
Process Skills		
Paces		
Attends		
Heeds		
Chooses		
Uses		
Handles		
Inquires		
Initiates		
Continues		
Sequences		
Terminates		
Searches/locates		
Gathers		
Organizes		
Restores		
Navigates		
Notices/responds		
Adjusts		
Accommodates		
Benefits		
Social Skills **The therapist can address social interaction skills using the game but this is client specific and thus can be determined by the therapist. Otherwise social interaction skills are not required to be successful in game.**		
Approaches/starts		
Concludes/ disengages		
Produces speech		
Gesticulates		
Speaks fluently		
Turns toward		
Looks		
Places self		
Touches		
Regulates		
Questions		

SKILL	N/A	Context of Skill Within the Game
Replies		
Discloses		
Expresses emotion		
Disagrees		
Thanks		
Transitions		
Times response		
Times duration		
Takes turns		
Matches language		
Clarifies		
Acknowledges and encourages		
Empathizes		
Heeds		
Accommodates		
Benefits		

Areas of Treatment (Application)

Interest Tags

Appendix B

Active Arcade

Active Arcade is a free mobile app that has several activities where the players are the controller. Meaning, players movement in the real world with the controller influences the actions the in-game character takes. What is great about this game besides it being free, is that the player can see themselves interacting with the virtual elements on screen in most of the activities within the game. This makes Active Arcade a great way to potentially challenge a player's spatial awareness. The games range from utilizing only the upper body, making it possible to play seated or standing depending on the positioning of the mobile device, to full body engagement. This means that either upper limb mobility coordination can be challenged to a degree or full body mobility and coordination can be challenged to a degree, depending on the activity that is chosen alongside as seated or standing balance.

The activities are straightforward and intuitive, even more so than Switch Sports (See page 40). Player performance can be assessed through achieving new personal high scores and observing the player's quality of movement during the gameplay session.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: Active Arcade

Objects and Their Properties Required

Which Platform: Mobile

Time to Play: Generally each game takes ~2-3 minutes to play

This app consists of 14 mini games ranging in difficulty that require the player to use their body as the controller.

WM= Whack A Mole

The player uses their upper extremities to whack moles that appear on screen all around the player. This game can be played cooperatively.

LD= Laser Dodge

Players move their entire bodies to dodge lasers that cut off areas of the screen

BH= Bunny Hop

Players move side to side and jump (exaggerated shoulder shrugging or arm movement can trigger the jump as well) to navigate a vertical stage until the end goal is reached

RF= Reaction Flow

Players use their arms (and optionally legs) to hit numbered targets as they appear on screen. Targets must be hit in sequential order. This game can be played completely with another player

DT= Dribble Tag

It is recommended to play the game while dribbling a ball. Players work to hit green targets with their off hand and orange targets with the ball.

SH= Super Hits

This is a rhythm game that has two different playstyles. The first and harder of the two styles is where players must wave their arms in the direction of the arrow as it approaches the player on screen. In the second option the screen is divided into six sections, three on the left and right of the player. The player must place their hand in the section as the notes approach the player. There are different difficulty levels for the songs available.

BA= Box Attack

Players must move their entire bodies to fit their bodies into box cutouts on screen. Requires jumping and getting up and down from the floor.

SP= Space Pong

Players use one hand to act as a paddle to volley a ball back and forth. Where the player's hand is positioned is where the paddle goes. Can be played completely online.

CK= Cone Knockout

Players move laterally back and forth and bend down to hit cones. This game works similarly to a shuttle run done laterally.

HK= High Kicks

Players use their arms and legs to hit targets as they appear on screen.

GJ= Galaxy Jumpers

Players navigate a ship through an obstacle course, where the frequency of jumping determines how high their ship flies. Less jumping or no jumping causes the ship to fall. Can be played cooperatively with up to three other players. Requires small jumps.

FP= Fit Pals

This game is essentially a jump counter, where players jump along with a chosen animal on screen. Can be played cooperatively.

P= Pose

Players position their entire bodies in such a way to mimic the pose shown on screen. This game requires to maintain balance in awkward positions (one foot and off axis)

R= Reaction

Players use their upper extremities to target as they appear on screen. The quicker the player hits the target the more points they are awarded. Can be played completely with another player

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight	X	
Attention: sustained attention and concentration; selective, divided, and shifting attention		The player must sustain attention during gameplay in order to be successful during gameplay. Most games have a timer in which the player must attend for that duration procuring points. If players do not attend they will score lower. Players' selective attention will be challenged in WM, RF, SP, HK, and R because there are elements the player must filter out or avoid (bombs and red targets) as well as reacting to the ball as it approaches in SP.
Memory: short-term, working, and long-term memory	X	
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive		Each game will challenge the players proprioceptive and vestibular ability. In each game, the player is the controller, using their whole bodies in LD, BH, DT, BA, CK, HK, GJ, FP, P and only required to use their upper extremities in WM, RF, SH, SP, R
Thought: control and		The player must have a baseline level of

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
content of thought, awareness of reality, logical and coherent thought		awareness of reality. But there is no direct challenge to thought. The games are simplistic.
Sequencing complex movement: regulating speed, response, quality, and time of motor production		Each game will challenge the players ability sequence complex movements In each game, the player is the controller, using their whole bodies thus requiring the sequence of full body movements such as getting up and down from the floor, jumping, bending, squatting, kicking, and lateral movement in LD, BH, DT, BA, CK, HK, GJ, FP, P and only required to use their upper extremities in WM, RF, SH, SP, R. Thus, challenge upper extremity ROM, reaching ability, and accuracy of movement. The games that only require the player to use their upper extremities can be played while seated successfully. Regulating speed, response, quality and time of motor production all are factors that will affect the players overall scores since most games are on a timer. Hitting a number of targets or moving their bodies into a space on screen before the prompt runs out (in LD and BA) in a set amount of time to achieve higher scores.
Emotional: regulation and range of emotion, appropriateness of emotions		Players compete against themselves in trying to beat their own scores. Players must be able to regulate their emotions in the cases where they are frustrated about not being able to beat their own score or when losing to another player (when playing the competitive games, see descriptions above)
Experience of self and time: appropriateness and range of emotion, body image, self-concept		Each game shows an image of the player during gameplay except for JP. This can challenge how the player perceives themselves and play into body image
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful		Complete consciousness is necessary in order to be successful in playing this game.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
state		
Orientation: orientation to person and self, place, time, and others	X	
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability; openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite		Confidence and motivation can be challenged through the use of scores being tracked. Players compete against themselves in most cases with exception to cases in which games are played completely (see game descriptions above). Openness to trying new things is required when the player has never played the game before and self-expression can be induced when reacting to their and or their partner's performance during gameplay.
Energy and drive: motivation, impulse control, appetite		Each game will challenge the player's energy and drive to a degree. The player is the controller, using their whole bodies thus requiring the sequence of full body movements such as getting up and down from the floor, jumping, bending, squatting, kicking, and lateral movement in LD, BH, DT, BA, CK, HK, GJ, FP, and P. These games will require a significant amount of energy expenditure from the player. The games that only require the use of the upper extremities in WM, RF, SH, SP, R will require less energy expenditure generally. Therapists must be mindful of the specific client's abilities and capacities.
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		A player must possess adequate levels of vision to distinguish objects on a screen. Players must possess enough visual acuity to determine where they are on screen, as well as identifying targets as they appear on screen. In the case of RF hitting targets in the proper order, requires that players can see the number on the targets. There is a degree of visual tracking to be

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		effective in this game specifically in SP where the player must track the ball as it is volleyed back and forth.
Hearing; sound detection and discrimination; awareness of location and distance of sounds	X	
Vestibular: position, balance, secure movement against gravity		Each game will challenge the player's vestibular ability to a degree. In the full body games, LD, BH, DT, BA, CK, HK, GJ, FP, and P. There are times when balance is challenged to a degree because of the awkward body positions the player is required to take, standing on one foot, jumping, moving laterally and/or standing off axis. This is especially the case in P. The games that only require the player to use their upper extremities (WM, RF, SH, SP, R), challenge upper extremity ROM, reaching ability, and accuracy of movements and can be played while seated successfully. Playing games will challenge vestibular ability through seated balance.
Proprioceptive: awareness of body position and space		The player moves in physical space to interact with virtual elements (hitting targets) as they present on screen. They must also be able perceive their body in space to determine where their limbs are in space and if they have enough room to perform the necessary movements. This ranges to just the upper body to full body depending on the game that is picked.
Touch: feeling of being touched, touching various textures	X	
Pain: localized and generalized pain	X	
Temperature and pressure: thermal awareness, sense of force applied to skin	X	
Neuromusculoskeletal and Movement-Related Functions		

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Joint mobility: range of motion		Can be determined by the therapist. The therapist must be aware of their client's own ability before having them attempt a given game. In each game, the player is the controller, using their whole bodies thus requiring the player to mobilize multiple joints or challenge their joint mobility such as getting up and down from the floor, jumping, bending, squatting, kicking, and lateral movement in LD, BH, DT, BA, CK, HK, GJ, FP, P and only required to use their upper extremities in WM, RF, SH, SP, R. Thus, only challenging upper extremity ROM, reaching ability, and accuracy of movement. The games that only require the player to use their upper extremities can be successfully played while seated. Each of the required movements to successfully engage in gameplay will challenge a player's joint mobility.
Joint stability: structural integrity of joints		Therapists should be aware of client limitations before having them attempt a given game.
Muscle Functions		
Muscle endurance: sustaining muscle contraction		Some games require the player to hold abnormal poses (LD, BA, P) or hold their arms up for an extended period of time (WM, SH, SP) thus challenging the player's muscle endurance.
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		All games will challenge all elements of involuntary movement control. In each game, the player is the controller, requiring the player to move and position their bodies in various ways such as getting up and down from the floor, jumping, bending, squatting, kicking, and lateral movement in LD, BH, DT, BA, CK, HK, GJ, FP, P and only required to use their upper

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		extremities in WM, RF, SH, SP, R. Thus, only challenging upper extremity ROM, reaching ability, and accuracy of movement. The games that only require the player to use their upper extremities can be played while seated successfully. All of this requires that the player maintain postural control, adjust their body position, and challenge supporting reactions standing or seated.
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		Each game requires a significant ability to control voluntary movement, eye hand coordination, and/or foot hand coordination, bilateral integration, gross motor control and oculomotor control are all challenged to a degree depending on which game is selected. The only exception being FP. FP is only jumping up and down and so this game specifically only requires gross motor control. The degree to which each is challenged is varied within each game as some games are inherently more challenging than others.
Gait patterns: movements used to walk		CK, LD, BH, and BA will challenge the player's ability to move laterally in order to position themselves effectively on screen.
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm		Depending on the amount of exertion exhibited during gameplay, the cardiovascular system could be challenged for some to a degree.
Respiratory system: rate, rhythm, depth of respiration		Depending on the amount of exertion exhibited during gameplay, the respiratory system could be challenged for some to a degree.
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity		The degree of challenge to physical endurance and stamina depends on the length of the play session and how much motion the player is producing during gameplay (given their ability).

FUNCTION (Specific Mental Functions)	N/A	Detailed Description
		Depending on the amount of exertion exhibited during gameplay, additional functions could be challenged for some to a degree especially when considering length of play sessions, challenge to stamina and aerobic capacity can be graded (number of attempts, or whether to play seated or standing). Players must possess enough physical endurance, stamina, and aerobic capacity to last for the duration of a game's singular duration. In most cases, this is 30-60 seconds.
Voice and speech: rhythm and fluency, alternative vocalization functions		During cooperative gameplay players can communicate, vocalizing information to each other. Players could use speech to relay information if playing as intended. Such as in WM communication can consist of who gets what targets and or helping each other identify when bombs are present on screen. But this is not specifically required to be successful.

Performance Skills Required

SKILL	N/A	Context of Skill Within the Game
Motor Skills		
Aligns		The degree to which this is challenged can be determined by the therapist.. Some of the games have the player standing. Others have the player seated.
Stabilizes		In each game, the player is the controller, requiring the player to move and position their bodies in various ways in which require various degrees of stabilization such as getting up and down from the floor, jumping, bending, squatting, kicking, and lateral movement in LD, BH, DT, BA, CK, HK, GJ, FP, P and only required to use their upper extremities in WM, RF, SH, SP, R. Thus, only challenging upper extremity ROM, reaching ability, and accuracy of movement. The games that only require the player to use their

SKILL	N/A	Context of Skill Within the Game
		upper extremities can be played while seated successfully. Challenging the players ability to stabilize themselves while seated P will especially challenge this because the player will frequently be prompted to stand on one foot and on off axis.
Positions		The player needs to position themselves with some level of precision in order to be successful during gameplay. Specifically in LD and BA because the player will be prompted to position their bodies in a specific area of the screen in order to be successful.
Reaches		The player is required to reach in physical space to interact with virtual elements shown on screen. Specifically, in RF, DT, SH, SP, CK, HK, P, and R all have various degrees of reaching required in order to be successful
Bends		Full body games (LD, BH, DT, BA, CK, HK, GJ, FP, P) will challenge the player's ability to bend to some degree, because the player will need to move and position their bodies in various ways in which require various degrees of bending such as getting up and down from the floor, jumping, bending, squatting, kicking, and lateral movement
Grips	X	
Manipulates	X	
Coordinates		Each game will challenge the players ability to coordinate movements to some degree. In each game, the player is the controller, using their whole bodies thus requiring the coordination of full body movements such as getting up and down from the floor, jumping, bending, squatting, kicking, and lateral movement in LD, BH, DT, BA, CK, HK, GJ, FP, P and only required to use their upper extremities in WM, RF, SH, SP, R. Thus, challenging the player's ability to coordinate upper extremity movement.
Moves	X	
Lifts	X	
Walks		Players do not walk specifically, but some games; CK, LD, BH, and BA will require the player to

SKILL	N/A	Context of Skill Within the Game
		move laterally in order to position themselves effectively on screen
Transports	X	
Calibrates	X	
Flows		Actions must be smooth and deliberate to be effective during gameplay especially when attempting to reach the higher levels and for them to register accurately by the device.
Endures		The player will be challenged to sustain the required movements/positions throughout the duration of a round of gameplay.
Paces		The rhythm games will challenge the players ability to keep pace with the music.
Process Skills		
Paces		Players need to mentally process and maintain (body movement tempo) at a consistent or increasing rate in order to achieve better scores.
Attends		A player must attend to the game throughout the length of the gameplay session, otherwise there will be an increased rate of failure or lower scores.
Heeds		Can be determined by the therapist The player completes gameplay under parameters requested by the therapist (execute the motions as directed by therapist).
Chooses		If allowed by the therapist, the player can choose which game they want to play or the therapist can provide the player with options.
Uses	X	
Handles	X	
Inquires		Can be determined by therapist But not required to be successful (i.e. asking clarifying questions when necessary in order to play the game successfully).
Initiates		Players begin performing required actions when gameplay starts.
Continues		Players continue required actions for the duration of the round of gameplay.
Sequences		RF requires players to hit targets in a numbered order. SH requires the player hit notes in rhythm with the music.
Terminates		The player ceases required movements when the gameplay round ends.

SKILL	N/A	Context of Skill Within the Game
Searches/locates		In WM, LD, BH, RF, DT, BA, HK, and R the player is required to scan the screen and locate target elements or platforms to interact with in order to score points or reaching the goal.
Gathers	X	
Organizes	X	
Restores	X	
Navigates		BH requires that players use their bodies to navigate a vertical stage to reach the end goal.
Notices/responds		The player notices and responds to how different virtual elements affect them (i.e. WM with bombs and different colored moles then RF, HK, DT, and R with different colored targets).
Adjusts		The player adjusts their gameplay in subsequent attempts in order to achieve higher scores.
Accommodates		Can be determined by the therapist.
Benefits		Can be determined by the therapist.
Social Skills The therapist can address social interaction skills using the game but this is client specific and thus can be determined by the therapist. Some games do allow for play with another player (see descriptions above). Otherwise, social interaction skills are not required to be successful in game.		
Approaches/starts		Players start relaying necessary information to each other. Not specifically required to be successful.
Concludes/ disengages	X	
Produces speech		Players may produce speech in order to communicate with each other in order to be most successful. Not specifically required to engage in gameplay effectively.
Gesticulates		Can be used to communicate if players are playing in the same space.
Speaks fluently		Players speak in ways that both players can understand when vocal communication is occurring.
Turns toward	X	
Looks	X	
Places self	X	
Touches		Can be determined by the therapist (appropriate touching). May be present but not required to be successful.

SKILL	N/A	Context of Skill Within the Game
Regulates		Players are able to remain focused on information relevant to the game.
Questions		Players are able to ask for appropriate clarifying information, when necessary, amongst each other or from the therapist. (i.e. What did you want me to do. How do I do X again).
Replies		Players continue relaying necessary information, responding accordingly when necessary. Thus, leading to better coordination and cooperation during gameplay.
Discloses	X	
Expresses emotion		Can be determined by the therapist. Players appropriately express their own emotions and their emotions toward one another such as when one player messes up causing both to fail or not achieve a higher score.
Disagrees		Players may need to appropriately express their differing opinions such as when discussing strategy on how to best go about achieving a higher score.
Thanks		May be present but not required to be successful.
Transitions	X	
Times response		Players respond to each other in a timely manner. Failure to respond in a timely manner can cause either player to make unnecessary mistakes due to them not knowing otherwise, information needs to be communicated quickly and efficiently. Only applies if players are actively communicating with each other but this is not specifically required to successfully engage in gameplay.
Times duration		Players respond to each other in a timely manner. Failure to respond in a timely manner can cause either player to make unnecessary mistakes due to poor coordination. Only applies if players are actively communicating with each other but this is not specifically required to successfully engage in gameplay.
Takes turns		Can be determined by the therapist if working with multiple patients or between themselves and their patient.
Matches language		May be present but not required to be successful.

SKILL	N/A	Context of Skill Within the Game
Clarifies		Players are able to clarify what they are attempting to communicate to the other player or therapist when necessary or when asked. Such as a gameplay strategy idea they may have.
Acknowledges and encourages		Players are able to acknowledge each other's frustrations when present as when trying to achieve a new high score and are able to appropriately encourage each other when necessary.
Empathizes		May be present but not required to be successful. Players are able to recognize the emotions the other is feeling, such as when getting frustrated and able to understand why they are feeling that way.
Heeds		Players heed to the others instructions when appropriate and able to communicate effective and coordinate actions cooperatively in order to be successful in achieving higher scores
Accommodates		Can be determined by the therapist.
Benefits		Can be determined by the therapist.

Areas of Treatment (Application)
Postural control
Balance
ROM
Muscular strength and endurance
Coordination

Interest Tags
Music, Dancing

Arms

The game Arms provides an experience very similar to the beloved Wii Sports Boxing. Core aspects of this game provide a great way to challenge the player's upper-extremity movement and range of motion. The game primarily utilizes punching motions from the player to throw punches in game. The game also offers functionality beyond basic punching found in Wii Boxing. This includes the ability to dodge, jump, and dash as well. Along with being able to throw punches with both arms, the dodge and dash abilities are activated with motions utilizing both limbs at once, thus incorporating an element of bilateral integration. However, focus can be kept on upper-extremity range of motion and endurance by setting the opponent's difficulty to "low" and choosing a small, simple arena that does not require a lot of navigation.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: Arms (motion controls)

Objects and Their Properties Required

Which Platform: Nintendo Switch

Time to Play: 1-2min to complete a default match

Sequencing and Timing

1. Select versus match
2. Choose Character
3. Select fist modifications
4. Match starts
5. Perform punching actions to perform punches in game
6. Tilt joy-con controllers to block and dodge punches from opponent
7. Do enough damage to opponent to win the round
8. Repeat steps 3-7 for round two

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive		Players are in a boxing match. In fighting matches, knowing when to press the attack or hold off and defend, depends on many factors that the player must be cognizant of in order to be successful.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
flexibility, insight		The player needs to make decisions and react based on in-game situations. Taking into account their opponents' actions and abilities; as well as health and the amount of super meter each player has. This requires a degree of judgment and cognitive flexibility.
Attention: sustained attention and concentration; selective, divided, and shifting attention		The player must remain attentive to both of their fists and the opponents' fists. In game modes with multiple targets, they must remain attentive to those targets in order to react appropriately. Analyzing their opponent in order to know what is coming and reacting, takes a degree of concentration and sustained attention. If the player does not concentrate on the game during gameplay. They will be beaten up and eventually lose the round and or match
Memory: short-term, working, and long-term memory	X	
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive		In game: There are audio and visual cues that identify when actively punching and when power ups are available. There are also unique audio and visual cues for player/opponent attacks that cue the player to what is coming or occurring. The player must be aware of their body in space. Possessing enough proprioception to identify where their limbs are in space, so that they can perform the actions necessary for gameplay (punches) will lead to better outcomes. Vestibular sense can be incorporated if the game is played while standing or free sitting given the client's abilities.
Thought: control and content of thought, awareness of reality, logical and coherent		Players need to logically analyze the "in game" situation and take appropriate actions to be successful. Matches are ever changing and so circumstances constantly change as

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
thought		well. An example would be closing space before executing a move that has a finite amount of range so that the move connects.
Sequencing complex movement: regulating speed, response, quality, and time of motor production		This game requires sequencing of movement within the upper arm including shoulder, elbow, wrist, thumb, and fingers to effectively play the game. The player actively throws punches to execute actions in game. Different types of punches execute different actions: two hand punches execute a grapple and throw, punching. While supinating or pronating the wrist will throw a hook punch in game in that direction. Tilting the joy-cons in various directions perform dodges and dashes. In order to make progress in game, gameplay necessitates that players perfect timing of movements (i.e. jumps, dodges and punches). For this to be accomplished, the player's ability to regulate the speed in which they provide input to the controller, response time, and time of motor production will all be challenged to a degree.
Emotional: regulation and range of emotion, appropriateness of emotions		It is assumed some might easily be caught in the emotion of the game as it is competitive. The player must demonstrate a degree of emotional regulation in this case in order to keep their emotions appropriate for the given situation.
Experience of self and time: appropriateness and range of emotion, body image, self-concept	X	
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		Complete consciousness is necessary in order to be successful in playing this game.
Orientation: orientation to person and self, place,	X	

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
time, and others		
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability; openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite		Can be determined by the therapist When playing versus other people, a degree of conscientiousness is necessary as there should be healthy competition, but not a demeaning or rudeness amongst the players to each other. Emotional stability, self-expression, confidence, motivation, self-control and impulse are all elements that can be challenged to a degree. Self-control and impulse are challenged, as players must keep the appropriate range of emotion while playing the game and not get caught up in the competitive nature of the game. If the player is having difficulties winning a match, a degree of confidence and motivation is necessary to persevere and to be able to deal with losing. Self expression may be present when players celebrate a win or deal with a loss.
Energy and drive: motivation, impulse control, appetite		There is a substantial degree of upper limb movement required to effectively play this game. Players actively throw many punches throughout a match for the duration of a match. Players must also possess enough motivation and drive to persevere when they face a challenge in game that they cannot easily overcome.
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		The player must have enough visual ability to perceive elements on the screen. Players must possess enough visual acuity to determine where they are on screen as well as obstacles to navigate through stages and respond to the actions their opponents are taking. Players must also track a number of enemies when playing game modes that have multiple opponents at one time. There is also a degree of visual tracking to be

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		effective in this game (i.e. tracking fists) both their own fists and their opponents so that they can take appropriate actions to dodge. At times there can be a lot of visual stimuli on screen (number of enemies, shifting stage elements, and visual effects from attacks). Players must be able to filter out excessive stimuli in order to focus on the important stimuli.
Hearing; sound detection and discrimination; awareness of location and distance of sounds		There are audio cues that signify when punching and when the player has power ups, but hearing is not necessary to effectively play the game. There are also unique audio and visual cues for player/opponent attacks that cue the player to what is coming.
Vestibular: position, balance, secure movement against gravity		Can be determined by the therapist. Punching motions are required to play the game so the player must be able to sustain their balance while performing these actions. Can be graded up or down (i.e. performed seated or standing or on a dynamic surface).
Proprioceptive: awareness of body position and space		At minimum, players must be able to perceive their body in space, to determine where their upper limbs are in space and if they have enough room to perform the necessary punching actions.
Touch: feeling of being touched, touching various textures		The game requires the use of a controller that the player must physically interact with. Players must be able to tell they are holding the controller and/or if they are hitting the desired inputs (triggers vs buttons vs joysticks) and if they are interacting with the joystick in the desired manner (orienting to the desired direction and not pressing down with excessive force) as this actuates another input L3 & R3; which can lead to unintended actions if the player did not mean to press those inputs.
Pain: localized and generalized pain	X	

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Temperature and pressure: thermal awareness, sense of force applied to skin	X	
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		At minimum the player must be able to minimally flex their shoulder and/or ulnarly deviate their wrist. The therapist can grade up the motion to a full punching motion. A player must also have enough joint mobility in the hands and fingers to interact with the input device. The game requires rapid button presses as well as timely responses on specific inputs (i.e. jumping and dodging, which is executed by tilting the joy-cons in a direction) in order to be successful. Thus, challenging the player's ROM and precision of the hand, finger, thumb, and wrist joints.
Joint stability: structural integrity of joints		At minimum the player must be able to sustain structural stability while performing the motions described above in joint mobility, especially when performing full punching motions.
Muscle Functions		
Muscle endurance: sustaining muscle contraction		The player's muscular endurance will be challenged while playing this game. Players must be able to keep throwing punches throughout the duration of a match. If players are unable to do so, they will not be able to defeat their opponent thus leading to failure.
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		The player must have enough postural control to maintain position while performing the required motions of the game (see joint mobility). The degree required can be determined by the therapist.
Control of voluntary		The game requires a significant ability to

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		control voluntary movement, eye hand coordination, bilateral integration, gross motor control and oculomotor control are all challenged to a degree when playing this game. Players coordinate movements between both limbs (tilting both joy-cons to dodge or dash, punching with both arms in order to grapple and throw) utilizing bilateral integration (punching with both arms), and crossing midline when throwing hook punches. Players exhibit fine motor control when interacting with the input device (moving the joystick accurately and pressing desired buttons), effective gross motor control when executing punches, and eye hand coordination in order to hit the desired target and the game requires players to perform actions in a timely manner.
Gait patterns: movements used to walk	X	
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm		Can be determined by the therapist. Depending on the amount of exertion exhibited during gameplay, the cardiovascular system could be challenged for some to a degree.
Respiratory system: rate, rhythm, depth of respiration		Can be determined by therapist Depending on the amount of exertion exhibited during gameplay, the respiratory system could be challenged for some to a degree.
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity		Can be determined by therapist The required amount of endurance depends on how much motion the player is producing (given their ability). When performing full punches, a minimal-moderate level of endurance is required from

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		an average individual. Depending on the amount of exertion exhibited during gameplay, additional functions could be challenged for some to a degree, especially when considering length of play sessions, challenge to physical endurance, stamina, and aerobic capacity can be graded.
Voice and speech: rhythm and fluency, alternative vocalization functions	X	

Performance Skills Required

SKILL	**N/A**	**Context of Skill Within the Game**
Motor Skills		
Aligns		Can be determined by the therapist. Ability to maintain posture without propping is required to effectively play the game. Under normal circumstances both hands are used to play the game.
Stabilizes		Can be determined by the therapist. The challenge to stabilization can be graded to fit the client's ability.
Positions		The player must position themselves within the environment in such a way to provide adequate enough space to perform actions necessary to play the game.
Reaches		Can be determined by the therapist (See joint mobility). The player performs the required motions to execute actions within the game and can be graded to fit their own ability.
Bends	X	
Grips		Must be able to maintain grip of joy-con controllers, ideally in both hands, while performing the necessary actions.

SKILL	N/A	Context of Skill Within the Game
Manipulates		Interacting with the input device requires a degree of manipulation in order to press the desired inputs in a timely manner.
Coordinates		This game necessitates the ability to coordinate upper limb movement to be effective at playing the game. The player throws punches with both arms as well as tilting both joy-cons in synchronicity in a direction to dodge, dash and block.
Moves	X	
Lifts		Lifting the joy-con controller is required in order to throw punches with them in hand.
Walks	X	
Transports	X	
Calibrates		Can be determined by a therapist. It takes very little motion to actually execute an action within the game (see joint mobility). However, this can be graded up (i.e. full punching motion) thus requiring a higher level of calibration.
Flows		Actions must be smooth and deliberate to be effective during gameplay. Throwing a combo of punches is most effective in order to keep the opponent at bay. If there is significant delay between actions, the player may be vulnerable to counter attack by their opponent.
Endures		Default matches are two rounds of 99 seconds (most rounds last 30-60 seconds) Other game modes (i.e. 1 vs 100) will take longer to fully complete. The player must endure postural control and hand, finger, wrist, and upper extremity movements for the duration of the gameplay session or until they reach a suitable stopping point.
Paces		Can be determined by the therapist The player must maintain the same rate and tempo throughout the matches. A slowing in pace at times can leave the player vulnerable. At the same time, the player cannot throw punches wildly, because this can be easily

SKILL	N/A	Context of Skill Within the Game
		countered by the opponent especially at higher difficulties.
Process Skills		
Paces		The player cannot constantly throw punches. There is a level of timing and tempo required in order to be effective during gameplay. Timing and tempo will change for each match, because it depends on many variables that the player has to process while in the match. This includes the arena, each players' health, how much super energy each player has, what types of attacks each player has and so on.
Attends		The player must attend the game until completion in order to be successful. Otherwise, they will not be able to react to what their opponent is doing.
Heeds		Can be determined by the therapist The player completes gameplay under parameters requested by the therapist (i.e. full punches).
Chooses		The players can choose from different boxing gloves at the beginning of each round. Each glove has a different mechanic that may better aid the player. (like a boomerang fist, and a heavy hitting wrecking ball fist).
Uses		The player must use the joy-con controllers as they are intended.
Handles		Players must hold joy-cons in the requested manner (thumb up in a neutral wrist position).
Inquires		Can be determined by therapist Players can ask for clarifying questions of the therapist whenever necessary. But not required to be successful.
Initiates		They must initiate multiple actions fluidly in order to be effective during gameplay (i.e. multiple punches or jumps/dodges).
Continues		The player continues various gameplay actions until the end of the match.
Sequences	X	
Terminates		There are times when it is most appropriate to punch and when to dodge. Players will be challenged to appropriately terminate their present action and switch to another at the most opportune

SKILL	N/A	Context of Skill Within the Game
		time in order to be most successful during gameplay. If the player punches wildly, that can be easily countered and if the player keeps blocking that leaves the player open to grapples.
Searches/locates		Players can search and locate health and super boosts on stage to aid them in being successful in a match.
Gathers	X	
Restores	X	
Navigates	X	
Notices/responds	X	
Adjusts	X	
Accommodates		Can be determined by the therapist. This is client specific.
Benefits		Can be determined by the therapist. This is client specific.
Social Interaction Skills The game has multiplayer but players compete against each other. There is no communication necessitated by the game itself. With that said, all social interaction skills are client/session specific. Thus, applications can be determined by the therapist but are not required to be successful during gameplay.		
Approaches/starts		
Concludes/ disengages		
Produces speech		
Gesticulates		
Speaks fluently		
Turns toward		
Looks		
Places self		
Touches		
Regulates		
Questions		
Replies		
Discloses		
Expresses emotion		
Disagrees		
Thanks		
Transitions		
Times response		
Times duration		
Takes turns		

SKILL	N/A	Context of Skill Within the Game
Matches language		
Clarifies		
Acknowledges and encourages		
Empathizes		
Heeds		
Accommodates		
Benefits		

Areas of Treatment (Application)
Stroke Rehab
Muscular Strength/Endurance
ROM
Postural Stability
CP
Parkinson's

Interest Tags
Sports
Boxing

Ring Fit

Ring Fit offers a variety of gross motor and balance activities. This can be accomplished through mini games or workout routines. Both the mini games and workout routines are categorized by the muscle group they target. The amount of exertion required from the player can be graded to varying degrees. For example, you can change the amount of force needed to actuate the Ring Fit controller. Additionally, the "knee friendly" setting can be enabled which makes registering leg movements either easier or eliminates the need for them entirely depending on the activity.

Ring Fit Adventure mode is a story-based mode in which players progress through various stages by jogging in place and utilizing the players body and the Ring Fit controller in various ways to perform different actions. (i.e., aiming the controller downward and squeezing to jump). This mode is a mix of all the movements and actions within the game. If the goal is more targeted, for example trunk strength, then choosing either a mini game or workout routine specifically targeting the trunk would be the better option.

Note: each new player can set up their personalized profile in which all of their settings, scores, and stats are saved and tracked so any progress for a given activity can be displayed in some capacity.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: Ring Fit Adventure

Objects and Their Properties Required

Which Platform: Nintendo Switch

Note: Players must wear a leg strap. Time to put on the leg strap will vary based on clients' mobility

Time to Play: A level in adventure ~3-5 minutes, minigames ~2 minutes, rhythm game ~2-3 minutes

Sequencing and Timing

In adventure mode, players jog in place and interact with the ring-con controllers in various ways, to successfully navigate a stage. (i.e. squeezing the ring-con shoots a blast that can knock out enemies, squeezing the ring-con while aimed downward will cause the player to jump, pulling the ring-con apart opens doors.

Outside of adventure mode, there are mini games and exercise routines that are categorized by the muscle groups they target. These will prompt the player to position the ring-con in various ways and perform specific actions. For example, pulling actions to target back muscles. Squeezes to target chest muscles, and squats to target leg muscles.

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight	X	
Attention: sustained attention and concentration; selective, divided, and shifting attention		This game will challenge all aspects of attention to some degree. Players will need to concentrate in order to match elements on screen in order to perform more efficiently as well as filter out excess stimuli such as environmental effects and visual effects while in adventure mode.
Memory: short-term, working, and long-term memory	X	
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive		Interacting with the ring-controller will challenge the player's tactile discrimination as there are various levels of force required while squeezing and pulling on the ring-con controller. Performing necessary actions will challenge vestibular and proprioceptive ability such as when assuming yoga poses and when lunging and squatting.
Thought: control and content of thought, awareness of reality, logical and coherent thought		The player must have a baseline level of awareness of reality. However, there is no direct challenge to thought. The games are simplistic and there are a lot of prompts (outside of adventure mode when participating in a workout routine).
Sequencing complex movement: regulating		Note: There are degrees of freedom when performing the appropriate actions in game.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
speed, response, quality, and time of motor production		Adventure mode requires the player to run in place as well as position the arms so that the ring-con points downward or overhead. The player will also squeeze on the ring-con to jump and shoot blasts at enemies. Players pull on the ring-con to interact with doors and other objects. Outside of adventure mode, depending on the activity, this game requires sequencing of movement within the upper arm including shoulder, elbow, wrist, thumb, fingers, trunk, hips, knees, and ankles to effectively play the game. This can be determined by the therapist by choosing an activity that targets the desired muscle group. For example, there is a trunk strength-oriented exercise in which the player places the ring-con against their belly and jog in place. On screen, the character is walking a tightrope with a long balance pole. The player must lean side to side so that the character on screen collects coins with the pole as well as avoid bombs that hurt the character.
Emotional: regulation and range of emotion, appropriateness of emotions		Players maintain an acceptable range of emotions and appropriateness of emotions while essentially exercising which is perceived as an unpleasant experience by many.
Experience of self and time: appropriateness and range of emotion, body image, self-concept		This game does well to promote basic health attitudes and being comfortable with one's own ability. The player's profile is unique to them. As such, they are only competing against themselves.
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		Complete consciousness is necessary in order to be successful in playing this game.
Orientation: orientation		Outside of adventure mode, players must be

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
to person and self, place, time, and others		able to orient themselves to the image presented on screen in order to perform the given activity effectively. Such as assuming the proper starting position before performing a given movement. This varies depending on the exercise routine chosen.
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability; openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite		Exercise is something that not everyone enjoys. However, this game makes engaging in exercise a more fun and engaging experience especially when choosing from the mini games because they gamify the movements required to target the chosen muscle group. (See sequencing of complex movement). However, the player's openness to experience, confidence and motivation will all be challenged to a degree as these are all elements that are inherently present when participating in exercise
Energy and drive: motivation, impulse control, appetite		Can be determined by the therapist This game will require a moderate level of energy to participate in effectively.
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		In adventure mode, a player must possess adequate levels of vision to distinguish objects on a screen. Players must possess enough visual acuity to determine where they are on screen as well as identifying targets and enemies as they appear on screen. The same can be said when playing mini games but there is a degree of visual tracking to be effective (i.e. tracking targets and coins on screen) and challenge to the visual field because targets appear anywhere on screen. During exercise routines, possessing enough visual ability to view the prompts on screen (the character's body position) will aid in the player performing the required movement successfully themselves.
Hearing; sound detection		When in exercise routines, there are audio

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
and discrimination; awareness of location and distance of sounds		cues that players can distinguish to aid in performing the movement with the proper tempo. (There is a "coach" that guides the player through the exercise routine).
Vestibular: position, balance, secure movement against gravity		Movements emulated within the game are calisthenic (i.e. squats, pushes, pulls, jogging in place, and core exercises) based around using the ring-con to add interactive elements within the game as well as tactile resistance Player's vestibular ability will be challenged when performing any of the various movements that the game may prompt from the player. The game even lists when an activity can be completed while seated in which case, seated balance would be challenged. This is the case with a lot of the arm oriented mini games and exercise routines.
Proprioceptive: awareness of body position and space		Players will need to interact with the ring-con in various ways to orient their character on screen to be successful in the game. The player moves in physical space to interact with virtual elements (hitting targets) as they present on screen. Such as when in adventure mode the player jogs in place to move and turns to aim the ring toward enemies then squeezing the ring-con to shoot a projectile to blast the enemies.
Touch: feeling of being touched, touching various textures		Players interact with the ring-con in various ways (i.e. squeezing/pulling in hand, placing on stomach, placing on ankles). Players must also be able to distinguish how much force they are applying to the ring-con when squeezing/pulling. Different amounts of force yields different outcomes depending on the given activity. Such as the distance a projectile will fly, how much power it has, or the speed in which the character on screen moves.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Pain: localized and generalized pain		Clients should be monitored by therapists at all times. Players will need to be able to self-assess their own exertion level and communicate if they are experiencing any pain or excessive discomfort when participating in gameplay.
Temperature and pressure: thermal awareness, sense of force applied to skin		Being able to detect how much force is being applied to the ring-con while it is placed on the user's stomach is applicable to some mini games (see sequencing complex movement) and when participating in trunk exercises in exercise routines. Too much self-applied force could lead to injury or damage to skin.
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		Can be determined by a therapist. Depending on the selected settings/activity, players will be asked to squat, lunge, reach, bend, raise over head, jog in place, and jump Players' relative joint mobility should be able to withstand the required movement of the given activity.
Joint stability: structural integrity of joints		Can be determined by a therapist. Players relative joint stability should be able to withstand the required movement of the given activity see joint mobility.
Muscle Functions		
Muscle endurance: sustaining muscle contraction		The player is asked to hold various positions and muscle contraction meant to challenge an individual's endurance This can be graded by the therapist as there are different levels of difficulty for the mini games and exercise routines that change the duration and intensity of the activity. Players must possess enough muscular endurance to participate in a given activity

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		An example of this would be in chest target exercises, the player will be prompted to sustain muscular contraction by maintaining a squeeze against the ring-con. Same with back exercises except the player will be prompted to execute a sustained pull against the ring-con.
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		The player must have enough postural control to maintain position while performing the required motions of the game (see joint mobility). This game has activities meant to challenge a players postural control such as in-trunk targeting mini games and exercise routines. However even while performing other actions even while seated, the players righting reactions, ability to adjust and postural control will all be challenged to a degree.
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		The game requires a significant ability to control voluntary movement eye hand coordination (to perform the movements necessary in a given activity which is dependent on the muscle group target chosen), bilateral integration (squeezing and pulling against the ring-con), gross motor control (performing big body movements such as pushes/pulls with the arms, squats, lunges, and jumps with the legs.) and oculomotor control (searching/tracking enemies, targets, and coins) are all challenged to a degree when playing this game. Each activity has a score that is tracked and each player can have a profile in which scores are tracked. Players compete against themselves as progress is tracked within these profiles.
Gait patterns: movements used to walk		Players are required to jog in place for some activities. Mostly in adventure mode (as this

FUNCTION (Specific Mental Functions)	N/A	Detailed Description
		is how players make the character move along in a level). Jogging in place is also present in some mini games and leg-oriented exercise routines as well. The game does a good job at describing what is required for a given activity.
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm		Depending on the amount of exertion exhibited during gameplay, the cardiovascular system could be challenged for some to a degree. Activities can be graded with difficulty choices.
Respiratory system: rate, rhythm, depth of respiration		Depending on the amount of exertion exhibited during gameplay, the respiratory system could be challenged for some to a degree. Activities can be graded with difficulty choices.
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity		The degree of challenge to physical endurance and stamina depends on the length of the play session and how much motion the player is producing during gameplay (given their ability). Depending on the amount of exertion exhibited during gameplay, additional functions could be challenged for some to a degree, especially when considering length of play sessions, challenge to stamina and aerobic capacity can be graded. The game roughly tracks calories burned and heart rate.
Voice and speech: rhythm and fluency, alternative vocalization functions	X	

Performance Skills Required

SKILL	N/A	Context of Skill Within the Game
Motor Skills		
Aligns		Can be determined by the therapist. The player's ability to maintain posture without propping is required to effectively play the game. Outside of adventure mode all activities list the muscle groups used during participation. Many can be made to be done seated with a change of settings (i.e. enable knee assist mode).
Stabilizes		Therapists will need to monitor their client as they play, so they do not lose their balance especially while jogging in place and performing lower body movements.
Positions		The player must position themselves within the environment in such a way to provide adequate space to perform actions necessary to play the game, as well as mimic the positions presented on screen in order to be most effective,
Reaches		Various activities will require the player to reach overhead, laterally and out front. Specifically, in activities that target the shoulders and trunk.
Bends		Various activities will require the player to bend in all directions as well as emulate a hula hoop motion. Specifically, those that target the trunk as many of these will prompt the player to bend in all directions. One example is a parachute game in which players hold the ring-con overhead. The direction the player leans determines which direction the player floats as they fall. The objective is to collect as many coins as possible before hitting the ground.
Grips		The player will need to sustain a grip on the ring-con controller at various levels to both push and pull the ring-con.
Manipulates	X	
Coordinates		Depending on the activity the player will be required to coordinate full body movements (see joint mobility).
Moves	X	
Lifts		Some activities require players to lift the ring-con above or behind their head (see bends).
Walks		Players are required to walk/jog in place for some activities. Specifically, in adventure mode and

SKILL	N/A	Context of Skill Within the Game
		some exercise routines targeting the legs and mini games.
Transports	X	
Calibrates		Players will need to calibrate various movements such as squat depth, pulling force and pushing force in order to achieve higher scores and be successful in game (see touch).
Flows		The better the player is able to flow with a given movement in a given activity, ultimately leads to better outcomes (i.e. higher scores) in game.
Endures		Players perform the activity for the length of time required to complete the activity.
Paces		Some activities require a specific rate and tempo in order to be effectively keeping pace and will translate into higher scores.
Process Skills		
Paces		Sustains pace in given activity to score higher scores. For example, there are activities that prompts players to do as many reps as they can in a given time (i.e. Forcefully squeezing the ring-con and returning to neutral) The player must pace themselves so that they do not exhaust themselves before they even reach the time limit.
Attends		The player must attend to the game until completion in order to be most successful.
Heeds		Can be determined by the therapist. The player completes gameplay under parameters requested by the therapist (execute the required motions as directed by therapist), with desired tempo and ROM.
Chooses		If allowed by the therapist, the player can choose the activity they would like to do or be presented with options to choose from.
Uses		The player uses the ring-con as it is intended.
Handles		The player handles the ring-con as intended.
Inquires		Can be determined by a therapist (asking for clarification on what the game is prompting the player to do). However, this is not required to be successful.
Initiates		Players initiate each movement within each given activity Specifically in exercise routines, players

SKILL	N/A	Context of Skill Within the Game
		initiate each rep of a given movement when prompted.
Continues		Players continue required motions until the end of the activity.
Sequences		Players need to execute the motions as prompted on screen in order to be successful during gameplay. This can require the recruitment of multiple joints (see joint mobility). Mentally, the player will sequence which targets to go for first in many mini games. The better the player is able to do this, the higher their scores will be.
Terminates		Players terminate certain actions (i.e. squeezing, pulling) at appropriate time to improve outcomes.
Searches/locates		There are three bonus coins placed within each level. Many of these are not obvious. As such players will need to actively search and locate these items.
Gathers	X	
Organizes	X	
Restores	X	
Navigates		In adventure mode, players navigate a level performing the necessary actions (walking/running in place and squeezing/pulling on the ring-con when necessary).
Notices/responds		Players are able to perform the necessary actions to navigate a level without any further prompting in order to complete a level. Outside of adventure modes players could be challenged to perform necessary actions and movements without any extra prompting.
Adjusts		Players are challenged to adjust real world performance of actions (i.e. better form and positioning) to achieve better overall outcomes in games.
Accommodates		Can be determined by a therapist.
Benefits		Can be determined by a therapist.
Social Interaction Skills The therapist can address social interaction skills using the game but this is client specific and thus can be determined by the therapist. Otherwise, social interaction skills are not required to be successful in game.		
Approaches/starts		
Concludes/ disengages		

SKILL	N/A	Context of Skill Within the Game
Produces speech		
Gesticulates		
Speaks fluently		
Turns toward		
Looks		
Places self		
Touches		
Regulates		
Questions		
Replies		
Discloses		
Expresses emotion		
Disagrees		
Thanks		
Transitions		
Times response		
Times duration		
Takes turns		
Matches language		
Clarifies		
Acknowledges and encourages		
Empathizes		
Heeds		
Accommodates		
Benefits		

Areas of Treatment (Application)
Postural control
Balance
ROM
Muscular strength and endurance

Interest Tags
Fitness/Exercise

Switch Sports

Nintendo Switch Sports is the reiteration of the classic Wii Sports on current hardware. It has returning sports such as bowling, golf, and tennis; as well as new sports including badminton, chambara (sword fighting), soccer, and volleyball. Similar to Wii Sports, players control their character's movement by physically emulating the motions of the sport they are playing in the game while holding the joy-con (a motion-based controller). Every sport, except for soccer (unless playing with the leg strap which is not included with the game), can be played with one arm. Soccer is played with both arms or one arm and one leg. All sports can be played seated or standing with success.

Switch Sports is good for challenging a patient's functional mobility, range of motion, and coordination particularly in the upper limbs. Lower limb mobility can be challenged while emulating movements for the golf, soccer, and volleyball games (i.e. performed while standing and bending at the knees or twisting at the hips). This also means that Switch Sports can challenge a player's seated or standing balance to a degree. In actuality, very little motion is required from the player to trigger actions in game. However, therapists can grade the amount of motion required from the player during a gameplay session.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: Switch Sports (Badminton, Bowling, Chambara, Golf, Soccer, Tennis, & Volleyball)

Objects and Their Properties Required

Which Platform: Nintendo Switch

Time to Play: 2-5 minutes depending on the sport activity selected.

Sequencing and Timing

Badminton

1. The serving player swings the joy-con controller upward to put the birdie in play
2. Players then volley the ball back and forth motioning their arm with the joy-con in such a way as to mimic forehand, backhand, and spikes until the birdie hits the ground scoring that player a point
3. Play continues until score level is reached
   Note: performing appropriate actions (i.e. forehand when the birdie is on the racket side, spike when the birdie is up above and backhand when the birdie is on the non-racket side of the player leads to more powerful hits in game

Bowling

1. The player positions their character as they desire on the lane using the directional buttons
2. The player bring the joy-con controller up to their chin
3. Presses and holds trigger button to initiate the movement in game
4. The player then emulates a bowling motion swinging the controller back then forward to release the ball toward the pins
5. Repeat steps 1-4 for the remainder of the frame

Chambara

1. The player points the joy-con at the display then presses the top button on the joy-con controller to initiate the start of the round
2. The player then must swing the joy-con perpendicular to how their opponent's sword to land a hit (Note: only applies if the opponent is blocking, if the opponent is not blocking, a hit will land regardless of the direction of the swing)
3. The player must react to their opponent's swings as well by initiating a block by pressing and holding the trigger button and positioning their sword perpendicular to their opponent.
4. The round ends once the health bar of either player fully depletes
5. Repeat steps 1-4 for rounds two and three

Golf

1. The player stands with their non-dominant shoulder facing the display
2. The player then points the joy-con down at the ground and presses the top button to initiate practice swings
3. The player can aim their shot using the left and right buttons on the joy-con
4. The player initiates their actual shot by pressing and holding the trigger button on the controller
5. The player then swings the joy-con back until they reach the desired level of power
6. The player then swings downward to strike the ball.
7. Repeat steps 1-6 until all holes are completed

Tennis

1. The serving player swings the joy-con controller upward then downward when the ball is at its peak to put the ball in play
2. Players then volley the ball back and forth motioning their arm with the joy-con in such a way as to mimic forehand, backhand, and spikes until the ball bounces twice on the opposing side of the net scoring that player a point
3. Repeat play until the predetermined score total is reached
4. Note: performing appropriate actions (i.e. forehand when the ball is on the racket side, spike when the ball is up above and backhand when the ball is on the non-racket side of the player leads to more powerful hits in game

Volleyball

1. The serving player swings the joy-con controller upward then downward when the ball is at its peak to put the ball in play
2. Players then volley the ball back and forth (Note: the game automatically alternates

players cueing them for the appropriate hits bump set spike.)
3. Depending on the timing of the player in performing the designated hit determines the quality of the strike
4. Rally continues until the ball hits the floor scoring the player on the opposite side of the net a point.
5. Repeat play until the predetermined score total is reached

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight	X	
Attention: sustained attention and concentration; selective, divided, and shifting attention		The player must sustain attention during gameplay in order to be successful during gameplay. This is especially the case when participating in tennis, volleyball, badminton, soccer and chambira as these have an active opponent in which the player must react to.
Memory: short-term, working, and long-term memory	X	
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive		Performing the necessary actions will challenge vestibular and proprioceptive ability. Essentially, the player uses the joy-con controller to mimic the motions in a given sport (i.e. swinging a golf club, swinging a tennis racket, spiking a volleyball, or bowling a bowling ball etc…). The therapist or player can decide how intentional and realistic these movements need to be during gameplay (actions can actually be triggered with very little required motion).
Thought: control and content of thought,		The player must have a baseline level of awareness of reality.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
awareness of reality, logical and coherent thought		But there is no direct challenge to thought. The games are simplistic and there are a lot of prompts.
Sequencing complex movement: regulating speed, response, quality, and time of motor production		Note: there are degrees of freedom to perform the appropriate action in game. This game requires sequencing of movement within the upper arm including shoulder, elbow, wrist, thumb, and fingers to effectively play the game. Trunk movement can be incorporated as well in order to more realistically simulate the movements of the various sports (i.e. swinging a golf club, swinging a tennis racket, spiking a volleyball, or bowling a bowling ball etc…) Lower extremity motion can be challenged while playing soccer (or any other sport if played while standing but this is not required). Note: Soccer requires the leg strap that is not included with the game if the goal is to play as it was intended. This is how to get the legs most involved in the activity.
Emotional: regulation and range of emotion, appropriateness of emotions		It is assumed some might easily be caught in the emotion of the game as it is competitive. The player must demonstrate a degree of emotional regulation in this case.
Experience of self and time: appropriateness and range of emotion, body image, self-concept		Players can choose to create a "sportsmate" that is then used during gameplay. They can make themselves or anyone else they choose.
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		Complete consciousness is necessary in order to be successful in playing this game.
Orientation: orientation	X	

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
to person and self, place, time, and others		
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability; openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite		Can be determined by the therapist. When playing vs other people, a degree of conscientiousness is necessary. Agreeableness, and conscientiousness; emotional stability; self-expression, confidence, motivation, self-control and impulse are all elements that can be challenged to a degree as these are all involved in some way when there is competition. (See emotional).
Energy and drive: motivation, impulse control, appetite		At minimum, the player must exhibit enough energy and motivation to move at least one upper extremity for 5/6 sports and use both upper extremities to effectively play soccer (soccer can be played with upper extremities alone but it requires both.
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		The player must have enough visual ability to perceive elements on the screen and where they are on screen as well as be able to track objects such as the ball when playing tennis and badminton.
Hearing; sound detection and discrimination; awareness of location and distance of sounds	X	
Vestibular: position, balance, secure movement against gravity		Can be determined by the therapist. Emulated motions of various sport activities are utilized to interact within the game (i.e. Swing a golf club or tennis racket). This can be graded up or down (i.e. performed seated or standing or on a dynamic surface). Standing is recommended while playing golf. A leg strap can be implemented when playing soccer requiring the player to

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		maintain balance while kicking. Note: leg strap not self-tested by the one conducting this analysis but was observed on video
Proprioceptive: awareness of body position and space		At minimum, the player must be able to grip a joy-con controller with one hand in 5/6 activities, soccer requires both hands to hold a joy-con. They must also be able perceive their body in space to determine where their limbs are in space and if they have enough room to perform the necessary emulated sports movements
Touch: feeling of being touched, touching various textures		The game requires the use of a controller. The player must physically interact with the input devices in order to play the game. Players must be able to tell if they holding the controller and or if they are hitting the desired inputs (triggers vs buttons vs joysticks) and if they are interacting with the joystick in the desired manner (orienting to the desired direction) and not pressing down with excessive force as this actuates another input L3 & R3 which can lead to unintended actions if the player did not mean to press those inputs.
Pain: localized and generalized pain	X	
Temperature and pressure: thermal awareness, sense of force applied to skin	X	
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		At minimum, the player must be able to minimally flex their shoulder, elbow and minimally flex extend radially deviate, and ulnarly deviate their wrist depending on the sport selected. Full/Exact execution of the simulated sport movement is not required to be successful in any of the activities but is encouraged based on client ability for best results.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		The degree to which this is challenged can be done is determined by the therapist.
Joint stability: structural integrity of joints		At minimum, the player must be able to sustain structural stability while performing the motions described above (see joint mobility).
Muscle Functions		
Muscle endurance: sustaining muscle contraction		
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		The player must have enough postural control to maintain position while performing the required motions of the game (see joint mobility) The degree required can be determined by the therapist
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		The game requires a significant ability to control voluntary movement, eye hand coordination, bilateral integration, gross motor control and oculomotor control, are all challenged to a degree when playing this game. The simpler sport activities are bowling and tennis. The harder activities are golf and chambira An example would be tennis where the player must exhibit hand eye coordination to time their swing as the ball approaches. Executing a swing effectively requires a degree of gross motor function in the upper extremity. A full ROM swing will require the player to cross midline. Oculomotor control is utilized when tracking the ball as it approaches the player. Bilateral integration is present in soccer, as at least two extremities are required to play (Both upper extremities or one upper

FUNCTION (Specific Mental Functions)	N/A	Detailed Description
		extremity and one leg). Bilateral integration can be utilized in sports such as volleyball and golf if players simulate the motions required as realistic as possible.
Gait patterns: movements used to walk	X	
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm		Depending on the amount of exertion exhibited during gameplay, the cardiovascular system could be challenged for some to a degree
Respiratory system: rate, rhythm, depth of respiration		Depending on the amount of exertion exhibited during gameplay, the respiratory system could be challenged for some to a degree
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity		The degree of challenge to physical endurance and stamina depends on the length of the play session and how much motion the player is producing during gameplay (given their ability) When performing fully emulated sports actions, a minimal-moderate level of stamina is required from an average individual Depending on the amount of exertion exhibited during gameplay, additional functions could be challenged for some to a degree, especially when considering length of play sessions, challenge to stamina and aerobic capacity can be graded
Voice and speech: rhythm and fluency, alternative vocalization functions		Can be determined by the therapist But is not required to be successful.

Performance Skills Required

SKILL	N/A	Context of Skill Within the Game
Motor Skills		
Aligns		Can be determined by the therapist. Ability to maintain posture without propping is required to effectively play the game. Under ideal

SKILL	N/A	Context of Skill Within the Game
		circumstances both hands are used in each sport activity excluding tennis, badminton, and soccer (if using the leg strap). The use of both hands is not required for successful gameplay except for soccer.
Stabilizes		Can be determined by the therapist.
Positions		The player must position themselves in such a way in relation to the display so that they are able to view the entire display without the elements on screen being too small for them to see. They must position their body as well as limbs, wrists, hands, and fingers in a way that is comfortable and enables them to best endure the duration of the play session and sustain postural control. The player must also position themselves within the environment in such a way to provide adequate space to perform actions necessary to play the game.
Reaches		Reaching is especially prevalent in the badminton and tennis sport activities as it is required to reach upward, emulating a spike, to produce the most power in game.
Bends		This is not required to be successful, but can be used when emulating golf or volleyball.
Grips		Players must be able to maintain grip of joy-con controllers, ideally in both hands.
Manipulates		Interacting with the input device of choice requires a degree of manipulation.
Coordinates		Can be determined by the therapist. This game necessitates the ability to coordinate upper limb movement to be effective at playing the game in order to simulate actions such as swinging a golf club, swinging a tennis racket, spiking a volleyball, or bowling a bowling ball etc. Lower limb coordination can be challenged when using the leg strap during the soccer activity. Trunk motion can be incorporated in activities such as golf and volleyball but is not required to successfully engage with the game.
Moves	X	

SKILL	N/A	Context of Skill Within the Game
Lifts		Lifting the joy-con controller is required to perform simulated sport actions.
Walks	X	
Transports	X	
Calibrates		Can be determined by a therapist. It takes very little motion to actually execute an action within the game. However, this can be graded up (i.e. fully simulating sport actions) thus requiring a higher level of calibration. An exception to this is golf where the player determines the power of their swing based on the amount of backswing and the force of the downswing thus necessitating the ability to calibrate.
Flows		Actions must be smooth and deliberate to be effective during gameplay. Actions may not register properly if they are not deliberate and smooth.
Endures		The player must endure postural control and hand and finger movements for the duration of the gameplay session or until they reach a suitable stopping point. The player must be able to repeatedly perform required actions in order to be successful (i.e. sustaining a rally in tennis or volleyball).
Paces		Can be determined by the therapist. The player must maintain the same rate and tempo throughout the duration of the sport activity.
Process Skills		
Paces		Unique actions require a degree of timing and tempo to execute successfully (serving in tennis, badminton and volleyball, also when bowling).
Attends		The player must sustain attention during gameplay in order to be successful during gameplay. This is especially the case when participating in tennis, volleyball, badminton, soccer and chambira as these have an active opponent in which the player must react to.
Heeds		Can be determined by the therapist.

SKILL	N/A	Context of Skill Within the Game
		The player completes gameplay under parameters requested by the therapist (execute the sport motions as directed by therapist).
Chooses		Players have the freedom to choose which sport they want to play or be provided options from the therapist.
Uses		The player must use the joy-con controllers as they are intended.
Handles		Player must hold joy-cons in the requested manner.
Inquires		Can be determined by the therapist (i.e. the player asking questions on how to play and reminders on what to do next in gameplay).
Initiates		The must initiate multiple actions fluidly in order to be effective during gameplay in some sport activities such as chambara (engaging blocking, and swinging the sword) badminton (initiating serves and swinging), tennis (initiating serves and swinging, volleyball (initiating serves, bumps sets and spikes) and soccer (initiating kickoff). Other sport activities are more segmented (i.e. golf and bowling) however, players initiate their swing in golf and initiate their approach when bowling.
Continues		The player continues respective sport actions until the end of the gameplay. Especially prevalent in tennis, volleyball, and badminton because at times there can be long volleys in which the player must continue batting the ball back to their opponent. Similarly, in chambara, players continue striking and blocking until someone is knocked off the platform.
Sequences		Golf and bowling require that buttons be pressed in a certain sequence before the player can initiate the required motion. Other sport activities such as chambara and soccer require the player to react to their opponent. In chambara the play must block as well as attack and in soccer the player must move their character to the ball before swinging to kick.
Terminates		Sport activities such as golf and bowling have a distinct stop and reset. The player must recognize

SKILL	N/A	Context of Skill Within the Game
		that they do not need to swing multiple times in these particular sports.
Searches/locates	X	
Gathers	X	
Restores	X	
Navigates	X	
Notices/responds		Players instinctively react and take actions necessary during gameplay without external prompting. Such as when playing tennis, badminton, chambira, and soccer.
Adjusts	X	
Accommodates		Can be determined by the therapist. This is client specific.
Benefits		Can be determined by the therapist. This is client specific.
Social Interaction Skills The game has multiplayer in which case the therapist my want to work on some social skills depending on the goals for the client however these are client specific and can be determined by the therapist. Otherwise, they are not required to be successful in game.		
Approaches/starts		
Concludes/ disengages		
Produces speech		
Gesticulates		
Speaks fluently		
Turns toward		
Looks		
Places self		
Touches		Can be determined by the therapist (appropriate touching). This may be present but not required to be successful.
Regulates		
Questions		
Replies		
Discloses		
Expresses emotion		
Disagrees		
Thanks		
Transitions		
Times response		
Times duration		

SKILL	N/A	Context of Skill Within the Game
Takes turns		Taking turns can be made present in bowling and in golf. Players share one joy-con and pass it between each other when it is their turn.
Matches language		
Clarifies		
Acknowledges and encourages		
Empathizes		
Heeds		
Accommodates		
Benefits		

Areas of Treatment (Application)
Postural control
Balance
ROM
Muscular strength and endurance
Coordination

Interest Tags
Sports

Cuphead

Cuphead is an intentionally difficult game that often challenges a player's emotional regulation skills given how often failure is experienced in the game. Players are constantly facing dangers like copious amounts of enemies, projectiles, and the inherent structure of each game stage itself. Players will need to exhibit adequate precision and reaction time in their fine motor movements, while providing game input, in order to be successful in navigating the various stages and surviving boss battles. There is often a substantial amount of visual and auditory stimuli on the screen at once which requires the player to maintain focus on important stimuli and filter out any irrelevant stimuli in a given scenario (i.e., ignoring enemies and projectiles that are too far away to cause damage, and focusing on the immediate threats in close proximity).

This game is particularly useful from a therapeutic potential standpoint when it comes to addressing working and short-term memory. The design of each stage always remains the same; all challenging components including exact enemy placement, the number of enemies, and other stage elements are always presented in the same exact manner, regardless of how many times the player has attempted a particular stage. When a player dies (by losing all health or falling off the stage platform), they must restart from the beginning of that stage or boss fight. Even bosses provide the same attacks, unique animations, and often audio cues that remain consistent per boss. The unique animations and audio cues let the player know which attack is about to occur. Players are challenged to memorize the exact placements of enemies and order of enemy attacks as they appear in a level or boss fight, as being prepared for what is to come is the best way to achieve success in the stage.

The game can also be played cooperatively with another player. However, each player has their own separate health meter, and therefore do not need to work together or worry about what the other player is doing. Despite this, the game is made somewhat easier while playing cooperatively with a partner, because both players have to die before the level restarts. Additionally, there are opportunities to be revived if one player dies while the other is still alive.

Note: Any previously beaten levels can be revisited and replayed, including boss fights.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: Cuphead

Objects and Their Properties Required

Which Platform: Nintendo Switch, PC, Xbox

Time to Play: Stages generally take 5-10 minutes to complete. Can take longer depending on skill level

Sequencing and Timing

In world levels

1. Players choose a level.
2. Players navigate the side scrolling level by eliminating enemies and traversing pitfalls with jumps and dashes.
3. Players can collect three coins hidden throughout the level as they progress. These used to purchase character upgrades from the shop.
4. Once the end of the level is reached the level is cleared.
5. If the player loses all their hearts by taking damage (the default is three hearts) or falls into a pitfall, the player must restart at the beginning of the level losing all progress from the previous run.

In Boss levels

1. During boss levels the player must deal enough damage to deplete the bosses health bar to zero
2. Players must do this without taking too much damage losing all of their hearts (the default is three hearts) otherwise they will need to restart the battle from the beginning.
3. The boss has the same attack animations that the player can que in on to know what is coming. However, the boss will add more or different attacks once different stages of the fight are reached. This is usually determined by the amount of health the boss has.
4. Players clear the level once they deplete the boss's health to zero.

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight	X	
Attention: sustained attention and concentration; selective, divided, and shifting attention		This game will challenge sustained attention, concentration, and shifting attention. If the player is unable to display the above skills to a degree, the player will have an increased rate of failure. The game has a constant flow of threats to the player coming at any given time (enemies, projectiles and the stage itself because of hazards and gaps). The player must be able to readily identify these threats and react in such a way to preserve their life in game and make progress. All progress is lost once all hearts are lost and the player

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		must start the level over from the beginning.
Memory: short-term, working, and long-term memory		This game challenges short term and working memory. Each stage has its set elements (i.e. platforms and enemies positioned in the same locations). Through trial and error, the player learns/recalls/memorizes the stage in order to make progress through the stage, eventually conquering that one stage leading to the next in which the process begins again. Even during boss battles, the boss uses the same attacks, not necessarily in the same sequence, but each individual attack has a unique animation meant to telegraph to the player which attack is about to occur. The player will learn and remember the bosses' attack patterns and animations to eventually prevail.
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive	X	
Thought: control and content of thought, awareness of reality, logical and coherent thought		Players will be challenged to logically reason how to progress through levels and take down bosses. The bosses have patterns to their attacks that once identified, can clue the player in on how to beat them.
Sequencing complex movement: regulating speed, response, quality, and time of motor production		In order to make progress in game, gameplay necessitates that players perfect timing of movements (i.e. jumps, dodges, and shooting) in conjunction with locations of moving elements (i.e. enemies and platforms). For this to be accomplished the player's ability to regulate the speed in which they provide input to the controller, response time, and time of motor production will all be challenged to a degree.
Emotional: regulation and range of emotion, appropriateness of emotions		Failure is inevitable when playing this game as it requires trial and error to progress. The game's timings (jumps and dodge windows) can be very unforgiving. On top of

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		navigating the stage, the player must contend with a steady stream of enemies that makes navigating the stage that much more complex. The player starts with three hearts (more can be added with power ups). The player loses a heart each time they come into contact with an enemy. Each time the player dies (losing their hearts or falling off the stage), they must start from the beginning of that stage. This in itself can be a frustrating experience, because any progress the player made previously is gone and they must repeat the same progression over again. Progress is meant to be slow; the reward of the game is the feeling of accomplishment after beating a level that was once viewed as unconquerable. The challenge the player faces continues to rise as they progress through the levels, meaning players will continually be met with frustration and fulfillment. Players must be able to control any emotions that arise during gameplay particularly when being faced with a challenge that is frustrating.
Experience of self and time: appropriateness and range of emotion, body image, self-concept	X	
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		Complete consciousness is necessary in order to be successful in playing this game.
Orientation: orientation to person and self, place, time, and others	X	
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability;		Failure is a frequent occurrence in this game as it is about trial and error. A player must sustain their motivation and confidence in order to persevere through the stages.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite		
Energy and drive: motivation, impulse control, appetite	X	This is not an actively demanding game. It is mentally demanding.
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		A player must possess adequate levels of vision to distinguish objects on a screen. Players must possess enough visual acuity to determine where they are on screen as well as identify any enemies present and or obstacles to navigate through. At any given time there can be a lot of visual stimuli on screen. (i.e. number of enemies, shifting platforms and shifting backgrounds as well as what the player is doing (shooting anything from little balls of energy to full on laser beams). This will challenge the player's ability to filter out excessive stimuli and attend to the important stimuli as well as visually track any moving elements at a given time.
Hearing; sound detection and discrimination; awareness of location and distance of sounds		During boss battles there are often audio cues that accompany the animations that telegraph the bosses attacks to the player.
Vestibular: position, balance, secure movement against gravity	X	
Proprioceptive: awareness of body position and space	X	
Touch: feeling of being touched, touching various textures		The game requires the use of a controller (or optionally mouse and keyboard if playing on PC) that the player must physically interact with. Players must be able to tell they are holding the controller and or if they are hitting the desired inputs (triggers vs buttons vs joystick) and if they are interacting with

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		the joystick in the desired manner (orienting to the desired direction and not pressing down with excessive force as this actuates another input L3 & R3 which can lead to unintended actions if the player did not mean to press those inputs.
Pain: localized and generalized pain	X	
Temperature and pressure: thermal awareness, sense of force applied to skin	X	
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		A player must have at minimum enough joint mobility in the hands and fingers to interact with the input device. The game requires rapid button presses as well as timely responses on specific inputs (i.e. jumping and dodging) in order to be successful thus challenging the player's ROM and precision of the hand, finger and thumb joints.
Joint stability: structural integrity of joints	X	
Muscle Functions		
Muscle endurance: sustaining muscle contraction	X	
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		Can be determined by the therapist. Normally, a player would participate in gameplay from a seated position. Requiring them to sustain postural control in that way.
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		The game has elements that the player must visually track (i.e. moving platforms, enemies, and incoming enemy projectiles). This will challenge the player's oculomotor control. The player also needs to make accurate and timely responses to these elements as they occur on screen (dodging enemy attacks, jumping over projectiles, timing jumps to successfully traverse gaps). Thus, challenging hand eye coordination and

FUNCTION (Specific Mental Functions)	N/A	Detailed Description
		fine motor control to a degree. The player normally uses two hands to interact with the input device.
Gait patterns: movements used to walk	X	
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm	X	
Respiratory system: rate, rhythm, depth of respiration	X	
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity	X	
Voice and speech: rhythm and fluency, alternative vocalization functions		During cooperative gameplay, players should communicate, vocalizing information to each other. Players will need to use speech to relay information if playing as intended. But this is not specifically required to be successful.

Performance Skills Required

SKILL	N/A	Context of Skill Within the Game
Motor Skills		
Aligns		Can be determined by the therapist.
Stabilizes		Can be determined by the therapist.
Positions		Can be determined by the therapist. The player must position themselves in such a way in relation to the display, so that they are able to view the entire display without the elements on screen being too small for them to see. They must position their body as well as limbs, wrists, hands, and fingers in a way that is comfortable and enables them to best endure the duration of the play session and sustain postural control.

SKILL	N/A	Context of Skill Within the Game
		In game: players need to position their character effectively to be successful in game (i.e. position on platforms, aiming shots, ducking).
Reaches	X	
Bends	X	
Grips	X	
Manipulates		Interacting with the input device of choice requires a degree of manipulation.
Coordinates		Normally, the player used both hands to interact with the input device.
Moves	X	
Lifts	X	
Walks	X	
Transports	X	
Calibrates	X	
Flows	X	
Endures		The player must endure postural control and hand and finger movements for the duration of the gameplay session or until they reach a suitable stopping point. The player may not always be able to stop and pause the game, especially during the faster paced levels. Attempting to pause or if they become too fatigued to finish a level in one sitting, will cause them to be killed by an enemy and lose their progress.
Paces		The player will be challenged to provide inputs in a pace that keeps up with the level they are presently in. Failure to keep pace will cause them to take damage and eventually cause them to have to start over.
Process Skills		
Paces		Players will be challenged to mentally keep pace with the level they are presently at. Players will need to process and react to the stimuli presented on screen in order to be successful during gameplay.
Attends		A player must attend to the game throughout the length of the gameplay session, otherwise there will be an increased rate of failure.
Heeds		Can be determined by a therapist. Beating certain levels or following instructions to beat a boss.
Chooses		There is a shop that players can visit that as players make progress through the game, will

SKILL	N/A	Context of Skill Within the Game
		supply the player with power ups they can choose from, as there is no set order in selection.
Uses		Players use input devices as they are intended
Handles		Players handle input devices as they are intended
Inquires		Can be determined by the therapist (i.e. the player asking questions on how to complete a stage).
Initiates		Players are challenged to take the appropriate actions (i.e. jump, dodge, duck, shoot etc.) at the appropriate times in order to be successful. This all depends on the context of the game at the time (i.e how much health does the player have, how far into the stage the player is, how many enemies there are etc.) which means that the game requires sound judgment from the player or else it will lead to frequent failures.
Continues		The player continues to navigate through stages for the duration of the gameplay session or once the desired number of stages are complete. In boss battles, players continue following the pattern until the battle is over.
Sequences		In game: the player has to sequence how to navigate through stages using a series of jumps and dashes as well as special abilities in some cases.
Terminates	X	
Searches/locates		There are three bonus coins placed within each level. Many of these are not obvious. As such players will need to actively search and locate these items. This also applies to any health or other in game item drops.
Gathers	X	
Organizes	X	
Restores	X	
Navigates		Players must determine how to navigate through game level layouts - as the path toward completion is typically linear. Therefore, if players are unable to determine which direction they came from, they can easily get lost. In game: the player has to sequence how to navigate through stages using a series of jumps and dashes as well as special abilities in some

SKILL	N/A	Context of Skill Within the Game
		cases using specific items obtained during gameplay.
Notices/responds		Players are able to recognize the pattern in the levels and boss battles and respond in order to progress further in levels or complete levels.
Adjusts		The player is challenged to adjust their gameplay for mistakes rather than repeating the same mistake frequently.
Accommodates		Can be determined by the therapist.
Benefits		Can be determined by the therapist.
Social Skills The therapist can address social interaction skills using the game but this is client specific and thus can be determined by the therapist. Social skills can be addressed while playing cooperatively but is not otherwise required to be successful		
Approaches/starts		Players start relaying necessary information to each other.
Concludes/ disengages	X	
Produces speech		Players should produce speech to communicate with each other in order to be most successful. However, this is not specifically required to be successful.
Gesticulates		Can be used to communicate if players are playing in the same space.
Speaks fluently		Players speak in a way that both players can understand.
Turns toward	X	
Looks	X	
Places self	X	
Touches		Can be determined by the therapist (appropriate touching). May be present but not required to be successful.
Regulates		Players are able to remain focused on information relevant to the game.
Questions		Players are able to ask for appropriate clarifying information, when necessary, amongst each other or from the therapist. (i.e. What did you want me to do? How do I do X again, or how do I dodge X attack? etc…).
Replies		Players continue relaying necessary information, responding accordingly when necessary. Thus, leading to better coordination and cooperation during gameplay.

SKILL	N/A	Context of Skill Within the Game
Discloses	X	
Expresses emotion		Can be determined by the therapist. Players appropriately express their own emotions and their emotions toward one another such as when one player messes up causing both to fail.
Disagrees		Players may need to appropriately express their differing opinions such as when discussing strategy on how to beat a level.
Thanks		May be present but not required to be successful.
Transitions	X	
Times response		Players respond to each other in a timely manner. Failure to respond in a timely manner can cause either player to make unnecessary mistakes due to the fast-paced nature of the game, information needs to be communicated quickly and efficiently
Times duration		Players respond to each other in a timely manner. Failure to relay information in a timely manner can cause either player to make unnecessary mistakes due to the fast-paced nature of the game, information needs to be communicated quickly and efficiently
Takes turns	X	
Matches language		May be present but not required to be successful.
Clarifies		Players are able to clarify what they are attempting to communicate to the other player or therapist when necessary or when asked. Such as the gameplay strategy idea they may have or when they recognize a pattern in a given boss battle.
Acknowledges and encourages		Players are able to acknowledge each other's frustrations when present as it is a challenging game and are able to appropriately encourage each other when necessary.
Empathizes		May be present but not required to be successful. Players are able to recognize the emotions the other is feeling such as when getting frustrated and able to understand why they are feeling that way.
Heeds		Players heed to the others instructions when appropriate and able to communicate effectively and coordinate actions cooperatively in order to be successful in beating levels.
Accommodates		Can be determined by the therapist.
Benefits		Can be determined by the therapist.

Areas of Treatment (Application)
Cooperation
Emotional regulation
Memory
Reaction time

Interest Tags
Disney art style

Death Squared

Death Squared is a puzzle game that can either be played by a single player or cooperatively with another player. From a therapeutic perspective, there are many aspects of the game that challenge a player's cognitive and process skills, including attention, problem-solving, and memory. There are also some physical skills that could be addressed with this game such as fine motor ability and the time and quality of motor production within the hands and fingers. When this game is played cooperatively, social skills can potentially be addressed, as both players must work together in order to beat various stages of the game and progress further. The social skill that could benefit most from this game is emotional regulation. This is because players will fail numerous times, slowly making progress on a given stage until it is eventually beaten. This experience could be frustrating for some and will require players who are easily frustrated to regulate their emotions.

Despite these other areas, this game provides the strongest therapeutic potential in addressing cognitive and process skills. Success in the game requires a great deal of focus, higher-level thinking, and problem solving in order to successfully complete the puzzles. Players become further challenged in these areas as they progress to later levels. Players get a break from maintaining focus in instances where the robots in the game are not moving. However, many levels have elements that move as the robots move, including platforms, walls, and lasers. Memory can be challenged to some degree especially in levels that contain hidden spikes as the player will be required to remember where the spikes are. Navigating a level safely requires a degree of problem-solving ability as well as the ability to think logically and coherently.

Note: Any previously beaten stages can be replayed indefinitely which is good for repeatability.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: Death Squared

Objects and Their Properties Required

Which Platform: Nintendo Switch, PC, PlayStation, Xbox

Time to Play: No preset time but early stages can take as little as a few seconds and mid to late stages can take a few minutes

Sequencing and Timing

1. Stage Start
2. Player navigates red robot using Left stick or WASD & navigates the blue robot using Right stick to reach respective colored rings
3. (Stage dependent) – player must interact with various elements (i.e. switches,

walls, lasers, platforms) in an appropriate manner/sequence to successfully complete the stage.

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight	X	
Attention: sustained attention and concentration; selective, divided, and shifting attention		There are multiple elements that must be focused on at a given time in order to solve a puzzle, especially shifting and divided attention, as actions from one robot will affect the other in real time. The degree to which this is challenged increases as progress is made through the stages. The degree of challenge can further be amplified if playing single player because then the player is responsible for controlling both robots at the same time. Controlling one with each joystick of a controller or arrow keys and WASD respectively.
Memory: short-term, working, and long-term memory		At times there are elements that appear on a stage when a switch is activated (e.g. spikes). The player must remember where these appear in order to avoid failing because it is not always possible to keep these elements revealed while navigating/completing the stage.
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive	X	
Thought: control and content of thought, awareness of reality, logical and coherent thought		Each stage has a logical solution that must be discovered by the player. In order to be successful, the player must be able to think logically.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		The degree to which this is challenged increases as progress is made through the stages.
Sequencing complex movement: regulating speed, response, quality, and time of motor production		Regulating speed and quality of motor production are skills that are challenged with this game. The most common ways to die are accidentally touching spikes and falling off the stage itself. To counter this, precise movements are necessary in order to navigate the stage, crossing tight spaces or dodging hazards (i.e. lasers). If a player has difficulty regulating motor production and quality, it will be more challenging to synchronize the movements between the two robots necessary to complete the stage. Frequently, the actions of one robot influence the other.
Emotional: regulation and range of emotion, appropriateness of emotions	X	Failure is inevitable when playing this game as it requires trial and error to progress. Which can be a frustrating experience on its own. The game's stages can be unforgiving, requiring precise movement. On top of that, if playing alone, the player is responsible for two robots at once. Adding yet another element that adds to potential frustration. The player must be able to control any emotions that arise during gameplay.
Experience of self and time: appropriateness and range of emotion, body image, self-concept	X	
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		Complete consciousness is necessary in order to be successful in playing this game.
Orientation: orientation		In game: there are times when one player's

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
to person and self, place, time, and others		actions affect the other. In these cases, the player must be able to orient their robot to the others in order to be successful. For example, one robot's movements control a platform that the other needs to get on. So, the two robots need to sync up their movements so that they can navigate successfully.
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability; openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite		If the player is playing cooperatively, then there is a degree of agreeableness and conscientiousness necessary in order to work together to complete stages. Failure is a frequent occurrence in this game as it is about trial and error. A player must sustain their motivation in order to persevere through the stages. Self-control and impulse control are tested during cooperative play as there are times where one player's fate is determined by the other. It can be fun to doom the other player to fail but if the goal is to complete stages, then a player must be able to exhibit self-control and impulse control.
Energy and drive: motivation, impulse control, appetite		This is not an actively demanding game. It is mentally demanding.
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		A player must be able to distinguish between the robots. This can be made easier through the use of individualized hats in color blind cases. As well as toggle a color-blind friendly setting in the menus. A player must possess adequate levels of vision to distinguish objects on a screen but there is no direct challenge of vision within the game as well as identifying any obstacles to navigate through or any useful elements such as switches.
Hearing; sound detection		Auditory sounds are made when activating

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
and discrimination; awareness of location and distance of sounds		switches and there is light hearted banter from the narrator (subtitles available) but they are not necessary for a player to play the game.
Vestibular: position, balance, secure movement against gravity	X	
Proprioceptive: awareness of body position and space		In game: the player must be aware of where their robot(s) are positioned on the stage at all times in order to be successful.
Touch: feeling of being touched, touching various textures		The game requires the use of a controller (or optionally, a keyboard if playing on PC). The player must physically interact with these input devices in order to play the game. Players must be able to tell if they holding the controller and or if they are hitting the desired inputs (triggers vs buttons vs joysticks) and if they are interacting with the joystick in the desired manner (orienting to the desired direction) and not pressing down with excessive force as this actuates another input L3 & R3 which can lead to unintended actions if the player did not mean to press those inputs.
Pain: localized and generalized pain	X	
Temperature and pressure: thermal awareness, sense of force applied to skin	X	
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		A player must have at minimum enough joint mobility in the hands and fingers to interact with the input device. This challenges the player's ROM and precision of the hand finger and thumb joints. The game is slow paced allowing players to move at their own pace. In most cases, when the player stops moving all stage elements stop as well.
Joint stability: structural integrity of joints	X	

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Muscle Functions		
Muscle endurance: sustaining muscle contraction	X	
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		Can be determined by the therapist. Normally, a player would participate in gameplay from a seated position. Requiring them to sustain postural control in that way.
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		A player must be able to finely adjust their robot's positioning at times in order to complete stages (i.e. precise movement of a joystick). When playing single player, the player is responsible for controlling both robots; one on each joystick (or WASD and Arrow keys with keyboard and mouse). Thus, requiring a degree of bilateral integration on top of fine motor control.
Gait patterns: movements used to walk	X	
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm	X	
Respiratory system: rate, rhythm, depth of respiration	X	
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity	X	
Voice and speech: rhythm and fluency, alternative vocalization functions		Can be determined by the therapist. If playing cooperatively, vocally communicating with other players can be challenged to a certain degree. Vocalizing information to each other. Players will need to use speech to relay information if playing as intended

Performance Skills Required

SKILL	N/A	Context of Skill Within the Game
Motor Skills		
Aligns		Can be determined by the therapist.
Stabilizes		Can be determined by the therapist.
Positions		Can be determined by the therapist. The player must position themselves in such a way in relation to the display so that they are able to view the entire display without the elements on screen being too small for them to see. They must position their body as well as limbs, wrists, hands, and fingers in a way that is comfortable and enables them to best endure the duration of the play session and sustain postural control. In game: players need to position their character effectively to be successful in game (i.e. position on platforms navigating stages).
Reaches	X	
Bends	X	
Grips	X	
Manipulates		Interacting with the input device of choice requires a degree of manipulation.
Coordinates		Normally, the player used both hands to interact with the input device.
Moves	X	
Lifts	X	
Walks	X	
Transports	X	
Calibrates		The speed at which the player makes inputs on the controller can affect overall outcomes. Meaning if the player frantically presses buttons or tries to rush that could lead to more failure and make it difficult to coordinate with the other robot.
Flows	X	
Endures		The player must endure postural control and hand and finger movements for the duration of the gameplay session or until they reach a suitable stopping point.
Paces	X	
Process Skills		

SKILL	N/A	Context of Skill Within the Game
Paces		In game: A player must be able to exhibit control over the pace they use to control their robot in given situation to complete stages (going to fast will lead to increased failure because they are more likely to make mistakes and fall off the stage).
Attends		A player must be able to attend to the task in order to make progress otherwise there will be an increased rate of failure. However, a player can pause their attendance without risk of failure by either stopping their robot or pausing the game.
Heeds		Can be set up to either complete a certain number of stages, follow directions to reach a location on the stage, or work together cooperatively to complete a stage. The degree of this can be determined by the therapist.
Chooses	X	
Uses		Uses input devices as they are intended. In game: A player must use objects (i.e. blocks, walls, other robots) in the appropriate manner in order to complete certain stages.
Handles		Handles input devices as they are intended. In game: There are times when a player must carry the other robot to a location they cannot otherwise reach independently. In these cases, a player must be cautious of their speed and positioning otherwise they risk failing the stage.
Inquires		Can be determined by the therapist. (i.e. the player asking questions on how to complete a stage, or asking what to do next when playing cooperatively).
Initiates	X	
Continues		In game: A player can start and stop movement within the game without any consequence but can exhibit mastery when their action becomes steady.
Sequences		In order to solve various stages, actions must take place in the correct order. Different elements are introduced in different stages. Switches that activate platforms or lasers. Blocks need to be

SKILL	N/A	Context of Skill Within the Game
		positioned appropriately or the robots may need to use each other. A player must determine the course of action and then execute that sequence in order to complete a stage. The degree to which this is challenged, increases as progress is made through the stages.
Terminates		At times actions from one robot effects the fate of the other, they also can influence elements of the stage (i.e. platforms move when the player moves or lasers track a robot) because of this, a player must be able to terminate their actions at the opportune time in order to be successful in completing a stage.
Searches/locates		A player must be able to locate useful elements on a given stage by scanning the entire screen.
Gathers	X	
Restores	X	
Navigates		Some stages have dangers that a player must navigate the robots through (i.e. spikes and lasers) if the player touches these elements they fail and must restart the stage.
Notices/responds		Actions one robot takes can positively affect the stage for the other robot. A player can instinctively respond and react to these changes. However, the changes are persistent until the affecting robot discontinues the action they are taking. So, the player is not required to notice/respond in a time sensitive manner in order to be successful in the game.
Adjusts		This game is about trial and error. Failure is inevitable. However, a player must adjust the actions they take in order to improve their overall outcome until they are eventually successful in completing a stage
Accommodates		Can be determined by the therapist. A player must be able to learn from their previous attempts in order to eventually be successful in completing a stage. If a player is persistently making the same mistake repeatedly then external assistance may be necessary (i.e. asking for assistance from therapist if allowed)

SKILL	N/A	Context of Skill Within the Game
		The degree to which this is challenged increases as progress is made through the stages
Benefits		Can be determined by the therapist.
Social Interaction Skills The therapist can address social interaction skills using the game but this is client specific and thus can be determined by the therapist. Social skills can be addressed while playing cooperatively but is not otherwise required to be successful		
Approaches/starts		Can be determined by the therapist. The manner/degree in which a player interacts with another is wholly up to the therapist.
Concludes/ disengages		Can be determined by the therapist. The manner/degree in which a player interacts with another is wholly up to the therapist.
Produces speech		Can be determined by the therapist. Players should produce speech in order to communicate with each other in order to be most successful.
Gesticulates		Not required to be successful but the use of emotes can be used between players to communicate.
Speaks fluently		Can be determined by the therapist. Players speak in a way that both players can understand. It is not required to be successful. Communication can be achieved non-verbally or through emotes within the game.
Turns toward		Can be determined by the therapist. But is not required to be successful.
Looks		Can be determined by the therapist. But is not required to be successful.
Places self		Can be determined by the therapist. But is not required to be successful.
Touches		Can be determined by the therapist (appropriate touching). May be present but not required to be successful.
Regulates		Players are able to remain focused on information relevant to the game.

SKILL	N/A	Context of Skill Within the Game
Questions		Players are able to ask for appropriate clarifying information, when necessary, amongst each other or from the therapist. (i.e. What did you want me to do.).
Replies		Players continue relaying necessary information, responding accordingly when necessary. Leading to better coordination and cooperation during gameplay.
Discloses	X	
Expresses emotion		Can be determined by the therapist. Players appropriately express their own emotions and their emotions toward one another such as when one player messes up causing both to fail.
Disagrees		Players may need to appropriately express their differing opinions such as when discussing strategy on how to beat a level.
Thanks		May be present but not required to be successful.
Transitions	X	
Times response		Players respond to each other in a timely manner. Failure to respond in a timely manner can cause either player to make unnecessary mistakes.
Times duration		Players respond to each other in a timely manner. Failure to respond in a timely manner can cause either player to make unnecessary mistakes.
Takes turns		Can be determined by the therapist. (i.e. two individuals taking turns completing stages independently). There are times where in order to complete stages, first one robot needs to take actions (activating a switch) before the other robot can do anything. Cooperatively: Some stages require that each player assist the other in these cases players must be able to take turns effectively.
Matches language		May be present but not required to be successful.
Clarifies		Players are able to clarify what they are attempting to communicate to the other player or therapist when necessary or when asked. Such as the gameplay strategy idea they may have.
Acknowledges and encourages		Players are able to acknowledge each other's frustrations when present as it is a challenging game and are able to appropriately encourage each other when necessary.

SKILL	N/A	Context of Skill Within the Game
Empathizes		May be present but not required to be successful. Players are able to recognize the emotions the other is feeling such as when getting frustrated and able to understand why they are feeling that way.
Heeds		Players heed to the other's instructions when appropriate and able to communicate effectively and coordinate actions cooperatively in order to be successful in beating levels.
Accommodates		Can be determined by the therapist.
Benefits		Can be determined by the therapist.

Areas of Treatment (Application)
Mild cognitive impairment
Attention Skills
Problem solving ability
Some fine motor aspects
Social Behaviors such as turn taking and patience
Emotional Control
Cooperative Play

Interest Tags
Puzzles, Robots

Good Pizza, Great Pizza

Good Pizza, Great Pizza, is a simple yet fun game that has the potential to challenge various skills such as attention, memory, money management, visual scanning, and fine motor skills. When a customer arrives at the player's pizza shop, they give their order once. The order only displays on screen for a discrete amount of time. Once the prompt is dismissed by the player the order is not shown again. This means that players will be required to remember the order as they are preparing it. Orders start simple but as the player progresses, orders become more complex through the introduction of additional topping options, topping arrangement, cutting preferences, and variances in the duration of baking time. Players must be sure to sustain attention and engage their working memory in order to get the nuances of the order correct for the customer. Toppings are not labeled in any way; therefore, players must discern and identify toppings based on their shape and color alone. Additionally, as more topping options are offered, the player's screen becomes filled more and more with topping stations. Eventually, the whole screen becomes filled with toppings. Thus, requiring the player to visually scan for the desired toppings.

The game can be played with mouse and keyboard (on PC), controller (on consoles), and additionally touch controls (on Nintendo Switch). It is recommended to play the game on the Nintendo Switch because of the added possibility of touch controls. With touch controls, fine motor skills can be challenged to a greater degree than on any other platform requiring precision movements with the wrist, hand, and fingers.

At the end of each day, players take their profits and must then decide how to best use them among the following options: restocking for the next day, paying for equipment improvements or repairs, or investing in aesthetic/decorative items that increase things like the number of tips received and customer respawn rates. Players must manage money wisely because if they are not able to restock and make repairs then they will face a game over.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: Good Pizza, Great Pizza

Objects and Their Properties Required

Which Platform: Nintendo Switch, PC

Time to Play: One day takes ~2 minutes to complete

Sequencing and Timing

1. The player is given an order from a customer
2. The player places the dough
3. (Depending on the order) the player places the toppings as requested

4. The player places the pizza in the oven as requested by the customer (i.e. regular or well done)
5. The player cuts the pizza based on the customer's order (i.e. four slices, in half)

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight		This game has an element of money management, as such players will need to make sound judgements on where to invest their money in order to progress. Otherwise, progress will be slow going or lead to a game over. Upgrades include better equipment to improve cooking, decorations to increase customer happiness and spawn rates, and new pizza toppings to allow for better service. However, players need to remain cognizant that each day they need to restock any used ingredients as well as fund potential repairs otherwise the inability to do so will lead to a game over
Attention: sustained attention and concentration; selective, divided, and shifting attention		This game requires a degree of concentration to place toppings effectively (i.e. toppings need to be evenly distributed, or to the customer's request as well as shifting and divided attention when preparing orders with multiple pizzas. The game is set up like an assembly line, 1. Take the order, 2. Assemble the Pizza, 3. Run it through the oven, 4. Cutting and boxing the pizza, 5. Handing the Pizza to the customer. In order to complete pizza orders in a timely manner players will need to multitask. The player can assemble the next pizza while another is run through the oven and or box one pizza while another is in the oven.
Memory: short-term, working, and long-term		This game challenges short term memory and working memory to a degree. Players need to

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
memory		remember customers' orders as they are given to them as the order is not repeated or displayed any other time in the game. The complexity of the orders get harder as the player progresses. Including aspects such as different toppings, half and half pizzas, well done (run in oven twice) and specific cutting dimensions
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive	X	
Thought: control and content of thought, awareness of reality, logical and coherent thought		The player is able to process customer orders and execute them effectively. Orders are sometimes vague and so the player will need to reason what the customer is looking for. For example, one customer during testing simply stated they would like some "za." The customer was given a cheese pizza and they responded saying they wanted a pepperoni pizza. This is part of learning the behaviors of the game and presumably the idea that one can't perfectly serve every customer. There is also an element of money management to this game, paying for toppings, repairs, and upgrades.
Sequencing complex movement: regulating speed, response, quality, and time of motor production	X	In this game, the quicker pizzas are accurately prepared the more potential customers the player can serve leading to more profits/tips. For this to be accomplished the players ability to regulate the speed in which they provide input to the controller, response time, quality and time of motor production will all be challenged to a degree because players need to accurately place toppings, and

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		provide inputs quickly.
Emotional: regulation and range of emotion, appropriateness of emotions	X	
Experience of self and time: appropriateness and range of emotion, body image, self-concept	X	
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		Complete consciousness is necessary in order to be successful in playing this game.
Orientation: orientation to person and self, place, time, and others	X	
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability; openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite		As the player progresses leading to more variables (more toppings and complexity to the orders). The amount of stress the player feels may increase due to the need to complete the orders and to meet the profit quota (enough to afford the next day). This will test the players emotional stability, confidence, and motivation. There is also a degree of self-control and impulse control required to be successful because the player has to place enough toppings to make the customer happy but they should avoid placing too many because it will cost them more money to restock.
Energy and drive: motivation, impulse control, appetite	X	This is not an actively demanding game. It is mentally demanding
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		The player must possess adequate levels of vision and visual acuity to distinguish between toppings on screen as well as read customer order requests (Therapist could assist with this). The player's visual field can be tested

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		especially as more toppings are introduced because all the toppings are displayed on a single screen.
Hearing; sound detection and discrimination; awareness of location and distance of sounds	X	
Vestibular: position, balance, secure movement against gravity	X	
Proprioceptive: awareness of body position and space	X	
Touch: feeling of being touched, touching various textures	X	The game requires the use of a controller (or optionally mouse and keyboard if playing on PC). As well as touch controls if playing on the Nintendo Switch The player must physically interact with these input devices in order to play the game. Players must be able to tell if they holding the controller and or if they are hitting the desired inputs (triggers vs buttons vs joysticks) and if they are interacting with the joystick in the desired manner (orienting to the desired direction) and not pressing down with excessive force as this actuates another input L3 & R3 which can lead to unintended actions if the player did not mean to press those inputs. When using touch controls the player must tell when they are making contact with the screen and with how much force they are pressing on the screen otherwise they risk damaging the device.
Pain: localized and generalized pain	X	
Temperature and pressure: thermal awareness, sense of force applied to skin	X	
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		A player must have at minimum enough joint mobility in the hands and fingers to interact

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		with the input device. The game requires specific inputs to complete the various stages of the pizza making process. Timely accurate motor production and response leads to more potential customers served and more profits. This challenges the player's ROM and precision of the hand finger and thumb joints. The shoulder and arm joints could be incorporated when using touch controls as the player will be required to lift and stabilize the shoulder and elbow joints.
Joint stability: structural integrity of joints		Can be determined by the therapist. This is most applicable when utilizing touch controls. The player's joint stability in the shoulder and elbow joints will be challenged in order to stabilize the arm for the duration of the gameplay session.
Muscle Functions		
Muscle endurance: sustaining muscle contraction		Applicable when using touch controls. Players sustain a contraction in the shoulder and elbow in order stabilize the are as they use their wrist, hand, and fingers to interact with the Nintendo Switch screen. Players select and place toping with their finger as well as draw the lines in which the pizza is cut.
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		Can be determined by the therapist. Normally, a player would participate in gameplay from a seated position. Requiring them to sustain postural control in that way.
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		This game challenges fine motor control and hand eye coordination to a degree when placing topping on the pizza. Especially if playing on Nintendo Switch because the game uses touch controls. The player normally uses two hands to interact with the input device.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Gait patterns: movements used to walk	X	
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm	X	
Respiratory system: rate, rhythm, depth of respiration	X	
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity	X	
Voice and speech: rhythm and fluency, alternative vocalization functions	X	

Performance Skills Required

SKILL	**N/A**	**Context of Skill Within the Game**
Motor Skills		
Aligns		Can be determined by the therapist.
Stabilizes		Can be determined by the therapist.
Positions		Can be determined by the therapist. The player must position themselves so that they can distinguish everything on screen as well as position their bodies so that they can execute required actions with the hands and fingers (or fingers, hand, wrist, arm, and shoulder if using touch controls) comfortably for the duration of the gameplay session.
Reaches		When using touch controls, the therapist can position the device in such a way that requires the player to reach to interact with the device.
Bends		When using touch controls the therapist can place the device at a different level from the player requiring them to bend to interact with the device.
Grips	X	
Manipulates		Interacting with the input device of choice requires a degree of manipulation.

SKILL	N/A	Context of Skill Within the Game
Coordinates		Normally, the player used both hands to interact with the input device.
Moves	X	
Lifts	X	
Walks	X	
Transports		In game: The player has to initiate moving the pizza from the toppings station, to the oven, to the cutting board, to the box, and finally delivered to the customer.
Calibrates		In order to prepare the pizza and place toppings with accuracy the player must be able to calibrate the rate at which they interact with the thumb stick or move their finger when using touch controls. Otherwise, they risk misplacing topping or putting sauce on the crust of the pizza leading to less customer satisfaction.
Flows		Some toppings require a degree of flow to place them effectively (i.e. sauce and cheese) As the player is required to steadily draw a circle with either the control stick or finger when using the touch controls.
Endures		The player must endure postural control and hand and finger movements for the duration of the gameplay session.
Paces		The better the player is able to maintain the pace of their hand in finger movements, the better the gameplay outcome will be. If they begin to slow, they will not be able to serve as many customers.
Process Skills		
Paces		Is challenged slightly, time passes as the player prepares pizzas. The longer the player takes the less pizzas they will be able to make in a day.
Attends		The player has to attend to the customer orders and the pizza preparing process in order to properly fulfill the order in order to improve outcomes (i.e. better tips). Players need to remember the customer's order and then accurately follow through with that order (the toppings, cooking options, and any specified cutting instructions).
Heeds		Can be determined by the therapist (i.e. number of proper completed orders and or limited mistakes).

SKILL	N/A	Context of Skill Within the Game
Chooses		At the end of each day, players have the option to purchase new toppings and or upgrades they choose as long as they have enough funds to do so.
Uses		The player uses the input devices as they are intended.
Handles		The player handles the input devices as they are intended.
Inquires		Can be determined by the therapist. The player could ask the therapist for a reminder of what the order was if allowed.
Initiates		The player initiates each step of the in game pizza making process in this game actively transitioning from taking the customer's order, to the topping station – initiating the selection of dough, sauce, and toppings, then transition to the oven – players must initiate placing the pizza back in the oven in the case of well-done orders, then there is the cutting station in which the player needs to initialize each cut, then next box the pizza, lastly the pizza order is actively handed over to the customer.
Continues		The player continues placing toppings until they are evenly distributed or to the customers' liking
Sequences		There is a sequence to making the pizzas. However, the game guides you through. Challenges to sequencing would occur when preparing the pizza (i.e. first dough, then sauce, then cheese, then toppings and/or when the pizza has to be well done).
Terminates		The player has to actively terminate placing toppings. It is possible to place too little or too many toppings. This can lead to customer dissatisfaction and higher ingredient costs.
Searches/locates		The player is able to locate the toppings needed on screen. Especially as more toppings are introduced because all the toppings are displayed on a single screen and are not labeled. (Think like the toppings station at a Subway).
Gathers	X	
Organizes	X	
Restores	X	
Navigates	X	

SKILL	N/A	Context of Skill Within the Game
Notices/responds		The player is able to notice differences in orders when clients order multiple pizzas and or mistakes in preparation are made and respond accordingly. Ruined pizzas can be thrown out and the player can choose to re attempt making the pizza as desired by the customer.
Adjusts		The player adjusts their gameplay for mistakes rather than repeating the same mistake frequently.
Accommodates		Can be determined by the therapist.
Benefits		Can be determined by the therapist.
Social Interaction Skills The therapist can address social interaction skills using the game but this is client specific and thus can be determined by the therapist. Otherwise, social interaction skills are not required to be successful in game. The player could potentially role play social interactions with the customers or the therapist could ask the client what appropriate responses might be. Money can also be introduced to simulate the order process.		
Approaches/starts		
Concludes/ disengages		
Produces speech		
Gesticulates		
Speaks fluently		
Turns toward		
Looks		
Places self		
Touches		
Regulates		
Questions		
Replies		
Discloses		
Expresses emotion		
Disagrees		
Thanks		
Transitions		
Times response		
Times duration		
Takes turns		
Matches language		
Clarifies		
Acknowledges and encourages		
Empathizes		
Heeds		

SKILL	N/A	Context of Skill Within the Game
Accommodates		
Benefits		

Areas of Treatment (Application)
Memory
Task Sequencing
Social Skills (impulse control)
Fine Motor
Money Management

Interest Tags
Food, Pizza

Tetris Effect: Connected

Tetris effect is a modern version of the original Tetris game. The potential therapeutic benefits of this game are the inherent problem solving required from the player to effectively place blocks as they come and avoid errant block placements that can result in a game-over. The demands become more challenging as the player progresses further. As the speed of the blocks increases, the degree of fine motor challenge the player experiences will also increase as the player must continue to provide accurate inputs to the input device with less time. There is also the element of planning ahead, placing blocks in such a way so that when a particular piece comes (such as the long piece) it can be placed most effectively in order to clear the maximum number of lines possible, thus leading to higher scores overall. Tetris Effect also provides a great deal of visual and auditory stimulation such as delivering blocks to the beat of the background music playing. This will challenge the player's ability to filter out excessive stimuli in order to focus on the gameplay. Overall, Tetris Effect is a game with the potential to challenge various cognitive skills and fine motor movements of the player.

Note: By default, the games visuals may be challenging due to the lack of contrast between the Tetris blocks and the background, which could be a potential way to challenge a player's visual skills, but if this is not the goal or the player simply has too much difficulty viewing the gameplay, there is a setting that will make the blocks contrast with the background more. There is also the option to turn off nearly all the excessive visual stimuli if desired.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: Tetris Effect Connected

Objects and Their Properties Required

Which Platform: Nintendo Switch, PC, PlayStation, Xbox

Time to Play: 5-10 minutes to complete a level

Sequencing and Timing

1. Random blocks appear at the top of the screen
2. Player must stack/orient blocks using the directional buttons to move the block and the rotate buttons to orient the block with the goal of creating lines across the stage
3. Points are awarded each time lines are completed
4. Play continues until the score threshold is reached or the stack of blocks reaches the top of the stage

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight	X	
Attention: sustained attention and concentration; selective, divided, and shifting attention		The player must sustain attention during gameplay in order to be successful. New pieces are constantly flowing because of this, players must continually think about where to place pieces and plan ahead in order to create lines. Selective attention can be challenged if visual effects are left on in this game. There is a lot of visual effects and distracting backgrounds in normal gameplay.
Memory: short-term, working, and long-term memory		The player can store a block to then swap with another block at any time. Remembering what block is stored is beneficial for effective gameplay.
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive	X	
Thought: control and content of thought, awareness of reality, logical and coherent thought		Thinking ahead and positioning blocks in such a way as to complete more lines at one time leads to better outcomes. The better the player is at planning ahead the more successful they will be during gameplay.
Sequencing complex movement: regulating speed, response, quality, and time of motor production		Regulating speed, response, quality, and time of motor production are all factors that influence the success a player will have during gameplay. The more levels the player clears the faster the gameplay becomes (blocks fall faster). Thus, requiring the player to react quicker

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		and provide more precise inputs to the input device.
Emotional: regulation and range of emotion, appropriateness of emotions		As a player progresses through the stages, they get increasingly more changing (i.e. blocks drop faster) this can lead to stressful situations as the player engages in gameplay. The player must manage their emotions when these situations arise.
Experience of self and time: appropriateness and range of emotion, body image, self-concept	X	
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		Complete consciousness is necessary in order to be successful in playing this game.
Orientation: orientation to person and self, place, time, and others	X	
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability; openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite		A degree of impulse control is necessary in order to place the blocks effectively. It is possible that the player can get caught in the music that plays along with dropping the blocks making the player want to drop the blocks recklessly.
Energy and drive: motivation, impulse control, appetite		If the player progresses enough levels can become challenging leading to failure. A player must maintain a level of motivation to persevere past these challenges.
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		A player must possess adequate levels of vision to distinguish objects on a screen. Players must possess enough visual acuity to determine where their guiding their current block.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		At times there can be a lot of visual stimuli on screen at any given time (i.e. visual effects in beat with the music and dropped blocks). This will challenge the player's ability to filter out excessive stimuli and attend to the important stimuli as well as visually track any moving elements at a given time. The amount of visual stimuli can be graded down with tweaks to the visual settings in game.
Hearing; sound detection and discrimination; awareness of location and distance of sounds	X	
Vestibular: position, balance, secure movement against gravity	X	
Proprioceptive: awareness of body position and space	X	
Touch: feeling of being touched, touching various textures	X	
Pain: localized and generalized pain	X	
Temperature and pressure: thermal awareness, sense of force applied to skin	X	
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		A player must have at minimum enough joint mobility in the hands and fingers to interact with the input device. The game requires rapid button presses as well as timely responses on specific inputs (i.e. moving, rotating and stashing blocks) in order to be successful thus challenging the player's ROM and precision of the hand, finger and thumb joints.
Joint stability: structural integrity of joints	X	

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Muscle Functions		
Muscle endurance: sustaining muscle contraction		There is an endless mode "marathon" that can be used to challenge a client's hand and finger joints. It is as the name implies. The game only ends with a game over or when the player decides to stop.
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		The degree required can be determined by the therapist. Normally, a player would participate in gameplay from a seated position. Requiring them to sustain postural control in that way.
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		Eye hand coordination and fine motor control is challenged to a degree while using finger and thumb movements to provide controller inputs to place blocks as they fall in the desired position. Challenge increases with the more levels that are cleared.
Gait patterns: movements used to walk	X	
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm	X	
Respiratory system: rate, rhythm, depth of respiration	X	
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity	X	
Voice and speech: rhythm and fluency, alternative vocalization functions		Can be determined by the therapist. When playing cooperatively this can be challenged to a degree but is not required to be successful.

Performance Skills Required

SKILL	N/A	Context of Skill Within the Game
Motor Skills		
Aligns		Can be determined by the therapist.
Stabilizes		Can be determined by the therapist.
Positions		Can be determined by the therapist. The player must position themselves in such a way in relation to the display so that they are able to view the entire display without the elements on screen being too small for them to see. They must position their body as well as limbs, wrists, hands, and fingers in a way that is comfortable and enables them to best endure the duration of the play session and sustain postural control.
Reaches	X	
Bends	X	
Grips	X	
Manipulates		Interacting with the input device of choice requires a degree of manipulation.
Coordinates		Normally, the player used both hands to interact with the input device.
Moves	X	
Lifts	X	
Walks	X	
Transports	X	
Calibrates		The speed at which the player makes inputs on the controller can affect overall outcomes. Meaning if the player frantically presses buttons or tries to rush, could lead to more mistakes and ultimately failure of the level.
Flows		With mastery, players should be able to move seamlessly from providing inputs to place one block right into providing input for the next block.
Endures		The player must endure postural control and hand and finger movements for the duration of the gameplay session or until they reach a suitable stopping point. The player may not always be able to stop and pause the game, especially during the faster paced levels, attempting to pause or if they become too fatigued to finish a level in one sitting could cause them to fail the levels because the blocks are coming too quickly.

SKILL	N/A	Context of Skill Within the Game
Paces		Players must provide inputs in a timely manner, keeping pace with the speed of the current level. Failure to keep pace will ultimately lead to the player failing the level.
Process Skills		
Paces		The game's tempo steadily increases as the player progresses through levels, thus challenging the player's ability to keep pace in order to be successful. Players need to make decisions quickly especially in higher levels, deciding how and where to place blocks that best sets up the next upcoming block.
Attends		The player must sustain attention during gameplay in order to be successful. New pieces are constantly being introduced. Because of this, players must continually think about where to place pieces and plan ahead in order to create lines.
Heeds		Can be determined by the therapist. Beating a certain number of levels or not stashing blocks (with or without distracting visual effects).
Chooses	X	
Uses		The player uses input devices as they are intended.
Handles		The player handles input devices as they are intended.
Inquires		The player could ask the therapist for clarifying question if necessary and if allowed.
Initiates	X	Blocks fall without the player’s input.
Continues		Player continues gameplay placing blocks without pause. Excessive pauses will lead to increased rate of failure especially in later levels.
Sequences		In game: the player attempts to place the blocks as they are presented in the most beneficial way in order to continue progression. If players are thinking ahead and planning, they can place blocks in preparation for a particular block (for example, the long block) to clear the most rows and lead to higher scores.
Terminates	X	
Searches/locates	X	
Gathers	X	
Restores	X	
Navigates	X	

SKILL	N/A	Context of Skill Within the Game
Notices/responds		Players instinctively act to place blocks as they are presented without any additional external prompting.
Adjusts		Errant blocks will be placed by mistake from time to time. It is during these times when the player can adjust, overcoming a poor situation and still be successful in completing a stage or setting a high score.
Accommodates		Can be determined by the therapist but this is client specific.
Benefits		Can be determined by the therapist but this is client specific.
Social Interaction Skills The therapist can address social interaction skills using the game but this is client specific and thus can be determined by the therapist. Social skills can be addressed while playing cooperatively but are not otherwise required to be successful.		
Approaches/starts		Players start relaying necessary information to each other.
Concludes/ disengages		
Produces speech		Players may produce speech in order to communicate with each other in order to be most successful. However, this is not specifically required to be successful.
Gesticulates	X	
Speaks fluently		Players speak in a way that both players can understand
Turns toward	X	
Looks	X	
Places self	X	
Touches		Can be determined by the therapist (appropriate touching). May be present but not required to be successful
Regulates		Players are able to remain focused on information relevant to the game.
Questions		Players are able to ask appropriate questions to gather beneficial information, when necessary, amongst each other or from the therapist.
Replies		Players continue relaying necessary information, responding accordingly when necessary. Leading to better coordination and cooperation during

SKILL	N/A	Context of Skill Within the Game
		gameplay (going for multiple line clears rather than single line clears).
Discloses	X	
Expresses emotion		Can be determined by the therapist. Players appropriately express their own emotions and their emotions toward one another such as when one player messes up causing both to fail.
Disagrees		Can be determined by the therapist. Players will have to work together in order to complete stages. There are times when each player may have their own opinions/ideas on how to go about completing a stage. Discussing/executing these ideas in an appropriate manner will improve rate of success (going for multiple line clears rather than single line clears).
Thanks		May be present but not required to be successful.
Transitions	X	
Times response		Players respond to each other in a timely manner. Failure to respond in a timely manner can cause either player to make unnecessary mistakes due to the fast-paced nature of the game, information needs to be communicated quickly and efficiently
Times duration		Players relay information to each other in a timely manner. Failure to relay information in a timely manner can cause either player to make unnecessary mistakes due to the fast-paced nature of the game, information needs to be communicated quickly and efficiently.
Takes turns	X	
Matches language		May be present but not required to be successful.
Clarifies		Players are able to clarify what they are attempting to communicate to the other player or therapist when necessary or when asked.
Acknowledges and encourages		Players are able to acknowledge each other's frustrations when present as it is a challenging game and are able to appropriately encourage each other when necessary.
Empathizes		May be present but not required to be successful. Players are able to recognize the emotions the other is feeling such as when getting frustrated and able to understand why they are feeling that way.

SKILL	N/A	Context of Skill Within the Game
Heeds		Players heed to the others instructions when appropriate and able to communicate effective and coordinate actions cooperatively in order to be successful in beating levels
Accommodates		Can be determined by the therapist.
Benefits		Can be determined by the therapist.

Areas of Treatment (Application)
Cognitive impairment
Emotional regulation
Planning ahead
Attention deficits

Interest Tags
Puzzles, Tetris, Music

Unpacking

Unpacking is a simple and peaceful "moving-in simulator." This game can challenge concept formation and praxis, as players are required to visually interpret an object, determine what the object is, then decide which room of the house is appropriate for the object to be placed in. The therapist could collaborate with the player to determine where the most appropriate location for a given item is. It could be used as a virtual substitute to organize one's room/home before attempting a real-life scenario.

There is no time limit and there is an option in the settings of the game that when enabled, gives the player the freedom to place any object anywhere, making it so that there are no "correct" location requirements to clear a given level.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: Unpacking

Objects and Their Properties Required

Which Platform: Nintendo Switch, PC, PlayStation, Xbox

Time to Play: ~5-10 minutes to finish a room

Sequencing and Timing

Players are presented with an in home setting and tasked with unpacking boxes and placing them in appropriate locations

1. Open a box
2. Place given item in appropriate location
3. Return to box to grab another item
4. Repeat steps 1-3 until all the items are unpacked

Body Functions Required

FUNCTION (Specific Mental Functions)	N/A	Detailed Description
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight		This game requires the player to have a degree of concept formation as well as praxis because players will need to mentally ascertain what the current object they are placing is and then where might the most appropriate location for that item might be.

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		Some levels have multiple rooms and so one box in one room might contain an item from another room (i.e. a pot that belongs in the kitchen that came out of the box in the bathroom).
Attention: sustained attention and concentration; selective, divided, and shifting attention		This game requires sustained attention to a degree in order to complete the unpacking task. There is no time limit but progress can only be made while the player attends to the game because the player must actively place the objects in desired locations. Other elements of attention can be addressed based on parameters set by the therapist. For example, the therapist can ask the client to finish the boxes in one room before moving on to the next room. Players can use context clues to determine where an item may belong (i.e. other items that were replaced in a level like shelves and desks etc.). This requires a degree of attention.
Memory: short-term, working, and long-term memory	X	
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive	X	
Thought: control and content of thought, awareness of reality, logical and coherent thought		Items have logical locations. Players will need to be able to think logically when placing items. Incorrectly placed items will be highlighted once the player tries to submit the level for completion. There is a setting that allows items to be

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		placed wherever the player desires, enabling a greater degree of freedom during gameplay.
Sequencing complex movement: regulating speed, response, quality, and time of motor production	X	
Emotional: regulation and range of emotion, appropriateness of emotions	X	
Experience of self and time: appropriateness and range of emotion, body image, self-concept		Players could potentially relate to the setting as levels progress. They represent periods of time in a person's life (i.e. moving into a new little house or moving into a college dorm). Players could use these settings to then relate back to themselves.
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		The player must have full consciousness in order to play the game.
Orientation: orientation to person and self, place, time, and others	X	
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability; openness to experience; self-expression; confidence; motivation; self-control and impulse control; appetite	X	
Energy and drive: motivation, impulse control, appetite		This is a low energy easy going game.
Sensory Functions		
Visual: quality of vision, visual acuity, visual		Players will need to be able to distinguish what the items are while they are unpacking

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
stability, visual field		in order to place them correctly as well as have enough quality of vision to determine which room they are presently in to help determine if an item belongs there.
Hearing; sound detection and discrimination; awareness of location and distance of sounds	X	
Vestibular: position, balance, secure movement against gravity	X	
Proprioceptive: awareness of body position and space	X	
Touch: feeling of being touched, touching various textures		The game requires the use of a controller (or optionally, mouse and keyboard if playing on PC). As well as touch controls if playing on the Nintendo Switch The player must physically interact with these input devices in order to play the game. Players must be able to tell if they holding the controller and or if they are hitting the desired inputs (triggers vs buttons vs joysticks) and if they are interacting with the joysticks in the desired manner (orienting to the desired direction and not pressing down with excessive force as this actuates another input L3 & R3 which can lead to unintended actions if the player did not mean to press those inputs.
Pain: localized and generalized pain	X	
Temperature and pressure: thermal awareness, sense of force applied to skin	X	
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		A player must have at minimum enough joint mobility in the hands and fingers to interact with the input device. This challenges the player's ROM and precision of the hand finger and thumb joints. The game is slow paced and relaxing

FUNCTION (Specific Mental Functions)	N/A	Detailed Description
		allowing players to move at their own pace.
Joint stability: structural integrity of joints	X	
Muscle Functions		
Muscle endurance: sustaining muscle contraction	X	
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		This can be determined by the therapist. Normally, a player would participate in gameplay from a seated position. Requiring them to sustain postural control in that way.
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		This game will challenge fine motor control to a degree in order to place various items effectively. Some spaces are small such as desktop areas and interacting with objects such as opening drawers require a degree of precision when manipulating a mouse or joystick of the input device.
Gait patterns: movements used to walk	X	
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm	X	
Respiratory system: rate, rhythm, depth of respiration	X	
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity	X	
Voice and speech: rhythm and fluency, alternative vocalization functions	X	

Performance Skills Required

SKILL	N/A	Context of Skill Within the Game
Motor Skills		
Aligns		Can be determined by the therapist.

SKILL	N/A	Context of Skill Within the Game
Stabilizes		Can be determined by the therapist.
Positions		The player positions themselves in a way so that they can view the entire screen and positions their arms, hands, and fingers so that they can comfortably interact with the input device for the duration of the gameplay session. In game: objects need to be positioned in such a way to fit other items, such as, when placing items in cabinets or on a bookshelf.
Reaches	X	
Bends	X	
Grips		Normally the player maintains grip on the input device. However, the controller can be placed on a surface and the player could still play the game effectively.
Manipulates		The player must be able to manipulate the input device to effectively play the game
Coordinates		Normally, the player used both hands to interact with the input device
Moves	X	
Lifts	X	
Walks	X	
Transports		In game: Some levels require the player to unpack multiple rooms and items meant for one room could be unpacked from a box in another room. The player will need to transport objects between rooms in these instances in order to correctly place the items.
Calibrates	X	
Flows	X	
Endures		The player must endure postural control and hand and finger movements for the duration of the gameplay session.
Paces	X	
Process Skills		
Paces	X	
Attends		The player will need to attend to the game in order to be aware what room they are in and what objects they presently have in order to play the game effectively.

SKILL	N/A	Context of Skill Within the Game
		Progress can only be made so long as the player is able to attend, because the player must actively place objects.
Heeds		Can be determined by the therapist. The player can complete a room(s) independently or they can follow instructions from a third party.
Chooses		In game: The player has minor freedom to place objects as long as they are in the appropriate place. There is a setting in the game that allows all items to be placed anywhere. Freeing the player even more.
Uses		The player uses the input device as it was intended.
Handles		The player handles the input device appropriately.
Inquires		Can be determined by the therapist. The player could ask for assistance on where an object belongs if allowed.
Initiates		In game: There are multiple boxes that need to be unpacked in each level. The player initiates the unpacking process of each box. The player must actively retrieve each subsequent item from a box they are unpacking.
Continues		In game: The player can continue to unpack the box they started before moving on to the next.
Sequences		Can be determined by the therapist. Players are free to tackle the unpacking process as they see fit. However, the therapist can enforce parameters that facilitate a type of structure. Examples might be placing each item as it is unpacked, finishing one box before moving to the next, or first organizing items by room before placing them.
Terminates	X	
Searches/locates		Boxes can first be unpacked before putting objects in appropriate places. In these cases, the therapist can have the player search for requested objects. Normally, the player will need to locate the appropriate location for items.
Gathers		Can be determined by the therapist.

SKILL	N/A	Context of Skill Within the Game
		The player is free to gather all appropriate items in a room before thinking about where to place them (fully unpack boxes first).
Organizes		If boxes are completely unpacked before putting items away, the therapist can have the player organize items into the rooms that they belong in.
Restores		The premise of the game is to place packed objects in appropriate places. Players will need to determine where an item belongs.
Navigates	X	
Notices/responds		It is possible for players to instinctively place items without external prompting. After all items are placed, incorrect items are then highlighted and the player must find the correct location.
Adjusts	X	The player will need to respond to these mistakes and make changes appropriately to complete levels.
Accommodates		This can be determined by the therapist.
Benefits		This can be determined by the therapist.
Social Interaction Skills The therapist can address social interaction skills using the game but this is client specific and thus can be determined by the therapist. Otherwise, social interaction skills are not required to be successful in game.		
Approaches/starts		
Concludes/ disengages		
Produces speech		
Gesticulates		
Speaks fluently		
Turns toward		
Looks		
Places self		
Touches		
Regulates		
Questions		
Replies		
Discloses		
Expresses emotion		
Disagrees		
Thanks		
Transitions		
Times response		
Times duration		

SKILL	N/A	Context of Skill Within the Game
Takes turns		
Matches language		
Clarifies		
Acknowledges and encourages		
Empathizes		
Heeds		
Accommodates		
Benefits		

Areas of Treatment (Application)
OCD
Simulated House Cleaning
Cognitive impairment
Apraxia

Interest Tags
Cleaning/Organizing

It Takes Two

It Takes Two is a game that requires two players to play, hence the name. It has the most potential to benefit social skills as cooperation and communication between players is an integral part of the gameplay. Throughout the game, both players take actions that either aid the other player or that need to be completed in tandem with one another. For example, players are tasked with challenges like having one player stand on a button that opens a gate and staying in this position while the other player physically walks through the newly opened gate, or flying a plane where one player is the pilot and the other is the gunner. If one player fails to aid the other in these circumstances, then progress cannot be made or both players will die in-game resulting in a loss of progress. Some collaborative problem solving is needed to navigate certain areas or to clear boss battles when there is no clear path forward that one player can act upon alone. There are times when the way to navigate forward or beat a boss may not always be clear.

Fine motor skills, regulating speed, response, quality, and timing of motor production are also areas that can be challenged as players interact with their input devices given the high prevalence of game tasks that require platforming across gaps, dodging enemy attacks, etc. Failure to perform these motor skills in an accurate and timely manner will result in player death or failure and having to restart at the nearest checkpoint.

Note: The game is a linear, "story" experience; meaning it is not a game that is segmented into levels that can be repeated. However, after the game is completed, players are free to choose from chapters they would like to replay. This game is best suited as a longitudinal tool in which the therapist plays with or has two patients play together across multiple sessions.

Modified From: Banks, T., Ebner, C., & Polidan, K. (2017). Occupation-based activity analysis.

[Class handout]. Blackboard. https://class.usa.edu/ultra/courses/_17115_1/cl/outline

Video Game Activity Analysis Template

Title of Video Game: It Takes Two

Objects and Their Properties Required

Which Platform: Nintendo Switch, PC, PlayStation, Xbox

Time to Play: No definitive time

Sequencing and Timing

It Takes Two has no set or repeating sequence. All actions taken are dependent on context and the specific situation at the time of gameplay. There are similarly repeated actions such as when platforming, but this is not always done in the same way.

Body Functions Required

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
Higher-level cognitive judgment, concept formation, metacognition, executive functions, praxis, cognitive flexibility, insight	X	
Attention: sustained attention and concentration; selective, divided, and shifting attention		There is a logical progression to solving each stage. Players must pay attention to the environments and how their character can interact with it in order to come up with the solution. Ultimately, completing a stage most often requires concentration, sustained and selective attention. Players must observe their environment for elements that would help them make progress. (vacuum tubes that launch the player, levers and switches that affect surroundings, and targets that can interact with specific items gained throughout the game. Sustained attention will be specifically required during boss sequences and instances where the characters live are in danger such as when platforming through stages as there are threats that can damage the player and pitfalls the player can fall in.
Memory: short-term, working, and long-term memory	X	
Perception: discrimination of sensations: auditory, tactile, visual, olfactory, gustatory, vestibular, and proprioceptive	X	
Thought: control and content of thought, awareness of reality, logical and coherent thought		Each stage has a logical solution that must be discovered by the player. In order to be successful, the player must be able to think logically. Various parts of the game will challenge thought more. This game is a linear story and not broken up into levels. Once the game is

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		completed, it is possible to revisit specific section of the game.
Sequencing complex movement: regulating speed, response, quality, and time of motor production	X	
Emotional: regulation and range of emotion, appropriateness of emotions	X	
Experience of self and time: appropriateness and range of emotion, body image, self-concept	X	
Global Mental Functions		
Consciousness: awareness and alertness, clarity and continuity of the wakeful state		Complete consciousness is necessary in order to be successful in playing this game.
Orientation: orientation to person and self, place, time, and others		In game: There are moments in some puzzles where the players are separated. In these times, actions each player takes can influence the other. It is during these instances that players must be able to orient themselves to others. An example would be when one player controls switches that affect the environment for the other player. Both players must be able to orient themselves to each other because if they are out of sync, the wrong button could be hit at the wrong time or the other player could be standing in the wrong spot at the wrong time.
Temperament and personality: extroversion, introversion, agreeableness, and conscientiousness; emotional stability; openness to experience; self-expression;		This game is all about working together. As such, it requires agreeableness, extroversion, and willingness to work with others. Actions are taken by one player to benefit the other all throughout the game. There are points where one player can doom the other or leave them behind. It is in these

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
confidence; motivation; self-control and impulse control; appetite		moments when the players' self-control and impulse control are challenged to a degree. An example is when one player flies a plane while the other shoots. The player flying the plane could purposely crash or not align with the enemies so that their partner can shoot them down leading to failure. At the same time, the player shooting could choose not to shoot the enemies dooming them both to fail.
Energy and drive: motivation, impulse control, appetite	X	
Sensory Functions		
Visual: quality of vision, visual acuity, visual stability, visual field		A player must possess adequate levels of vision to distinguish objects on a screen. Players must possess enough visual acuity to determine where they are on screen as well as identify any enemies present and or obstacles to navigate through. As well as distinguish their in-game character from their partner's
Hearing; sound detection and discrimination; awareness of location and distance of sounds	X	
Vestibular: position, balance, secure movement against gravity	X	
Proprioceptive: awareness of body position and space		In game: The player has to be aware of where the character is in space in order to platform through the levels successfully and to dodge attacks from bosses.
Touch: feeling of being touched, touching various textures	X	The game requires the use of a controller (or optionally mouse and keyboard if playing on PC) that the player must physically interact with. Players must be able to tell they are holding the controller and or if they are hitting the desired inputs (triggers vs buttons vs joysticks) and if they are interacting with the joystick in the desired manner (orienting to the desired direction and not pressing down with excessive force as this actuates

FUNCTION (Specific Mental Functions)	**N/A**	**Detailed Description**
		another input L3 & R3 which can lead to unintended actions if the player did not mean to press those inputs.
Pain: localized and generalized pain	X	
Temperature and pressure: thermal awareness, sense of force applied to skin	X	
Neuromusculoskeletal and Movement-Related Functions		
Joint mobility: range of motion		A player must have at minimum enough joint mobility in the hands and fingers to interact with the input device. The game requires rapid button presses as well as timely responses on specific inputs (i.e. jumping and dodging) in order to be successful, thus challenging the player's ROM and precision of the hand, finger and thumb joints.
Joint stability: structural integrity of joints	X	
Muscle Functions		
Muscle endurance: sustaining muscle contraction	X	
Movement Functions		
Involuntary movement reactions: postural, body adjustment, and supporting reactions		Can be determined by the therapist. Normally, a player would participate in gameplay from a seated position. Requiring them to sustain postural control in that way.
Control of voluntary movement: eye-hand and eye-foot coordination, bilateral integration, crossing midline, fine and gross motor control, oculomotor control		During platforming and boss fighting elements, hand eye coordination, fine motor control, and oculomotor control, will be challenged to a degree. The game has elements that the player must visually track (i.e. moving platforms, enemies, and incoming enemy projectiles). This will challenge the player's oculomotor control. The player also needs to make accurate and timely responses to these elements as they occur on screen (dodging enemy attacks, jumping over projectiles,

FUNCTION (Specific Mental Functions)	N/A	Detailed Description
		timing jumps to successfully traverse gaps) thus challenging hand eye coordination and fine motor control to a degree. Normally, the player uses both hands when using the input device.
Gait patterns: movements used to walk	X	
Cardiovascular, Respiratory, Voice and Speech, Digestive, Skin Function		
Cardiovascular system: blood pressure, heart rate and rhythm	X	
Respiratory system: rate, rhythm, depth of respiration	X	
Additional functions of the cardiovascular and respiratory systems: physical endurance, stamina, aerobic capacity	X	
Voice and speech: rhythm and fluency, alternative vocalization functions		This game has elements that require players to coordinate their actions together to be successful during gameplay. This can be accomplished with speech. However, this is not required to be successful.

Performance Skills Required

SKILL	N/A	Context of Skill Within the Game
Motor Skills		
Aligns		Can be determined by the therapist.
Stabilizes		Can be determined by the therapist.
Positions		Can be determined by the therapist. The player must position themselves in such a way in relation to the display so that they are able to view the entire display without the elements on screen being too small for them to see. They must position their body as well as limbs, wrists, hands, and fingers in a way that is comfortable and enables them to best ensure the duration of the play session and sustain postural control.

SKILL	N/A	Context of Skill Within the Game
		In game: players need to position their character effectively to be successful in game (i.e. position on platforms, and dodging enemy attacks).
Reaches	X	
Bends	X	
Grips	X	
Manipulates		Interacting with the input device of choice requires a degree of manipulation.
Coordinates		Normally, the player used both hands to interact with the input device
Moves		In game: The game has elements where each player needs to move certain objects in order to progress through the stage.
Lifts	X	
Walks	X	
Transports	X	
Calibrates		In game: Platforming requires players to calibrate how quickly they run and jump because often these actions must be in sync with actions from the other player.
Flows	X	
Endures		The player must endure postural control and hand and finger movements for the duration of the gameplay session or until they reach a suitable stopping point.
Paces	X	
Process Skills		
Paces		Some platforming elements have a timing element to them. In these cases, the player will need to keep up with the required timing. The same can be said for boss fights. This includes jumping on platforms at the right times as it rotates. There is at least one boss that requires the players to block attacks at the appropriate time.
Attends		A player must attend to the game throughout the length of the gameplay session otherwise there will be an increased rate of failure.
Heeds		Can be determined by the therapist. This is a linear game. It is not split into segments or stages.
Chooses	X	
Uses		The player uses the input device as intended.
Handles		The player handles the input device as intended.

SKILL	N/A	Context of Skill Within the Game
Inquires		This skill is utilized when the two players are working together to figure out how to progress through a stage. The player can ask questions of the therapist when necessary and if allowed.
Initiates		In game: Various actions require the player to initiate them (i.e. pressing a button at the right time allowing the other player to progress).
Continues		In game: Various actions require the player to initiate them (i.e. holding up a vacuum tube allowing the other player to progress).
Sequences		In game: the player has to sequence how to navigate through stages using a series of jumps and dashes as well as special abilities, in some cases using specific items obtained during gameplay.
Terminates		The player terminates the various cooperative platforming elements once the other player progresses through. (i.e. letting go of the vacuum tube one the other player progresses through).
Searches/locates		There are puzzle elements in which players will need to search around in the environment for a solution.
Gathers	X	
Organizes	X	
Restores	X	
Navigates		In game: The player navigates through platforming elements successfully without frequent falls.
Notices/responds		This may be present as players work together to progress through a stage, they can instinctively react to each other's actions.
Adjusts		Players adjust their gameplay to account for previous failures eventually leading to success.
Accommodates		Can be determined by the therapist.
Benefits		Can be determined by the therapist.
Social Interaction *Skills* The therapist can address social interaction skills using the game but this is client specific and thus can be determined by the therapist. The game requires two people to play together.		
Approaches/starts		Players start relaying necessary information to each other.
Concludes/ disengages	X	

SKILL	N/A	Context of Skill Within the Game
Produces speech		Players should produce speech in order to communicate with each other in order to be most successful. However, speech is not specifically required to be successful.
Gesticulates		This can be used to communicate if players are playing in the same space.
Speaks fluently		Players speak fluently to each other so that they can understand.
Turns toward	X	
Looks	X	
Places self	X	
Touches		Can be determined by the therapist (appropriate touching). May be present but not required to be successful.
Regulates		Players are able to remain focused on information relevant to the game.
Questions		Players are able to ask for appropriate clarifying information, when necessary, amongst each other or from the therapist. (i.e. What did you want me to do. How do I do X again, or how do I dodge X attack etc…).
Replies		Players continue relaying necessary information, responding accordingly when necessary. Thus, leading to better coordination and cooperation during gameplay.
Discloses	X	
Expresses emotion		Can be determined by the therapist. Players appropriately express their own emotions and their emotions toward one another such as when one player messes up causing both to fail.
Disagrees		Players may need to appropriately express their differing opinions such as when discussing strategy on how to beat a level (particularly with boss fights).
Thanks		May be present but not required to be successful.
Transitions	X	
Times response		Players respond to each other in a timely manner. Failure to respond in a timely manner can cause either player to make unnecessary mistakes, such as falling off the stage or taking unnecessary hits from bosses.

SKILL	N/A	Context of Skill Within the Game
Times duration		Players relay information to each other in a timely manner. Failure to relay information in a timely manner can cause either player to make unnecessary mistakes. Players should do their best to communicate concisely, particularly during boss fights and the faster paced moments in the game.
Takes turns		In game: Frequently, players have to take turns helping each other navigate areas in various ways. Flipping switches, creating platforms for each other with unique items, and holding up vacuum tubes.
Matches language		May be present but not required to be successful.
Clarifies		Players are able to clarify what they are attempting to communicate to the other player or therapist when necessary or when asked. Such as the gameplay strategy idea they may have or when they recognize a pattern in a given boss battle.
Acknowledges and encourages		Players are able to acknowledge each other's frustrations when present, as it is a challenging game and are able to appropriately encourage each other when necessary.
Empathizes		May be present but not required to be successful. Players are able to recognize the emotions the other is feeling such as when getting frustrated and able to understand why they are feeling that way.
Heeds		Players heed to the others instructions when appropriate and able to communicate effectively and coordinate actions cooperatively in order to be successful in beating levels.
Accommodates		Can be determined by the therapist.
Benefits		Can be determined by the therapist.

Areas of Treatment (Application)
Social skills (turn taking)
Social play
Cooperation
Reaction time
Problem solving

Interest Tags
Platformers