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Promoting the adoption of gaming technology in occupational therapy practice

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Doctoral Project

**PROMOTING THE ADOPTION OF GAMING TECHNOLOGY IN
OCCUPATIONAL THERAPY PRACTICE**

by

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DEDICATION

I would like to dedicate this work to my father, Ken Jones, who taught me the importance of selflessness, compassion, creativity, and seizing opportunities to serve others in all facets of life.

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ABSTRACT

The prevalence of regular video game use among populations of all ages, genders, geographic locations, and life experiences has grown exponentially in recent years (Entertainment Software Association, 2021). Gaming provides many players with an opportunity to engage in an immersive, engaging, and enjoyable activity that has the power to positively impact many facets of quality of life and well-being (Jones, 2021; Britnell & Goldberg, 2002). Despite monumental strides made in the gaming industry to ensure gaming controllers and software settings are accessible for players with disabilities, many players still face barriers to video game access following the onset of injury, illness, or an existing condition.

The relationship between the occupational therapy profession and the prevalence of video game technologies is multifaceted. First, occupational therapists are tasked with adapting tasks or environments to facilitate access and independence in activities that a particular client finds meaningful. Additionally, occupational therapists ground the nature of their work in creating evaluation methods and intervention approaches that leverage a client's established meaningful occupations in producing functional outcomes through therapeutic exercise and activity (AJOT, 2020). Given the large and growing population

of clients who consider gaming a meaningful occupation, this project asserts that occupational therapists have the following responsibilities related to adequately serving the needs of their current and future clients: 1. Acquiring knowledge needed to successfully adapt gaming hardware and gameplay tasks through assistive technologies to facilitate access and independence in gameplay for leisure or social participation purposes 2. Acquiring knowledge needed to successfully embed game-based activities within occupational therapy interventions to ensure treatment sessions remain occupation based, meaningful, and engaging to applicable client populations.

Despite these factors, gaming knowledge and adoption among occupational therapists remains relatively low due to a variety of factors discussed in further detail throughout this paper (Hills et al., 2016; Jones, 2021; Levac et al., 2017; Thomson et al., 2016).

This project assessed the current body of evidence-based literature related to the therapeutic implications of gaming, the nature of current barriers contributing to low technology adoption rates, and established approaches deemed effective in mitigating these barriers in detail. This large body of data and evidence was used to create the Gaming and Occupational therapy Adoption Training Program (G.O.A.T.). This program leverages a multidimensional approach in providing a comprehensive intervention program for occupational therapists that ultimately seeks to increase the adoption of gaming technologies within the occupational therapy profession.

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CHAPTER ONE – Introduction

The primary focus of occupational therapy (OT) services targets the promotion of independence and engagement in meaningful activities. This independence is commonly achieved through therapeutic interventions that help clients acquire new skills or functional abilities, remediate skills and functional abilities lost following injury or illness, or through adaptations to the client's task or environment to remove barriers interfering with daily occupational independence (American Journal of Occupational Therapy, 2020).

While many occupations are commonly shared among the global population such as independently feeding, dressing, bathing, and toileting, many occupations deemed meaningful to one client can largely differ from other clients. One client who played tennis daily prior to an injury may consider returning to tennis matches as a primary goal. In contrast, another client with the same injury, illness, or level of functioning may have no desire to play tennis and instead considers their ability to use video chat on their phone to communicate with family as their primary independence goal. Regardless of an individual client's preferred activities and occupations, practitioners must be prepared to address the preferred goals of all clients encountered. This client-centered and occupation-based approach is a critical factor that sets the occupational therapy profession apart from others in the rehabilitation space.

This project examines the relationship between occupational therapy (OT) practitioners and the role that video game technologies play in the lives of current and future clients. Specifically, this project assesses the prevalence of video game usage

among national and global populations in comparison to the number of occupational therapists actively implementing video game technologies into their therapeutic practices. This chapter provides an overview of the current barriers practitioners face when seeking out video game technologies, primary factors contributing to these barriers, and a high-level summary of proposed program components that seek to mitigate these barriers.

In this chapter, an introduction to the scope of the problem will be provided. The following section details the importance of this problem as it pertains to the growth and efficacy of the occupational therapy profession. Finally, an overview of the key factors contributing to this problem and the planned proposal for addressing this problem are introduced.

Scope of the problem

A current gap in the occupational therapy profession is a general lack of understanding and implementation of common technologies in daily practice. Today, technology plays a critical role in the lives of most clients. Cell phones, computers, and tablets facilitate constant access to communication, productivity, entertainment, and education-related daily occupations (Rideout & Robb, 2019; 2020). Similarly, other forms of modern media like television shows and video games are critical in leisure, relaxation, and social participation occupations for many (Entertainment Software Association, 2021). After sustaining an injury or illness that prevents access to technology, clients are often excluded from multiple aspects of their daily occupational needs and activities including leisure exploration or social participation activities. This can ultimately have a negative effect on social participation, mental health, and overall

quality of life (Jones, 2021; Britnell & Goldberg, 2002).

Occupational therapists' familiarity with video game technologies, including the knowledge and skillsets needed to address gaming hardware and software access despite the presence of a disability, is particularly lacking (Langan et al., 2018; Levac et al., 2017; Tatla et al., 2015; Thomson et al., 2016). Additionally, this lack of familiarity prevents the use of video games as an occupation-based and client-centered modality that can be used to facilitate engagement in therapeutic exercise. Barriers to the adoption of mainstream commercial technologies like gaming could be due to a variety of reasons. Identifying these barriers to adoption was critical in ensuring that occupational therapists can provide occupation-based and client-centered care as daily technology use continues to grow among current and future client populations. Foundationally, this project seeks to answer the question of “*why* occupational therapists are not embracing and using such technologies in their practice and what can be done to bridge this gap?”

Implications of the problem

In 2018, there were 2.2 billion people in the world who identified as “gamers” (Gaimin Staff, 2018). While 40 percent of video game players still come from the 18 to 35 age demographic, 21 percent are 50 years and older (Gough, 2019). Pediatric clients today are growing up with tablets and game controllers in their hands (Rideout & Robb, 2020). This demographic will continue to increase. Additionally, there are likely numerous clients who, while not identifying as gamers themselves, would consider the ability to play games with loved ones during their recovery as both meaningful and engaging.

With gaming so heavily present in modern culture, gaming inherently becomes a meaningful occupation to leverage in practice for many of our clients. In addition to being considered client-centered and occupation-based, there is a relatively large amount of evidence-based research that supports the use of gaming in occupational therapy interventions as a means of increasing various aspects of mental health, social participation, and overall quality of life (Jones, 2019). In 2012, the Nintendo Wii was a common household item. OTs found gaming with the Wii effective in various functional performance outcomes such as standing balance, coordination, arm strength, and falls prevention confidence due to their engaging nature that prolonged activity tolerance (Jorgensen et al., 2012; Laessoe et al., 2015).

The American Occupational Therapy Association's (AOTA) Vision 2025 encourages OT professionals to be "influential leaders" that are "collaborative" when it comes to working with clients and other industries alike. This vision calls practitioners to "maximize health, well-being, and quality of life... through effective solutions that facilitate participation in everyday living" (American Occupational Therapy Association Staff, 2017). In the year 2022, the argument that that technology does not play a significant role in our "everyday living" is a hard **one** to make.

Acknowledging this lack of gaming technology adoption is critical in ensuring that occupational therapy practitioners are prepared to best serve the needs of current and future client populations who consider gaming a meaningful occupation. Additionally, a lack of gaming knowledge and adoption excludes occupational therapy practitioners from leveraging the engaging, enjoyable nature of games as a modality that facilitates

increased engagement in therapeutic exercises. When serving clients that value the intersection of independence and technology use in daily living, the OT profession must not only become familiar with these technologies, but additionally pursue ways to embed that technology within their intervention strategies in order to maintain an occupation-based practice.

Key contributing factors

The primary contributing factors to the lack of gaming adoption among occupational therapists as determined throughout the course of this research project included the following potential barriers:

1. **Lack of management support:** Many therapists may avoid pursuing gaming knowledge or technology due to a perceived lack of support from management and peers regarding otherwise novel and previously unexplored areas that have yet to surface in their practice area, clinic, or hospital.
2. **Lack of time:** Burnout is a phrase commonly used in the healthcare community. Occupational therapists are often pressured to meet productivity requirements in addition to being inundated with documentation and other ancillary demands. Many therapists may feel as though they do not have time in their schedules to learn additional treatment modalities.
3. **Cost barriers:** Given the above factors, it is also possible that funding is not set aside to acquire these resources. Gaming consoles, games, mounting hardware, and switches can be very expensive. If a therapist does not have access to this hardware, they cannot learn to use it.

4. **Lack of training resources and documentation:** OT-specific resources about how to use these technologies are also lacking. Without easily discoverable and user-friendly resources that accommodate a wide range of experience levels when it comes to gaming knowledge, it is very difficult for occupational therapists to learn the basics of gaming console set-up and use, let alone develop specific input placements or set-ups that facilitate access for a wide array of functional skills and mobility levels (Jones, 2021).

Planned proposal to address this problem

The Gaming and Occupational Therapy Adoption (G.O.A.T.) program seeks to increase gaming knowledge and adoption among occupational therapy practitioners through innovative program components that directly address the identified barriers to adoption. By eliminating primary barriers to adoption commonly faced among OTs, the resulting outcome will ideally include increased levels of gaming knowledge, adoption, and usage with clients. This adoption will allow OT practitioners to continue to provide client-centered and occupation-based interventions to the large and growing population of clients who consider gaming a meaningful and enjoyable activity.

The primary components of the G.O.A.T. program that work to address individual barriers to adoption are introduced in Table 1.

Table 1. Program Component Overview

1. The provision of “Gaming Kits”	To address barriers related to cost of equipment, this program will provide program participants with a starter kit of the necessary gaming equipment needed to learn about access-based and therapeutic implications for addressing video games with clients at no cost.
2. The creation of instructional training materials and dedicated support resources	An online, modular training resource that provides program participants with an easily navigable and time conscious overview of technical guidance related to the adoption and use of gaming technologies in occupational therapy practice will be offered to program participants.
3. Program evaluation	Research data will be collected throughout program participation to assess the efficacy of the G.O.A.T. program in facilitating initial and long-term adoption of gaming technologies among participants.
4. Dissemination of program results to key stakeholders	Research findings regarding the efficacy of the program will be shared among relevant key stakeholders including major occupational therapy governing bodies like the American Occupational Therapy Association (AOTA), the World Federation of Occupational Therapists (WFOT), and gaming industry leaders like Xbox to drive further funding opportunities and expand upon the reach of the program.

CHAPTER TWO – Project Theoretical and Evidence Base

This chapter consists of six main sections that present the theoretical and evidence base supporting this doctoral project. The first section provides a detailed explanation of the nature of the problem that this project seeks to address. The second section explores theoretical frameworks commonly applied within the occupational therapy profession to guide intervention approaches. This section specifically focuses on the Value and Meaning of Occupations (ValMO) and Model of Playfulness as they apply to role that game-based interventions can play in the provision of meaningful and occupation-based treatment services. The third section presents data supporting the high levels of technology and gaming use among national and global populations today. The fourth section describes the evidence base surrounding the application of video game-based interventions in promoting functional therapeutic outcomes through meaningful activity for clients with a wide range of conditions and targeted functional goals. Finally, the fifth and sixth sections provide an analysis of the current adoption and usage rates of video game-based interventions, and subsequent barriers contributing to low video game adoption rates, respectively.

Overview of the problem

The explanatory model for this project provides a visual representation of the relationship between technology and gaming as an integral component and source of meaningful occupations in the lives of current and future clients.

Statistics on video game technology use among United States and global populations support the notion of video games as heavily used and meaningful

occupation for a large and growing population of individuals of all ages (Entertainment Software Association, 2021). With increased prevalence of regular gaming technology use among current and future client populations, it's imperative that occupational therapists familiarize themselves with how to use these technologies so they can be leveraged in practice to produce effective functional outcomes through occupation-based modalities (Entertainment Software Association, 2021; American Occupational Therapy Association Representative Assembly Staff, 2019).

However, a multitude of barriers exist that prevent occupational therapists from acquiring this knowledge or adopting gaming into their practice (Hills et al., 2016; Jones, 2021; Levac et al., 2017; Thomson et al., 2016). As a result of these barriers, gaming use among occupational therapists remains low. Additionally, many studies assessed within the current body of evidence-based literature that explored the efficacy of game-based interventions on a variety of client populations and diagnoses featured small population sizes and largely outdated gaming devices.

These factors resulted in a limited body of conclusive research that established statistical significance. Researchers who carried out smaller exploratory studies, however, consistently commented on the promising nature of video game use in producing other aspects of health and well-being that are deserving of further exploration with larger population sizes and newer technologies to establish this statistical significance traditional (Sosa et al., 2019; Jung et al., 2020, Aramaki et al., 2019; Lopes et al., 2018; Belchior et al., 2019).

The Gaming and Occupational Therapy Adoption Training (G.O.A.T.) program works to address these barriers to adoption to ultimately increase the knowledge and use of game-based practice among occupational therapists and drive further research explorations regarding the efficacy of specific gaming technologies in increasing various aspects of functional independence among a pre-determined client population.

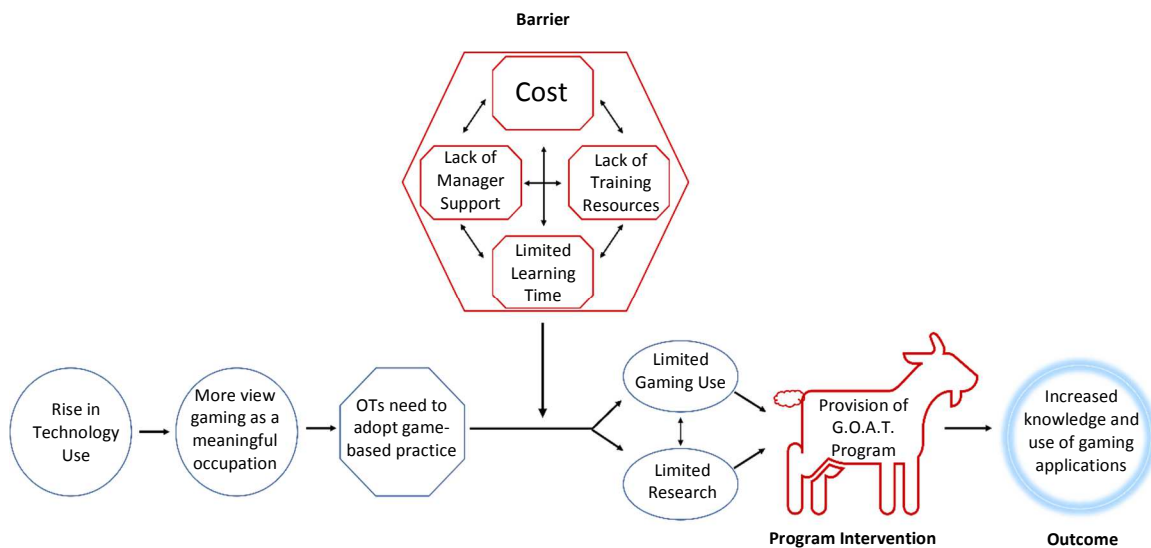


Figure 1. Model of the problem

Video games as a prevalent meaningful occupation

As society grows and changes, the scope of occupations that clients hold meaningful follows a similar path (Rideout & Robb, 2019, 2020; Anderson & Perrin, 2017). Over the past two decades, engagement in video game play has grown exponentially in both the United States and global communities. Today, nearly 227 million Americans play video games. Two thirds of adults over 18, and three quarters of kids under 18 engage in gameplay weekly (Entertainment Software Association, 2021). These statistics alone pose the irrefutable argument that current and future clients who

require occupational therapy services are likely to revere engagement in gameplay as a meaningful occupation they hope to get back to despite injury or illness.

Evidence confirms that technology is becoming a more important and meaningful factor in daily occupational engagement. In the United States, there are significantly high levels of technology device ownership and use among people of all ages (Rideout & Robb, 2019, 2020; Vogels, 2019). The research suggests that technology use including smartphones, computers, and tablets are not only heavily present in the majority of homes today, but many owners spend a significant amount of time per week using their devices for social participation, leisure, schoolwork, and other meaningful occupations (Rideout & Robb, 2019, 2020; Anderson & Perrin, 2017). Further, technology is being shown to be a growing necessity in daily life occupations including in school and learning environments as outlined by the National Education Technology Plan (U.S. Dept. of Education, 2016). The growing necessity of access to technology is further supported by the U.S. General Assembly of Human Rights Council which describes access to the internet as a basic human right (U.N. Human Rights Council, 2016).

Among these popular technology devices, video game device ownership was also significantly prevalent among individuals aged eight to sixty-five (Entertainment Software Association, 2021). In addition to game device ownership, evidence supported relatively high levels of daily engagement in gaming activities and number of hours spent gaming per week. Positive social perceptions regarding the benefits of gaming among U.S. gamers was also consistent among the literature (Entertainment Software Association, 2020). Similarly, evidence showing lower levels of video game device

ownership and engagement in the 55+ age range was consistent among studies conducted, however, given the many barriers to video game use at this age, the number of identified users in this age range was still relatively high as compared to other mainstream technologies like smartphones or computer devices (Ryd et al., 2018; Duggan, M. 2015; Nielsen Foundation, 2019).

In addition to high gaming prevalence, the volume of research exploring various aspects of the Esports industry further confirms gaming as more than just a leisure activity for many, but also a meaningful occupation in both the literal sense for a large number of professional Esports players, as well as through the lens of the Occupational Therapy Practice Framework 4's (OTPF-4) definition of routines, identity, and occupations like social and emotional promotion, play, leisure, and social participation (Wattanapisit, A., 2020; Bányai, 2019; American Journal of Occupational Therapy, 2020).

The Value and Meaning of Occupations (ValMO) and Model of Playfulness

This project examines the gap between the growing presence of emerging technologies, like video games, in the lives of our clients and the barriers that exist surrounding the adoption of these technologies into occupational therapy practice. Following the assessment of many existing frameworks and theories, the two primary theoretical frameworks chosen for this project are the Value and Meaning of Occupations Framework (ValMO) and the Model of Playfulness.

As supported by the Value and Meaning in Occupations (ValMO) framework, in order for “occupations to become therapeutic, they must be perceived as meaningful

(Erlandsson et al., 2010).” Further, ValMO asserts that “how we use our time [and] what we choose to do [...] constitutes the most important decisions we can make as these, taken together, set the basis of our quality of life” (Persson & Erlandsson, 2010). Given the amount of time many clients spend engaging in video game play during daily life, this occupation can be considered a meaningful and valued occupation for a large number of current and future clients.

The ValMO framework links occupational value and life meaning to three levels of occupations: macro, meso, and micro levels (Eakman & Eklund., 2010). The macro level consists of occupations that span the life course and “may be considered a part of the individual’s life story intimately linked with his or her identity” while the meso and micro-level “form a basis for routine or daily patterned action, and describe “single, discrete actions that compose an occupation” respectively (Eakman & Eklund., 2010).

Often, people with physical disabilities who are otherwise unable to fully participate in athletic activities or in-person social participation create game avatars that either resemble themselves or resemble a version of themselves they wish to be seen as. This allows them to live vicariously through the game as what they feel is their true self. This avatar often represents the life story of the gamer and gives them their own method of representing this life story (making friends online, for some - making an income through game streaming, achieving goals within the game, etc.) through virtual means when it is otherwise not possible to do so. Single discrete actions in gaming that provide meaning and value include aspects of play like social participation with others in the game, beating a game level or opponent, resulting in a sense of accomplishment and/or

confidence, or any other small actions that bring a sense of enjoyment, or occupy time meaningfully.

The Model of Playfulness presents a lens in which therapists can more clearly delineate the inherent value of gaming-related activities for all clients, even those who do not currently include playing video games in their daily occupations. This model asserts that “playfulness can be determined within any transaction by evaluating for the presence of three elements: intrinsic motivation, internal control, and the freedom to suspend reality (Reid, 2004).” These three characteristics are organically present in video gameplay.

First, the nature of video games provides inherent motivation for the player through multifaceted reward systems. When a player beats a level, unlocks a new quest, or defeats an enemy, these actions are often associated with rewards in the form of in-game money to purchase upgrades, flashy yet validating visuals of receiving a prize, and more; motivating players to continue to engage in actions that initiate further reward sequences. Secondly, games can provide players with an ability to feel in control of their actions and the subsequent outcomes; something players with disabilities may not ordinarily feel in many facets of their physical world. For example, a player with full-body paralysis who uses a mouth-based game controller can play a virtual game of basketball in which they can make decisions when to pass, shoot, or steal the ball. When juxtaposed to their physical world in which they cannot perform physical actions like feeding themselves, dressing themselves, or initiating any kind of physical action with their arms or legs, the feeling of control for one’s environment and decisions in the game

world are likely heightened. Finally, video games provide an immersive world in which players can easily suspend their own physical reality while engaged in gameplay. Players have the ability to design character avatars that may be in stark contrast to their physical body shape or abilities and temporarily live in a world where many of the physical, emotional, and cognitive barriers they face in daily life no longer exist. Engagement in gameplay can essentially “create opportunities for playful behavior while engaging in a variety of [virtual] activities that are typically not done well or safely in real life, with less effort” for those with disabilities (Reid, 2004).” In effect, those who spend time playing video games, therefore making them a meaningful occupation, likely do so given the game’s ability to elicit feelings of playful behavior like intrinsic motivation, control, and an escape from current reality. Those who have not yet been introduced to gaming and are lacking a vehicle to explore these areas due to disability, may also benefit from the introduction of video games, and subsequently adopt their usage as a meaningful occupation.

Both the ValMO model and the Model of Playfulness emphasize that there is a prominent connection between self-rewarding occupations, and an overall sense of meaning and subjective health (Erlandsson et al., 2010). Thus, when choosing treatment modalities through the lens of these models, activities that are considered intrinsically motivating and self-rewarding can not only help toward therapeutic goals, but also contribute to the client’s sense of overall health and well-being. In addition to this, “several studies have shown that adding purpose and meaning to exercises make patients perform those exercises more frequently, [therefore] exercising longer and reach[ing] a

wider range of motion than those who did a rote exercise” (Bigelius et al., 2009).

The argument that this doctoral project will examine through the lens of the ValMO model, and the Model of Playfulness includes the notion that, when a client chooses to spend their time engaging in video game play daily, it is an occupation that is inherently meaningful in their life and can be considered a contributing factor to overall quality of life. Further, video games can act as vehicles for helping clients with disabilities engage in activities that are intrinsically motivating, provide a sense of control, and suspend reality — three components that are often largely considered when choosing preferred occupations. As a result, including video game-based interventions in occupational therapy practice will ensure that interventions are meaningful, valued, therapeutic, and ultimately impact overall quality of life in a positive manner while simultaneously facilitating engagement in therapeutic exercise and activity during occupational therapy treatment sessions.

Literature review of video game-based intervention efficacy

In addition to the data on video game prevalence and theoretical basis that support the use of gaming in occupational therapy interventions as a vehicle for providing inherently meaningful interventions, research on the clinical efficacy of video game use in promoting targeting functional outcomes was also thoroughly examined.

Evidence supporting superior client outcomes when using game-based therapy versus traditional therapy outcomes varied. The literature reviews revealed a large volume of studies that explored the use of commercial video games in rehabilitation across a wide range of ages and disabilities. Among the literature reviewed that met

inclusion criteria for the scope of this project, the main client outcomes evaluated within the contexts of game-based intervention efficacy were standardized test scores for balance, upper extremity strength and range of motion, and functional assessment measures (Yacoby et al., 2019; Aramaki et al., 2019).

Other areas of interest that were evaluated included the constructs of enjoyment, motivation, and follow-through of the use of game-based exercise programs as compared to traditional exercise programs. Most of these studies found that experimental groups completing game-based interventions did not have significantly higher scores for functional standardized tests than those in the control group, however, those in game-based therapy experimental groups reported consistently higher levels of enjoyment, motivation, and compliance with their gaming interventions than their counterparts in the control groups (Aramaki, et al., 2019; Jung et al., 2020; Carras et al., 2018). Additionally, objective measures including activity tolerance, treatment session attendance, and pain tolerance were consistently higher among intervention groups receiving video game-based treatments as compared to control groups receiving traditional interventions (Iruthayarajah et al., 2017; Johansen et al., 2020; Yacoby et al., 2019).

These implications suggest that the motivating and engaging nature of game-based interventions, while not yet showing conclusive evidence as being significantly more effective than traditional interventions, have the potential to continue to produce outcomes over a prolonged period of time while traditional exercises are abandoned due to lack of interest or motivation. It should also be noted that most studies reviewed suggested that game-based interventions should be explored in more detail, as there is

likely a potential for more conclusive results supporting game-based interventions as more efficacious than traditional (Sosa et al., 2019; Jung et al., 2020, Aramaki et al., 2019; Lopes et al., 2018). The wide range of disabilities, ages, use of “gaming devices” and more across these studies also limits the ability to derive statistical significance due to small sample sizes of specific gaming devices for specific types of intervention outcomes.

Many studies listed limitations regarding the short amount of time in which interventions were held (four to five weeks) as a contributing factor in more conclusive results. Similarly, the majority of literature found included small populations and pilot studies, or meta-analyses of a group of randomized control groups and pilot studies with small population sizes. All studies reviewed asserted that these limitations implicate a need to further research this area with larger population sizes and protocols to ensure consistency among the participant pools and intervention methods to produce more generally conclusive results (Sosa et al., 2019; Jung et al., 2020, Aramaki et al., 2019; Lopes et al., 2018).

Gaming adoption and usage among occupational therapists

Current research regarding the prevalence of gaming technology use among occupational therapists cites very low representation of gaming use within the past ten years (Langan et al., 2018; Levac et al., 2017; Tatla et al., 2015; Thomson et al., 2016). Additionally, this research generally supports the existence of common barriers perceived by the OT population as largely influencing their abilities and desires to adopt gaming use into their practice. The primary barriers to adoption and use cited within the

literature included the following factors: costs of commercial gaming products, a lack of time (regarding learning the equipment as well as daily use), lack of confidence in using the technology, lack of management support, and a lack of accessibility of current systems in using these technologies regularly (Hills et al., 2016; Jones, 2021; Levac et al., 2017; Thomson et al., 2016).

Additionally, contextual evidence was gathered through an assessment of prominent occupational therapy resource hubs including conference proceedings, popular continuing education platforms, and major healthcare provider websites. These resources also supported the likeliness of limited gaming awareness and use among the occupational therapy community. The number of research studies and national conference speaker submissions related to any use of technology or gaming in therapy as compared to other categories was significantly low (American Occupational Therapy Association 2019; American Occupational Therapy Association, 2021; American Occupational Therapy Association, 2022).

Another piece of contextual evidence that potentially supports a limited use of gaming by occupational therapists was the large quantity of research articles that included the use of outdated gaming consoles in relatively newer studies (Sosa et al., 2019; Jung et al., 2020, Aramaki et al., 2019; Lopes et al., 2018). The most prevalent “gaming intervention” or “VR technology” used in studies that appeared in the literature search was the Nintendo Wii released in 2006 and the Xbox Kinect in 2010. Both of these products have been discontinued by their manufacturers since 2013 and 2016 respectively (Webster, 2013; Wilson 2017). Within the last 15 years, there have been many

improvements in gaming technologies that allow for significantly more flexibility in patient use to more easily facilitate desired outcomes. The Nintendo Switch as well as the Xbox Adaptive Controller are two products that have been released within the past five years (Huff, 2020; Spencer, 2018). Neither of these newer gaming resources appeared in any of the literature searches - suggesting that OTs may be uninvolved in the gaming technology space, thus not currently using these technologies with their patients. It can similarly be argued that if more occupational therapists were aware of new gaming technologies and the meaningful roles they play in their current and future client's lives, there would be more research and evidence to support the efficacy of gaming as a therapeutic tool.

Evidence identifying primary barriers to gaming adoption

Little research has been done regarding the barriers to adoption of gaming technologies among healthcare providers. The current body of research, however, established common themes related to the pain points experienced by therapists during game-based intervention use. This included difficulty understanding how to perform basic set-up tasks, use various aspects of the gaming technology, choose appropriate games, configure game options to meet the needs of the player, and troubleshoot technical issues when they arise. Other common problem areas contributing to lessened gaming use among therapists included a lack of knowledge and training resources available, lack of time needed properly train themselves on equipment use, and lack of time needed to set up equipment and make thorough clinical observations of the patient all within the timespan of a single intervention session (Annema et al., 2010; Valdes et al,

2018).

Literature review searches regarding barriers to acceptance of new technologies in practice by occupational therapists also provided key insights supporting the implications listed above. While there was not a significant amount of relevant literature, outcomes were relatively consistent among those that were reviewed. The highest rated barrier “themes” among the evidence were: lack of time, lack of training/education, access to the technology, therapist self-efficacy, perceived ease of use, and level of support at the management level for funding of devices, training time, and dedicated space (Liu, 2015; Bulmaro et al., 2018; Levac et al., 2017, Glegg & Levac, 2018; Seifert, et al., 2017).

While many of the perspectives previously described were gathered in the context of small population samples who were basing these perspectives on their use of older, discontinued gaming systems, many of these primary barriers were found to be consistent with a research survey conducted for this doctoral project among 97 occupational therapists this past year in 2021. Additional details about this survey-based study can be found in Appendix D. The population in this study demonstrated an equal representation of gaming console device use; the use of outdated systems like the Nintendo Wii was used by the same number of therapists using modern gaming technologies like the Xbox One and Xbox Adaptive Controller released in 2018. Primary barriers to adoption among the therapists in this study also included perceived high costs of necessary gaming equipment, a perceived lack of support from management in using gaming during interventions, and a lack of time and resources to learn the new technology as illustrated in Figure 2 (Jones, 2021; Thomson et al., 2016).

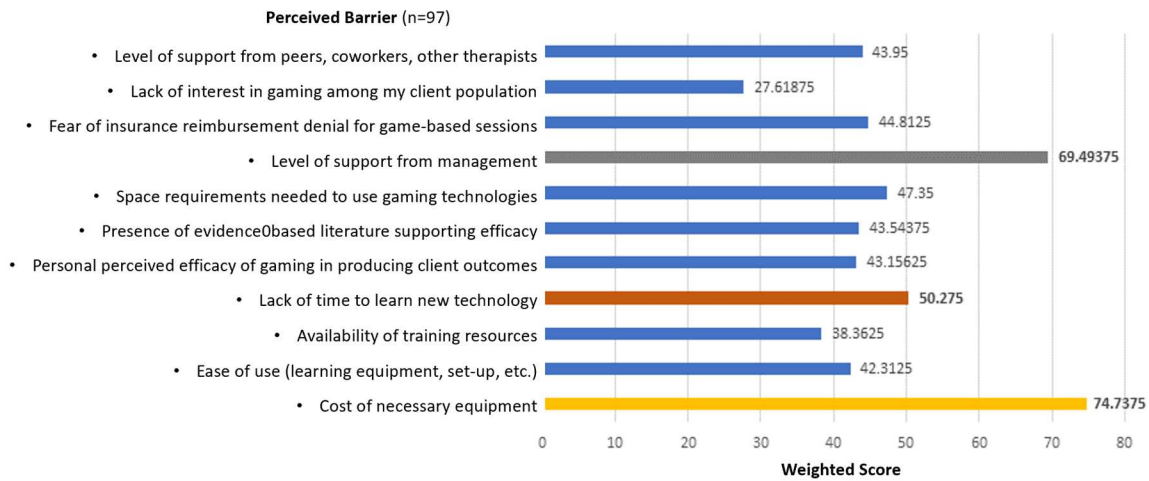


Figure 2. Survey Results: Perceived Barriers to Gaming Adoption

This survey asked participants to rank the perceived impact they felt each listed barrier had on their ability to adopt gaming technology into their practice on a scale from 1 (no impact) to 5 (significant impact). While there were many similar barriers presented to participants that likely contribute to the overall problem, the top three barriers identified by the weighted analysis in Figure 2 aligned with many of the listed barriers to general technology adoption among OTs found in the literature. Therefore, these barriers were identified as the focal points for this program intervention.

Conclusion

The previously described literature and theoretical analyses support an overarching need to establish a program that eliminates barriers to gaming technology adoption. Eliminating these barriers and consequently increasing the adoption of gaming knowledge and use will play a critical role in the growth and development of the occupational therapy profession in addressing the changing needs and interests of our clients. In the following chapter of this paper, an overview of previous approaches and

methods that seek to address this problem will be discussed. The outcomes of these previous approaches are used to structure the foundation of the G.O.A.T. program.

CHAPTER THREE – Overview of Current Approaches and Methods

Despite the evidence supporting gaming as a meaningful occupation with viable potential to improve functional outcomes for clients through increased engagement, activity tolerance, and follow-through than traditional intervention modalities like static exercise, arm bikes, cones, and other tools; the primary shortcoming in this space is a lack of occupational therapist familiarity and usage of commercial game-based technologies with their client populations (Langan et al., 2018; Levac et al., 2017; Tatla et al., 2015; Thomson et al., 2016).

This chapter will discuss previous programs, initiatives, and resources that have attempted to expand OT knowledge and understanding of gaming technologies. Additionally, this chapter describes existing evidence and theoretical models that were used to inform the structure, content, and delivery model for the G.O.A.T. program.

Summary of previous attempts to address this problem

The number of formal research studies that explore the existence or efficacy of programs catered toward increasing the use of game-based interventions among occupational therapy practitioners is limited (Langan et al., 2018; Levac et al., 2017; Tatla et al., 2015; Thomson et al., 2016). Given this, research efforts for this project were shifted toward identifying the presence of publicly available online resources providing similar guidance. The inclusion criteria for these searches included any resource or training modality intended to promote the use of gaming among therapists, provide therapist-specific knowledge facilitating the use of these technologies in the context of client care, guidance on how to acquire gaming devices through public funding and grant

programs or through the authoring of budget proposals, and any other type of resource that details recent gaming technology advancements that may contribute to the adoption of gaming in client care. This criterion was established based on the primary barriers to adoption identified in the research which included cost, lack of time and resources needed to learn these technologies, and lack of management support among therapists interested in using gaming.

Assessment of Existing Programs Addressing Cost Barriers

In terms of cost barriers that prevent therapists from acquiring the necessary hardware and software products needed to implement game-based intervention, online research yielded upwards of 20+ funding and donation programs created to bring gaming into hospitals and rehabilitation settings. These programs, including charity and non-profit organizations, however, are focused primarily on donating gaming equipment to patients themselves, large hospital networks, well-known children's hospitals, and other prominent healthcare settings for leisure and enjoyment purposes of patients (AbleGamers, n.d.; Child's Play, n.d.; Gamer's Outreach, n.d.).

The top 50 hits from an online Google search with the following search phrases were reviewed "gaming nonprofit, adaptive gaming funding, accessible gaming funding, gaming donations + therapy, gaming equipment donation for therapists, gaming equipment donation for occupational therapy, accessible gaming charity, therapeutic gaming." The results did not provide any viable opportunities or programs that supported therapists of any kind to request or apply for donations or funding assistance for gaming equipment to be used with clients. These results also did not offer any information or

training on how therapists can learn how to use gaming in a therapy setting.

Additionally, results of the “Gaming Use among OTs” survey carried out as part of this doctoral project illuminated the following breakdown of funding sources among survey respondents:

- 33% of participants had their equipment covered by their clinic’s budget
- 24% of participants personally bought or donated the equipment
- 20% of therapists acquired their equipment from “another organization” (either non-profit or for-profit)
- 15% of participants acquired their equipment through grant money
- 8% of participants cited “other” methods (Jones, 2021)

It should be noted that the small sample size of the therapists who responded to this survey coupled with the likely presence of population bias among survey respondents given the over-representation of respondents who were already familiar with gaming use may have resulted in skewed survey results for this question. It is possible that therapists already familiar with gaming may have had more visibility or insight regarding available funding programs and approaching discussions with clinic managers about the importance of funding gaming equipment than typical therapists who are little to no gaming knowledge and experience.

Assessment of Existing Programs Addressing Learning Resources

An assessment of available online resources intended to help therapist’s set-up, adapt, or use commercial gaming technologies as an intervention modality were also lacking. In a search of four major U.S. occupational therapy online continuing education credit sites

a total of two continuing education courses related to gaming were offered. One of these two courses only addressed gaming and leisure, as opposed to therapeutic use of gaming (American Occupational Therapy Association, n.d.; ContinuED, n.d.; Medbridge, n.d., Summit Education, n.d.).

A search of general online resources to aid occupational therapists in using gaming resulted in a similar lack of results. Of the resources that could be located, these “how-to” guides largely covered the same outdated gaming systems identified in the evidence-based research studies such as the Nintendo Wii, Xbox Kinect, and Omni VR system. Resources that specifically addressed the use of modern gaming technologies like the Xbox Adaptive Controller in therapeutic contexts could not be located. Additional searches yielded a handful of resources created by other occupational therapists; however, these resources were very basic in nature and did not address many of the logistical questions therapists new to gaming would likely have regarding initial gaming adoption and use (Craig, n.d.; Gleeson, 2017; Davis, n.d.; Special Effect, n.d., Rodriguez-Santos, 2012; Microsoft, n.d.).

Further, the vast majority of these resources proved difficult to locate through basic online searchers. Many were commonly embedded within the sub-pages of websites and required very specific search teams to produce and exist in a fragmented manner across different sites and platforms (Craig, n.d.; Davis, n.d.; Gleeson, 2017; Special Effect, n.d., Rodriguez-Santos, 2012). With the number of resources on this topic already being fairly limited in scope and abundance, the need to carry out complex, multi-step searches in order to locate these resources likely contributes to further negative

perceptions regarding barriers related to perceived lack of time and lack of available resources that therapists can leverage.

Evidence and theoretical basis guiding program creation

The number of existing resources or programs that address barriers to OT gaming knowledge and adoption are limited. Therefore, components of the G.O.A.T. program were guided by existing evidence-based literature related to technology adoption models, adult learning theories, and consultations with subject matter experts regarding this topic. These resources are described in greater detail in subsequent sections of this chapter. At a high level, these sources, in addition to the primary barriers to adoption identified in earlier segments of this project were used to inform the selection of components that this program will include, and the direction and scope in which they will be created.

Guiding Technology Adoption Models

Evidence within the current body of literature that explored the relationship between various external factors and technology adoption rates among healthcare professionals was examined. Findings from this literature were used to guide the content scope and delivery method of program components. The literature pointed to a few common variables found to be statistically significant factors in predicting the likelihood of healthcare professionals adopting new technologies into their practice (Levac et al., 2017; Scherer et al., 2019; Walker, 2014).

1. The technology's perceived usefulness in helping the healthcare professional carry out job functions in an efficient and effective manner.

2. The healthcare professional's perceived self-efficacy, or belief that they will be successful in carrying out tasks related to technology use.
3. The healthcare professional's perceived ease of use in adoption the technology.

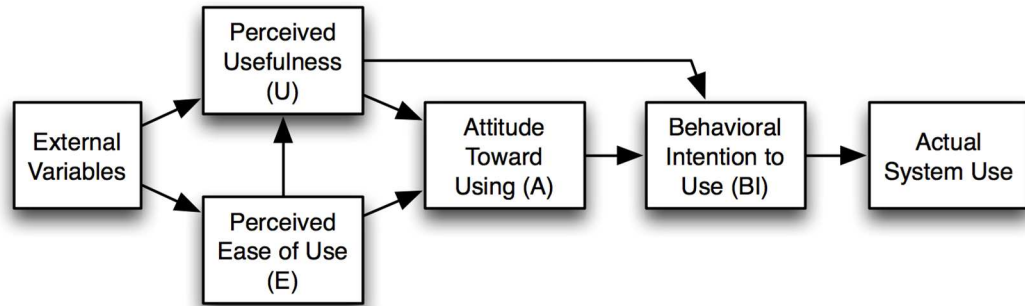


Figure 3. Technology Acceptance Model (TAM) Visual

These three constructs; perceived usefulness, perceived ease of use, and perceived self-efficacy, are heavily present in evidence-based research on the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Scherer, 2019; Liu et. Al., 2015). These models and components were used to determine key program and learning objectives that play a critical role in overall adoption rates among program participants. These objectives and subsequent applications to participant-provided materials throughout the G.O.A.T. program is detailed in Chapter 4, Table 2.

Guiding Adult Learning Theories

In addition to the use of technology acceptance models in informing the content scope and structural provision of program materials, multiple adult learning theories were examined to inform the nature in which specific concepts are delivered. The application of adult learning theories in this context is intended to enhance knowledge translation and

retention among healthcare professionals. The primary adult learning theory used to inform learning material delivery for this program was the Cognitive Flexibility Theory.

The Cognitive Flexibility Theory asserts principles like the fact that learning materials should be presented in a way that facilitates the learner's ability to structure information learned in adaptive ways to mitigate changing situational demands. Additionally, the learning materials should be presented through multiple channels and perspectives, including case studies that capture different implication contexts (Jonassen et al., 1992; Spiro et al. 1998). For example, learners should be presented with foundational knowledge on the various types of adaptive hardware products and software features available to create adaptive set-ups for their clients. However, the learners must ultimately be able to adapt their foundational knowledge and apply this knowledge toward creating gaming set-ups and intervention approaches that meet the needs of a wide array of client factors, goals, and levels of mobility. The following components of the Cognitive Flexibility Theory specifically are used to inform program content delivery to facilitate successful knowledge translation and retention among program participants.

- **Multiple Channels of Learning:** Learning materials regarding adaptive gaming hardware and software options, physical gaming set-ups, and the creation of adapted gamer profiles should be presented via multiple channels. This includes written instruction, video demonstrating use, interactive case studies, and when possible, hands-on opportunities to physically explore adaptive gaming hardware.
- **Detailed Instruction:** Information presented should be incredibly detailed to support context-dependent transfer of knowledge. Information should not be over-

simplified. Instead, learning materials should include the complex contexts in which gaming hardware and software features are appropriate to use based on their functionality as compared to the functional abilities of the client at hand.

- **Use of Case Studies:** Instruction should largely include individual case studies to reinforce learned skills and facilitate complex adaptive thinking that accommodates a wide range of client needs, goals, and applications.
- **Interconnected Resources:** Learning resources provided should come from an overall larger and interconnected network of information sourced by the gaming and disability community (Jonassen et al., 1992; Spiro et al. 1998).

Conclusion

Given the lack of existing programs that seek to address this problem, many aspects of the G.O.A.T. program were informed by established technology acceptance model principles and adult learning theories. Core components of the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) used to guide program structure included the importance of perceived ease of use, perceived usefulness, and perceived self-efficacy in being predictive factors of technology adoption among healthcare professionals (Scherer, 2019; Liu et. Al., 2015). Additionally, primary components of the Cognitive Flexibility Theory were used to inform the ways in which program learning materials will be presented to increase the likelihood of knowledge transfer and retention. A detailed explanation of actual program components as informed by these resources is presented in chapter four.

CHAPTER FOUR – Description of the Proposed Program

Program Introduction

The current body of evidence-based literature supports gaming as both a highly prevalent meaningful occupation as well as a promising therapeutic intervention modality. The proposed program takes a proactive educational approach aimed at increasing the knowledge and adoption of video game-based interventions among occupational therapists. The ultimate goal of increased video game knowledge and adoption among occupational therapists is to ensure that current and future client populations who consider gaming to be a meaningful occupation will continue to receive client-centered and occupation-based care in an age of rapid technological advancements. If occupational therapists are not prepared to address the gaming access needs of their clients or leverage game-based interventions to produce effective, occupation-based outcomes, core responsibilities of the occupational therapy profession cannot be upheld.

The Gaming and Occupational Therapy Adoption Training (G.O.A.T.) Program consists of four primary components: 1. The provision of gaming equipment at low to no cost 2. Educational learning modules 3. Ongoing dedicated support resources and 4. A program structure that supports flexible participation hours and access to program materials. Each of these four components work to specifically address one of the four major barriers to adoption identified throughout this project: cost, lack of time, lack of management support, and lack of available training resources and materials. These program components and their associated barrier to adoption are presented in Figure 4.

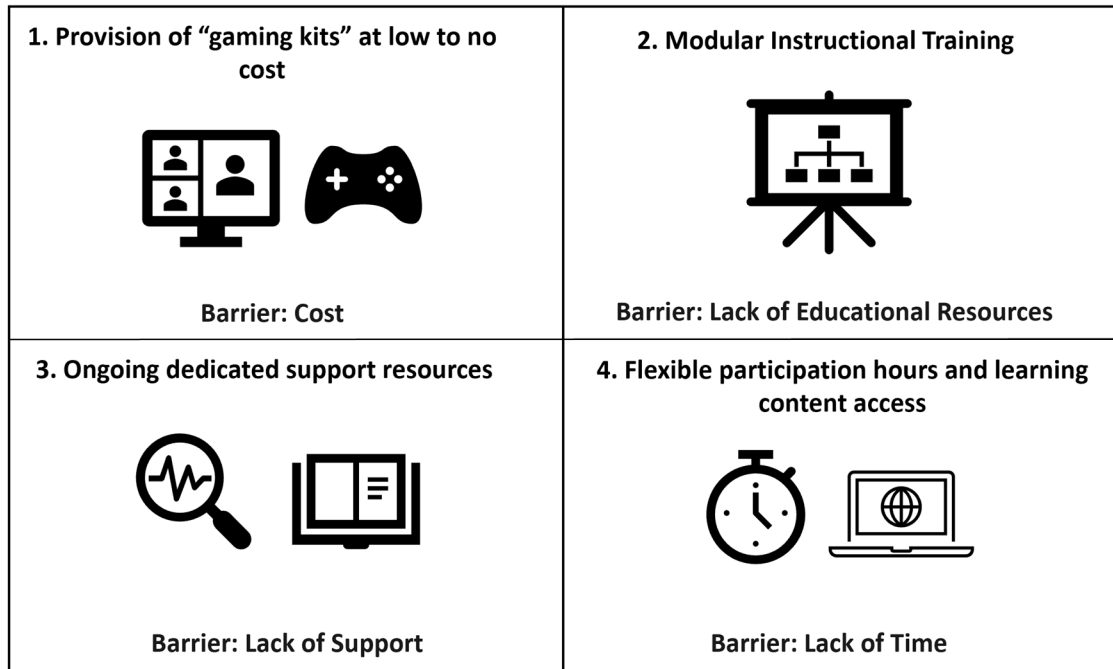


Figure 4. G.O.A.T. Program Component Overview

These components and the way they will be created and delivered to program participants were informed by the evidence-based research, technology acceptance models, and adult learning theories previously described in this paper. The following section of this chapter describes the relationship between program components and the existing evidence base in further detail. Subsequent sections in this chapter expand upon individual program components in further detail, identify key stakeholders, define program objectives, and list participant inclusion and exclusion criteria.

Relationship to Existing Evidence-Base

Creation of the G.O.A.T. program and its components are guided by a combination of evidence-based literature that established the four primary barriers to adoption discussed in this paper, predictive factors associated with technology acceptance and adoption as identified in the TAM and UTAUT models, and components of the

Cognitive Flexibility Theory that have been found to promote effective knowledge translation and retention among adult learners. A visual model of the intersection between these three sources and their impact on program components is provided in figure 5.

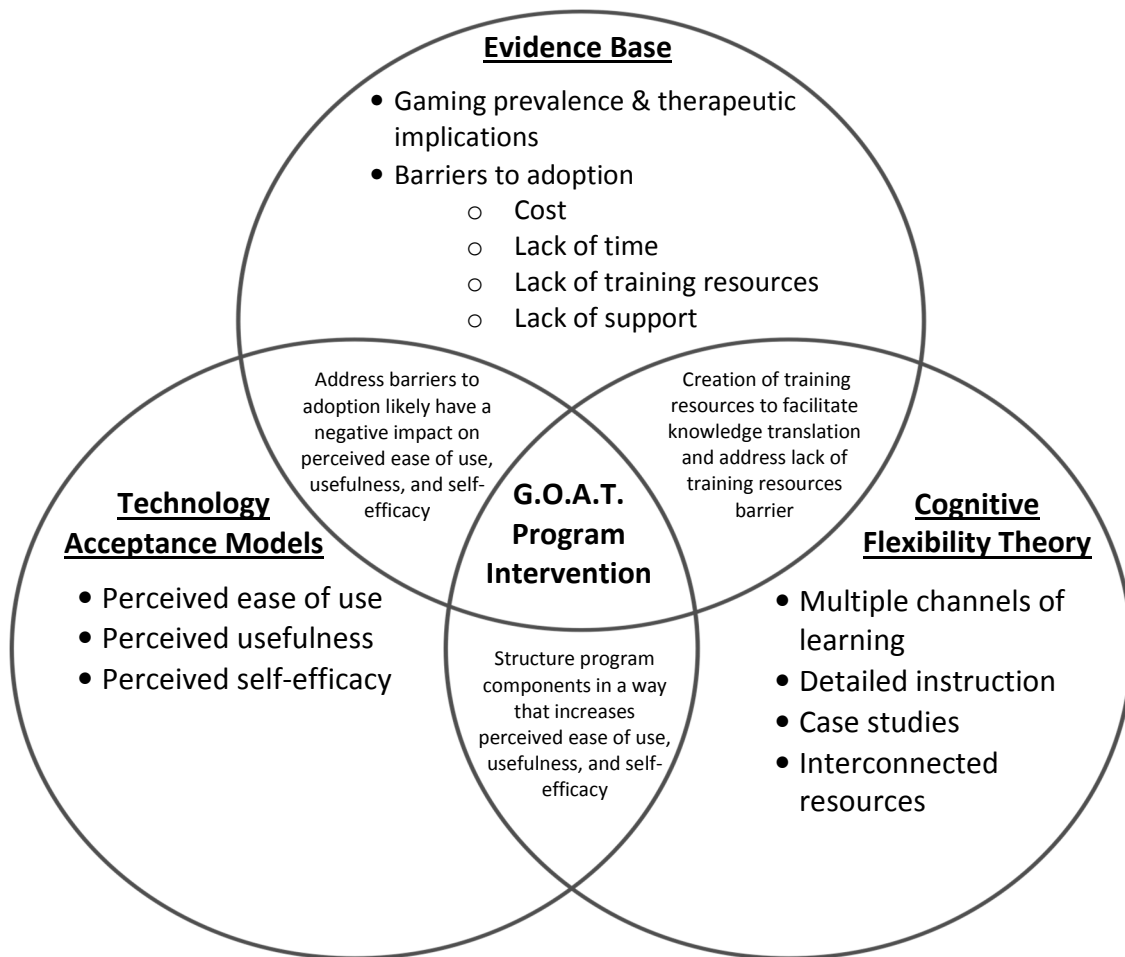


Figure 5. Relationship between evidence base and program components

Additionally, Table 2 provides a more detailed overview of the intersection between G.O.A.T. components, barriers to adoption, technology acceptance model components like perceived ease of use, usefulness, and self-efficacy, principles of the cognitive flexibility theory, and anticipated learning outcomes.

Table 2. Intersection of Evidence, Program Component, and Anticipated Outcome

G.O.A.T. Program Component and Associated Barrier	Application to Technology Acceptance Model Components	Application to Cognitive Flexibility Theory Component	Anticipated Outcome	Structural Application Approach
Modular Instructional Training Barrier: Lack of training and educational resources	Perceived usefulness	<ul style="list-style-type: none"> • Detailed Instruction 	Game-based therapy interventions are related to increased activity tolerance, client participation, client enjoyment and home exercise compliance as compared to traditional interventions	Provision of a learning module that provides an overview of the evidence-based literature supporting effective clinical outcomes related to game-based therapy
Modular Instructional Training Barrier: Lack of training and educational resources	Perceived usefulness	<ul style="list-style-type: none"> • Detailed Instruction • Multiple Channels of Learning • Use of Case Studies • Interconnected Resources 	Knowledge of gaming technologies enables the provision of occupation-based and meaningful interventions for a large population of current and future clients	Provision of learning modules that address each facet of gaming technology hardware and software applications in the context of specific client conditions or targeted outcomes
Modular Instructional Training Barrier: Lack of training and educational resources	Perceived self-efficacy	<ul style="list-style-type: none"> • Detailed Instruction • Multiple Channels of Learning • Use of Case Studies • Interconnected Resources 	Knowledge acquisition and application can be facilitated through training materials that accommodate a wide range of learner needs and facilitate an ability to adapt learned concepts to continuously changing contexts and scenarios	Provision of learning module materials that use multiple delivery mediums including text-based instruction, step-by-step videos, pictures or diagrams, and interactive case studies to accommodate a variety of learner needs
Ongoing dedicated support resources Barrier: lack of support	Perceived self-efficacy	<ul style="list-style-type: none"> • Interconnected Resources 	The G.O.A.T. program prioritizes implementation approaches that foster support and readily available assistance for participants	Program Participants have access to “customer support” platforms and can communicate with other therapists in the program who are also learning about gaming technology

				use to share ideas and troubleshoot
Flexible participation hours and learning content access Barrier: Lack of time	Perceived self-efficacy	Detailed Instruction • Multiple Channels of Learning	Despite busy schedules and productivity demands, new skills and technologies that make me a more effective therapist can still be learned	Learning materials can be accessed by participants at any time throughout the duration of the program. Referring to learning materials during hands-on gaming technology use is highly encouraged.
Provision of “gaming kits” at low to no cost Barrier: Cost	Perceived ease of use	N/A	The removal of cost barriers in acquiring gaming equipment facilitates my ability to begin using these technologies	Provision of low to no cost gaming kits containing all necessary equipment needed to use gaming in OT practice.
Flexible participation hours and learning content access Barrier: Lack of time	Perceived ease of use	N/A	Learning material is presented in a way that accommodates flexible learning hours and the ability to navigate learning topics through a graded approach	Each training module is less than one hour and contains a detailed index of sub-topics to support easy navigation of topics and flexibility in the amount of time one needs to dedicate to each learning session.
Modular Instructional Training Barrier: Lack of Management Support	Perceived ease of use	• Detailed Instruction	Despite perceptions that management does not support the exploration and use of gaming technologies, the participant is confident they have the foundational knowledge and understanding of supporting evidence to engage in conversations with their leadership.	A dedicated training module that addresses ways to engage in conversations with management and peers regarding your desire to explore gaming technologies in therapeutic settings

Program Components

Provision of Gaming Kits

The “gaming kit” component of the program addresses the barrier of cost by providing program participants with a donated assortment of necessary gaming equipment. Each gaming kit includes an Xbox Console, various assistive technologies like switch buttons and accessible joysticks, an Xbox Adaptive Controller which acts as a switch interface between gaming assistive technologies and the console, mounting equipment, and a one-year subscription to Xbox GamePass. A detailed overview of gaming kit items can be found in Appendix A. These specific items have been chosen based on this author’s personal and professional experience in creating adaptive and therapeutic gaming set-ups for individuals with disabilities. These “gaming kits” will provide participants with a starting set of diverse supplies that, when combined, will meet basic to intermediate gaming set-up needs.

Provision of Training Modules

The training module component of the program will be hosted on an online web portal that participants can access at any time throughout the duration of the program. A detailed index of all topics within the learn modules will be provided. This allows easy navigation of topics and supports the learner’s ability to “introduce” themselves to a topic during a pocket of free time, then easily find and review the guidance in that module once again when they are ready to begin practicing with the gaming kit equipment hands-on.

The content in the learning modules will be heavily guided by the principles of the Cognitive Flexibility Theory: 1. Multiple channels of learning 2. Detailed Instruction

3. Use of Case Studies and 4. Interconnected Resources (Jonassen et al., 1992; Spiro et al. 1998). The content within each module will be provided via multiple mediums including written instruction for reading/writing learners, charts and diagrams for visual learners, instructional videos for auditory learners, and the opportunity to practice learned concepts hands-on with “gaming kit” equipment for kinesthetic learners. Learners will have an opportunity to apply learned concepts to interactive case study vignettes. These case studies are intended to reinforce learned skills and facilitate complex adaptive thinking in order to accommodate a wide range of client needs, goals, and applications.

Finally, content within learning modules, while provided in a succinct manner on this program’s learning platform, will ultimately connect to a larger interconnected network of gaming information that learners can engage for further reading. This means that links to existing resources on related topics, the Xbox Customer Support page that covers basic console and controller set-up, will be provided within the learning modules. A full index of learning module topics is provided in Appendix F.

Provision of Dedicated Support Resources

In addition to the “gaming kits” and learning modules, program participants will have access to multiple dedicated support resources throughout the duration of the program. One of these resources includes a live customer support forum in which participants can email, text-chat, or schedule a video call with program staff during normal working hours for guidance on equipment troubleshooting or common technology issues. This is intended to rapidly resolve any blockers to equipment use and ensure all participants have the full duration of the program to use their equipment.

Additionally, an interactive community forum will be provided to program participants. Within this forum, participants can chat with other occupational therapists interested in using gaming in practice to share tips, ideas, photos of innovative gaming set-ups, and more. This ability to connect with other professionals engaged in similar niche practice areas is intended to foster a sense of support and self-efficacy for participants as they navigate learning a seemingly complex topic.

Flexible Participation Structure

Individual topics throughout the modules will be covered in short, “bite-sized,” lengths. This is intended to support the learner’s ability to easily review a specific topic during short bursts of free time they have in their day. For example, during a lunch break or client cancellation period, one or more topics can be reviewed at the learner’s pace. Learners should not feel as though they must dedicate multiple hours in one sitting to effectively advance through all learning content. Instead, the structure and delivery of learning modules are intended to accommodate flexible schedules and windows of free time in one’s schedule.

Program Stakeholders

This section identifies stakeholders at the micro, meso, and macro level who are anticipated to benefit from this program. Micro level stakeholders are individuals at the individual or client level. Meso level stakeholders include service providers, organizations, and other community-level groups. Finally, macro level stakeholders pertain to anticipated benefits at the government or policy level.

Micro Level Stakeholders

Micro level stakeholders include the actual occupational therapists who will serve as participants in this research project. Additionally, their clients, who will ideally have an orthopedic or neurological diagnosis that impacts functional movement will be important stakeholders.

Meso Level Stakeholders

Meso level stakeholders include the participant's clinical manager, as well as their overarching hospital network or employment company. These stakeholders must also be supportive of the therapist's participation in this program. Additional stakeholders include insurance company representatives with vested interest in their occupational therapy providers using evidence-based practice methods that produce effective client outcomes over the course of shorter treatment periods. The guidance of insurance representatives will be integral in ensuring learning materials on how to document game-based interventions, and their use in general, will be reimbursable by major insurance providers.

Macro Level Stakeholders

The macro level stakeholders include large, influential, technology and gaming developers such as Xbox. While this pilot program will include a "donation" of a gaming console, controllers, and other necessary equipment needed, support from the developers of these technologies is needed in order to scale a more sustainable program moving forward. Given Xbox's dedication to creating accessible products and ensuring that the Gaming and Disability Community can participate in their product and service offerings,

stakeholders from the Xbox organization may be open to a formalized partnership in which equipment is donated on their behalf to interested occupational therapists. In return, Xbox teams are provided with research opportunities that allow them to gain meaningful feedback on how they can improve the accessibility of their products. Additionally, occupational therapists are often the first and primary service providers to assist clients in re-engaging in meaningful occupations prior to injury or illness. In donating equipment to future program participants, more OTs will have an opportunity to introduce accessible gaming solutions to clients with disabilities who were previously unaware these technologies existed. This could result in an increase in product and service subscriptions for previously untapped markets.

Program Practice Scenario

Mary is the lead occupational therapist on an inpatient spinal cord injury unit of her local hospital. Many of her clients fall within the 16-25 age range. She has been experiencing difficulty keeping her clients engaged during intervention sessions that target increased range of motion, strength, and activity tolerance when performing tasks with the upper extremity. Her clients typically demonstrate low motivation when engaging in therapy exercises, citing the use of cones, dumbbells, and hand bikes as “boring” and “monotonous.”

She asks her clients about their preferred meaningful occupations. A few clients state that they were previously gamers who played multiple nights a week with their friends prior to injury. She wishes she could somehow incorporate gaming into her intervention sessions to motivate her clients and provide therapeutic activities that are

truly occupation-based. However, she is facing barriers related to clinic budgets that must be approved prior to purchasing gaming equipment for the hospital unit. Additionally, she's not sure where to start in terms of learning more about the gaming technologies available, determining what equipment is needed for her individual client's needs based on their levels of mobility, dexterity, and precision, or how gaming hardware can be set-up in a way that facilitates repetitive functional exercise that ultimately contributes to a client's larger independence goals.

She applied to be part of this program's pilot study. She receives her gaming kit free of charge and no longer has to wait for her budget approval to be reviewed. Additionally, she now has access to training materials that promptly facilitate her understanding of the technologies and how to use them in the context of OT interventions to produce therapeutic outcomes. She then begins using these technologies during client sessions.

Her manager notices that her clients appear to be far more engaged in therapy sessions and appear to be enjoying themselves, bantering among one another, and are ultimately demonstrating an increased activity tolerance throughout the sessions. Through increased activity, her clients have made rapid strides toward goals like independent dressing and other activities of daily living due to increased upper body range of motion, strength, and endurance. As a result of faster goal attainment, clients are discharged sooner, allowing them to return to their homes and begin acclimating to their new life. This allows for more open beds in the unit and decreases productivity demands placed on OTs who were previously overworked while attempting to treat an excess of clients in

one day.

As more OTs participate in this pilot program, a larger body of research supporting the efficacy of game-based interventions is generated, resulting in a systemic increase in support for the use of these technologies during OT services. As a result, larger pools of funding are allotted to support OTs in acquiring and using these technologies. Clients and insurance companies benefit, as their healthcare costs are diminished due to shorter treatment times.

Program Objectives

The scenario described in the previous section of this paper will be addressed through the components of the G.O.A.T. program. This program was created specifically for OT use and application as it builds upon existing knowledge of the following constructs unique to the occupational therapy profession.

1. **Occupation-based practice:** A core aspect of occupational therapy treatment is ensuring that the intervention methods used are occupation-based. With gaming on the rise as both an everyday leisure occupation, as well as the rise of professional eSports, providing game-based interventions to clients who hold gaming as a meaningful occupation (both for leisure and as their actual profession) will ensure we continue to provide occupation-based care in the future.
2. **Client-centered intervention approaches:** Gaming is unique and flexible in that players can choose from thousands upon thousands of games that meet their interests or preferred play styles. Even for clients who are not “gamers”

themselves, the use of gaming to safely simulate preferred occupations (i.e. golfing, driving cars, etc.) is an effective way to produce truly client-centered care. Additionally, if a particular client does not enjoy gaming, but their grandchild, sibling, etc. does, game-based interventions provide a meaningful way to promote repetitive tasks to improve function, while also involving family members into the session via multiplayer games.

- 3. Use of Existing Activity Analysis Skills:** Occupational therapists are highly trained in analyzing an activity and determining the associated functional demands that clients must successfully perform in order to execute a task safely and successfully. This knowledge can be applied to gaming experiences in creating interventions that address targeted functional outcomes for clients. For example, if a client is experiencing a deficit in dynamic standing balance and weight shifting following a leg injury that makes weight bearing painful, the therapist can choose a game that requires players to activate two different buttons. These buttons can then be placed far apart from one another on a high table while the client is standing. The client must shift their weight from one leg to the other as they reach and activate the button connected to the in-game task at hand like pressing button one to jump over an upcoming log then shifting weight to press button two to have their character duck under a low branch within the allotted time. Therapists will essentially use their existing activity analysis skills, creativity, and flexibility to leverage gaming as a modality that simulates targeted functional movements in an engaging and repetitive manner.

4. **Knowledge of Grading Activities:** Using the same example above, occupational therapists will use their existing knowledge of how to grade activities to provide the “just-right challenge” for clients as they improve. If the amount of weight shifting and reaching needed to activate the buttons on the table is no longer challenging for the client, simple placement adjustments can be made to grade the activity. For example, the therapist can move the buttons farther away from the client so the amount of time in which they are shifting weight to a specific leg is longer and more intense. Additionally, the therapist could use a game that requires four buttons and scatter them across the table to facilitate more rapid weight shifting. The options are endless.

Program Participant Criteria

Inclusion and Exclusion Criteria

The primary participants for this project will include occupational therapists who work in an inpatient rehabilitation setting or outpatient clinic and primarily work with clients that have mobility deficits due to orthopedic or neurological conditions (spinal cord injury, traumatic brain injury, cerebral palsy, trauma, etc.). The participants must have at least 3 years of experience as an occupational therapist in either of these settings. This is to ensure participants are already proficient in their standard OT practice and documentation skills in this setting and are not managing other “novel” experiences in addition to the training this program provides. One of the major goals of this program is to test the efficacy of the training materials provided in assisting occupational therapists in learning to use the Xbox console, platform, games, and Xbox Adaptive Controller for

therapeutic purposes with clients. Therefore, participants will be excluded if they have prior experience using these specific devices in a clinical or personal context within the past five years. The exclusion of these individuals is intended to avoid the introduction of bias regarding the efficacy of the training materials given their existing gaming knowledge outside of this training program

Participant Recruitment

The initial goal is to recruit 20 participants into the pilot program. Screening surveys will be sent to occupational therapy programs, clinics, and hospital networks within Washington State to maintain consistency with state laws and insurance regulations among all participants. The screening survey will include a background on the program, its intent, time commitment, and a set of screening questions that will ensure participants meet inclusion criteria. Depending on the volume of returned responses, all qualified respondents (based on screener responses) will be invited to participate in a short 10–15-minute virtual follow-up interview in which the primary investigator will confirm eligibility. A list of follow-up video interview questions can be found in Appendix G. Once 20 respondents have been verified as eligible, they will be invited to participate in the study.

Program Execution and Timeline

This section describes how the program will be executed and the order in which program components are provided to participants. In addition to gaming kits, training modules, and online support resources, other key components needed to executive this program include the provision of a virtual question and answer session at the conclusion

of allotted training module completion time and a series of pre and post-test evaluation surveys administered throughout the program.

Operational Execution of Program

Once all participants have received their “gaming kits,” they will also be sent a link to an online training platform containing a series of learning modules. A detailed list of topics covered within these learning modules can be found in Appendix F. Participants will be given four weeks to perform an initial review of all learning modules. At the conclusion of these four weeks, a live follow-up session will be held via video conference call. During this conference call, all participants will be given an opportunity to ask any remaining questions they have about equipment set-up, use, or other topics related to the program.

Following the conclusion of the training portion and follow-up conference call session of this program on day 29, participants should begin using the items in their gaming kits directly with clients for the next six weeks (days 31-67). During this time, participants will be able to practice their recently learned skills and adapt the foundational knowledge established during the training portion to address specific client needs. Participants are encouraged to use the first 10-15 days of this portion of the program to solely address leisure and social participation gaming applications with their clients. An ability to address the client’s basic access need is important in providing the foundation in which more involved gaming hardware set-ups that promote challenging movements for the client are pursued.

For example, a client who sustained a spinal cord injury that limits their finger

dexterity and strength is unable to use a standard gaming controller due to their inability to hold the controller, rapidly press buttons, or control joysticks in a precise manner with their thumbs. The therapist and client identify a simplistic game that the client shows interest in playing. They determine that the essential functions of this game are jumping, shooting, reloading a weapon, and steering character movement. Noting that the client has limited hand and finger use, the therapist instead mounts two switch buttons near the client's head which, when activated, initiates the "shoot" and "weapon reload" actions in the game. Additionally, a switch button that activates the "jump" action is placed in front of the client on a lap tray and can be activated by the client's palm. Finally, an oversized joystick with a U-shaped handle similar to the client's power chair is placed on the client's lap tray. Through gross shoulder and forearm movements, the client is able to steer the direction in which the character walks. This set-up is not intended to challenge the client. Instead, this set-up allows the client to comfortably engage in gameplay for leisure or social participation purposes. Figure 6 provides a graphic illustration of this type of gaming set-up and its components.

These experiences work to establish a deeper participant understanding of the technologies introduced in this program and how they can be adapted to facilitate access to gaming activities despite disability that prohibits the use of a standard controller.

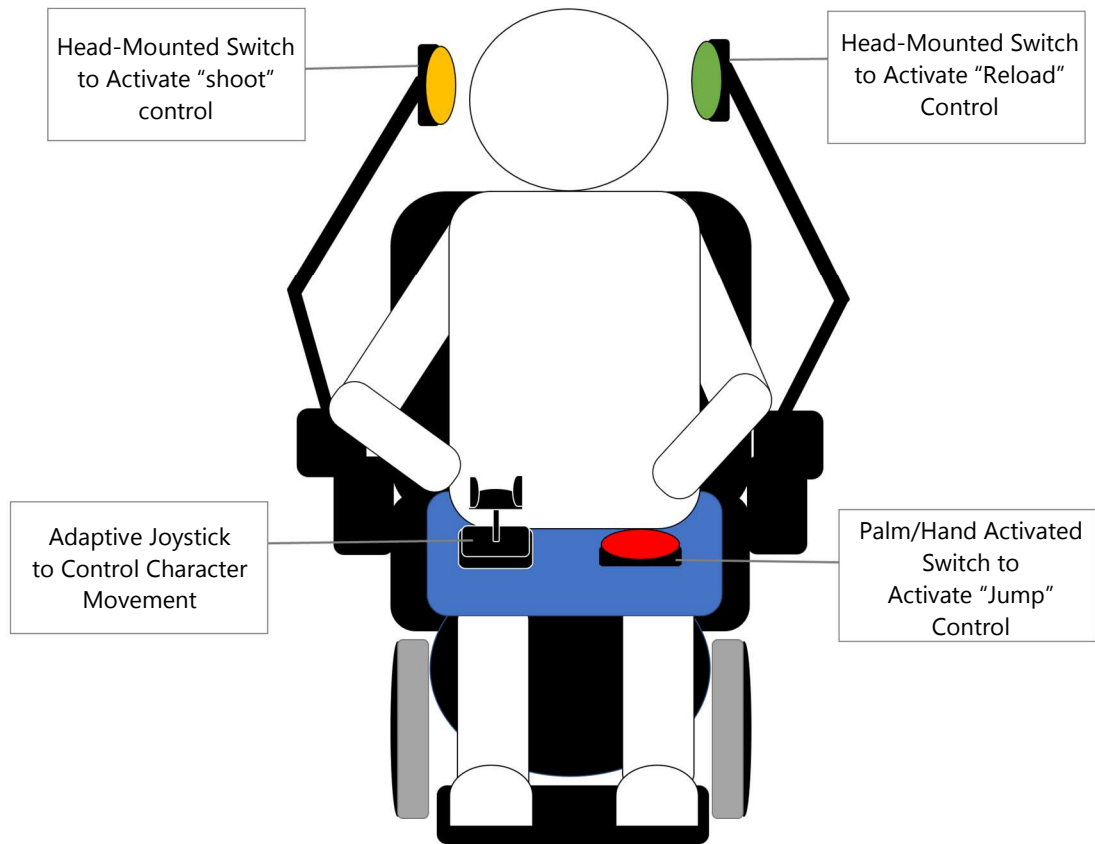


Figure 6. Access-based Gaming Set-up Graphic

Following increased competence in addressing gaming access needs, participants will then start to explore the application of gaming technologies as a therapeutic modality that facilitates engagement in therapeutic exercise. These applications expand on previously learned skills by making slight adjustments to the placement of switch buttons and joysticks, so they are farther away from the client and more difficult to access. These adjustments change the nature of client interaction with physical gaming inputs from facilitating easy and comfortable access, to providing clients with a physical challenge that specifically targets range of motion, endurance, strength, or other components of

therapeutic exercises relevant to their independence goals as they attempt to engage in gameplay.

For example, this same therapist and client are now ready to use gaming as an intervention modality. Specifically, the focus for this therapy session is around increasing bilateral shoulder flexion and range of motion to ultimately facilitate independence in donning and doffing pull over sweaters and shirts. Instead of placing the switch buttons under the client's elbow and joystick within close reach of their hand, these items are now mounted above the client's head, as illustrated in Figure 7.

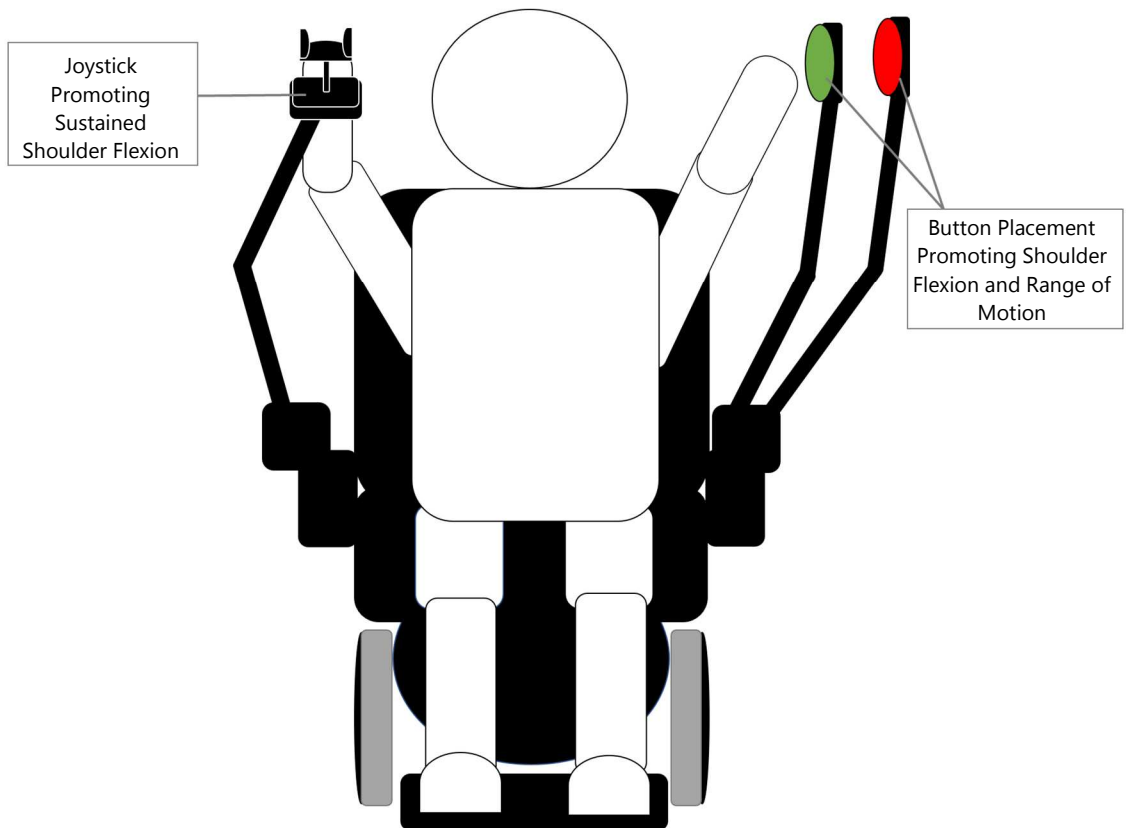


Figure 7. Therapeutic Exercise-based Gaming Set-up

The client must perform repetitive shoulder flexion motions each time their character needs to jump in the game or shoot at an enemy to avoid losing the game. The therapist's ability to adapt gaming knowledge from comfort and access, to promoting functional repetitive exercise through engagement in gameplay will ideally occur organically through hands-on experience with the equipment following the initial establishment of foundational knowledge and basic access applications. An overview of the program executive timeline is provided in Table 3.

Table 3. Program Execution Schedule

Day	Event	Description
Day 1	Pre-Test Survey	Pre-intervention survey to establish baseline knowledge and confidence in gaming use.
Day 2–28	Training Period	4 weeks to complete training modules
Day 29	Live Question and Answer Session	Live online session where participants can ask remaining questions regarding the equipment or its use prior to using with clients
Day 30	Post-Training Survey	Survey for participants to assess the efficacy of the training modules alone (prior to experience with clients)
Day 31–67 (6 weeks)	Gaming Use within Client Sessions	6-week period in which participants are asked to use game-based interventions for at least 3 treatment sessions per week.
Day 68	Post-Program Survey	Post-program survey to assess overall confidence in gaming use and perceived impact on client outcomes.

Program Outputs and Expected Outcomes

Overview of Program Outputs

Given the expected number of participants for this program and the scope of training and implementation requested of participants, the following program outputs are anticipated:

- Total participants: 20
- Training: 6 Modules x 1 hour total each + 3 hour live FAQ session = 9 hours training total
- Participant Use: At least 3 treatment sessions per week for 6 weeks = 18+ therapy sessions with embedded gaming elements completed in by each participant for an overall total of 360+ implemented game-based therapy session.

Anticipated Outcomes

At the completion of this program, participants are expected to have newly acquired knowledge and skills that will enable them to begin using game-based interventions with appropriate clients. Post-program completion, participants who continue to utilize gaming regularly in their treatments are likely to exhibit deeper knowledge and competence using game-based practice in addition to increased levels of perceived confidence, competence, and satisfaction in using these technologies. In the long term, anticipated outcomes include a shift in attitudes toward gaming technologies resulting in changed procedural patterns regarding the funding of gaming technologies.

- **Short-Term (Program Completion to 1 month post completion):** Participants will have newly acquired knowledge and skills about the use of therapeutic

gaming that can be measured through successful completion of the tasks listed in Table 4.

- **Intermediate Term (2 to 6 months post program):** Through ongoing experience with clients, participants will likely acquire more complex skills related to gaming and therapy setups and demonstrate an increase in perceived levels of confidence, competence, and satisfaction in the use of game-based interventions.
- **Long-Term (7 months to a year or more):** After seven months to one year of continued gaming with clients, changes in procedural patterns, attitudes, and policies regarding the role of gaming in occupational therapy services are anticipated.

Table 4. List of Anticipated Short, Intermediate, and Long-term Outcomes

<p>Short Term Outcomes</p>	<ul style="list-style-type: none"> • Properly connect an Xbox console to an appropriate power source and TV screen • Power on the Xbox console and necessary controllers including an Xbox Adaptive Controller • Connect adaptive gaming peripherals to an Xbox Adaptive Controller via the 3.5mm and USB ports on the device • Wirelessly pair Xbox controllers to the console • Connect the console to local Wi-Fi or hard-wired ethernet connection • Create a user profile for the clinic or hospital and successfully sign in • Locate and configure all accessibility settings provided on the console • Locate the game library and install a desired game • Choose an appropriate game for a specific client based on targeted outcomes • Use the Xbox Accessories Application to create an adequate mapping control profile for a client
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	<ul style="list-style-type: none"> • Create a basic hardware set up using 2 switch buttons and an analog joystick that targets a functional skill such as weight shifting or range of motion
Intermediate Term Outcomes	<ul style="list-style-type: none"> • A successful demonstration of the participant’s ability to let their client choose a desired game, and create a therapeutic controller set-up regardless of client game choice • A successful demonstration of troubleshooting common use errors such as internet connection, peripherals connection, and remapping profile errors • A rating score on the “perceived level of confidence” in using game-based intervention question that is 1-2 Likert scale ratings higher than their pre-program survey scores • A rating score on the “perceived level of competence” in using game-based intervention question that is 1-2 Likert scale ratings higher than their pre-program survey scores
Long Term Outcomes	<ul style="list-style-type: none"> • A rating score on the “perceived level of satisfaction” in using game-based intervention question that is 1-2 Likert scale ratings higher than their pre-program survey scores • An increase in the number of evidence-based practice articles focusing on the use of the Xbox Adaptive Controller and its efficacy in therapeutic interventions for clients with impacted mobility from a current total of zero articles to at least 2-3 articles • A 20% increase in the number of coworkers and colleagues of the original participants who are now seeking out or using game-based interventions with their clients • A 15% increase in the number of continuing education offerings and conference presentation topics on gaming as compared to previous years

Full Logic Model

The success of this program is dependent on the interaction of a multitude of inputs, program resources, theories, activities, and external factors that may influence overall program outcomes. Figure 8 provides a full logic model that demonstrates these interactional relationships and summarizes the anticipated resulting outcomes described in the previous chapter.

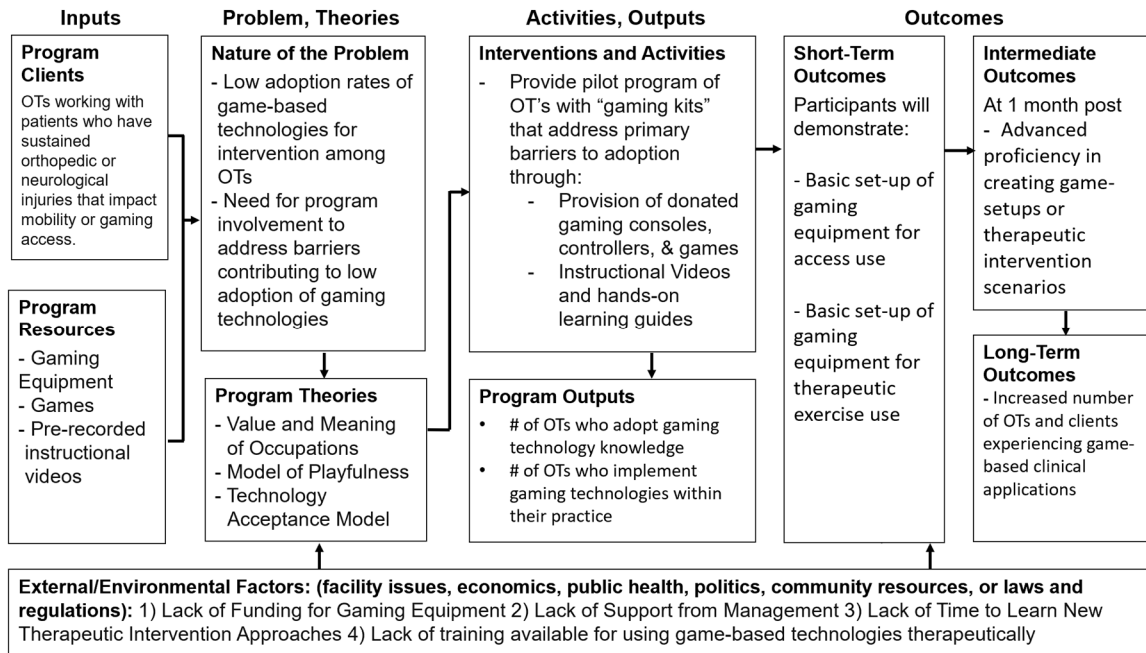


Figure 8. Full Logic Model

Anticipated Challenges and Barriers to Program Execution

Given existing perceptions among healthcare providers and non-healthcare providers alike related to perceived negative health effects associated with video games, there are many anticipated challenges and barriers that may impact the success of this program. Additionally, the existing attitudes, policies, and overall insurance provider reimbursement system currently influencing healthcare provision in the United States may also pose challenges and barriers.

General sentiment around “gaming” commonly cites negative health ramifications associated with concepts like the impact of excessive “screen time,” exposure to violence, and a lack of “physical, in-person” engagement in social participation (Granic et al., 2014). These attitudes and perceptions among caregivers, patients, and therapists alike

can create early deterrents from the use of video game interventions prior to exploring the potential benefits.

A mitigation strategy for this barrier includes efforts to specifically address this type of sentiment within the learning modules provided to participants. One of the training modules will include a “literature review” of current evidence-based research regarding both the positive and the negative outcomes of engagement in gameplay. It will be important to note that while prolonged periods of screen time or gaming have shown to have negative impact on aspects of health, the use of therapeutic gaming for 30-minute intervention sessions is not only an entirely different application of gaming, but has also shown to have a multitude of positive impacts on overall health and quality of life for individuals with disabilities who often cannot access to the same social participation opportunities that many others can.

Another foreseeable barrier is related to the current infrastructure in which many clinics and hospitals today measure their success for rehabilitation programs and individual therapists. This primarily includes measuring success based on the productivity of therapists. This is often based solely on the number of clients they treat per day. These metrics often do not account for ensuring that treatment sessions are client-centered or occupation-based. The physical environment of many clinic or hospital sites are also not conducive to accommodating the storage space, or therapy space needed for game-based treatments. This would include a treatment room or area with a large accessible TV and surrounding space for the client’s physical movement in front of the TV during their session. With high productivity demands and a lack of physical space,

this can lead to lengthy amounts of time to set-up equipment, troubleshoot technology issues, and tear down equipment for the therapist who needs the same space next.

While the issue of physical space or storage in a therapy setting will not be addressed specifically in this training, the program seeks to indirectly mitigate these concerns by providing clear documentations regarding the positive outcomes associated with the use of gaming technologies, provide technologies needed free of cost to participants, and provide high quality training materials that are intended to eliminate common troubleshooting or time consuming set-up efforts required by therapists. By providing a strong foundation that supports the use of therapeutic gaming as a highly positive “modality” option, thus allowing therapists to begin using the equipment with clients, it’s anticipated that higher level management and other therapists will see the enjoyment, engagement, and impact on functional gains feel inclined to invest in dedicated spaces like assistive technology labs for these types of therapy sessions.

Finally, fears regarding insurance reimbursement can potentially block investments in this space. Commercial gaming technologies are not considered medical or therapeutic devices, resulting in uncertainty around how to document the use of these technologies in treatment sessions. One of the modules provided in this training will specifically address how to document the use of gaming as a treatment modality for insurance purposes to accurately portray its role as a vehicle in promoting prolonged and repetitive exercises that can be considered therapeutic activity.

Conclusion

The G.O.A.T. program consists of multiple components that work to expand program participant knowledge and use of gaming activities. These components and the method in which they will be delivered were determined based on existing theories related to successful knowledge translation and retention, predictive factors of technology acceptance, and evidence within the literature that identified primary barriers to adoption. Identified program stakeholders range from individual therapists to large gaming industry executives who may take interest in how their products are being used in healthcare contexts. This program leverages existing OT knowledge and skill sets like activity analysis and grading of activities to foster efficient and comprehensive learning of new gaming technologies. Anticipated outcomes include proficiency in a wide array of bespoke gaming-related tasks. Over time, that nature of these outcomes is expected to expand beyond individual therapist proficiencies and will ideally influence attitudes and perceptions of gaming technology in therapy at a systemic level.

CHAPTER FIVE – Program Evaluation Research Plan

The primary goal of this program is to increase the number of occupational therapists who use game-based interventions with their clients to promote therapeutic outcomes. Therefore, research that evaluates the efficacy of program components in facilitating these is critical. Section one of this chapter provides an overview of the vision for this program's evaluation research. Section two lists proposed stakeholder engagement methods. Subsequent chapters include an outline of the preliminary exploration and confirmatory process as well as an outline of specific evaluation research questions that pertain to the interests and goals of each stakeholder group.

Vision for the Program Evaluation Research

In general, a large percentage of occupational therapy practitioners do not address technology access and use with their clients. Many cite a lack of knowledge or awareness of new technologies available as a contributing factor. Additionally, a lack of familiarity and therefore comfortability asking clients about their technology access needs is another major contributing factor (Jones, 2021).

This gap in knowledge regarding technology use and access can be detrimental to our profession's ability to provide occupation-based services that are both relevant and useful to clients. With an estimated 93% of millennials, 90 % of Gen Xers, and 68% of Baby Boomers in the United States owning devices like smartphones, it is clear that our current and future clients hold access to these devices and other technologies in their lives as very important (Vogels, 2019). These devices have become integral parts of our lives that allow us to perform basic tasks like scheduling doctors' appointments, engaging in

social participation virtually, and even performing work-related tasks. When major knowledge gaps around technology access and use exist among OT practitioners, this may mean that many clients who require accessible solutions to access their technology following injury or illness are not being provided those services.

Specifically, a lack of awareness and expertise in supporting a client's use of gaming technologies is more prominent among OTs than general technology use (Jones, 2021). In the U.S., 67% of adults and 76% of children under 18 play video games regularly (ESA, 2021). As this large population of children become future clients of ours within the healthcare care system, it's imperative that OT practitioners familiarize themselves with these technologies and are comfortable enabling independence in video game play following injury or illness that prevents access. Further, adopting video game-based interventions will help ensure that intervention modalities remain occupation-based and relevant to a client's needs and interests. This program evaluation research will generate important data on the most effective way to fill these knowledge gaps among the OT population.

In the short term, this program evaluation will determine how effective the G.O.A.T. program is in addressing these gaps. Data regarding each individual component of the program, and its effectiveness in terms of eliminating barriers to gaming technology adoption will be evaluated. Once the kits, training, and support sources have been shown to effectively eliminate and lessen barriers to adoption, data will be collected on aspects weekly use of game-based interventions, and the effect of game-based interventions on client outcomes as compared to traditional, non-technology-based

interventions. Ultimately, the benefit of this program is two-fold: first the intent is to increase the use of game-based interventions with clients to ensure that OTs are providing occupation-based interventions. Second, the model and structure of the program can be used to increase knowledge and usage of subsequent technologies or intervention modalities that will inevitably surface in coming years that OTs must be prepared to address with clients.

Engagement of Stakeholders

Individual stakeholders needed for this project would first include an individual to help recruit participants for the study and carry out follow-up interviews. The OT practitioners who agree to participate in the study and document their experiences throughout the program to generate the research data would also be critical. A researcher who is familiar with various statistical data analysis programs will be needed to assess the data and summarize findings. This program will only be collecting data from occupational therapists about their perceived competence in using these technologies. The effect of game-based interventions on specific client outcomes will not be assessed. Therefore, Institutional Review Board approval is not needed to collect this data.

Additional stakeholders for this program would include a researcher from the Xbox User Research team and a Program Manager from the Xbox Gaming Accessibility team. Early involvement of these stakeholders is critical in ensuring the Xbox products and services provided in the gaming kits are being properly used, and that any specific questions or outcomes that are of particular interest to Xbox stakeholders are captured throughout the program's execution. This communication is important in establishing a

future partnership with Xbox in which the company can donate equipment for future gaming kits in order to sustain the program for longer periods of time. A representative who is an expert in OT-related insurance billing and approvals for public and private healthcare would also be needed to address any concerns or questions regarding the feasibility of using gaming as a true treatment intervention that is reimbursable.

When reaching out to these stakeholders, it will be important to provide insights on the potential impact that program outcomes will have on advancing the occupational therapy profession and maintaining our profession's goal of providing occupation-based and evidence-based practice. Many potential stakeholders that have been engaged in the past regarding this project have expressed interest given the "niche" topic. Unlike many other types of data collection and analysis, the inclusion of gaming, a modern-day staple in today's society, has anecdotally shown increased interest and curiosity of stakeholders within the OT and data science space based on this author's experience.

Simplified Logic Model

The simplified logic module provided in this document outlines the primary program resources, intervention activities, outputs, and short, intermediate, and long-term goals and can be shared with stakeholders. Participants will be provided with gaming kits. The output being tracked would ultimately include the number of OTs in the program who ultimately adopted gaming into their practice regularly as a result of the intervention. Additionally, anecdotal sentiment regarding the number of clients who demonstrated increased participation and motivation in therapy sessions following the use of game-based interventions will be collected from participants. These program

evaluation components and anticipated outcomes are illustrated in Figure 9. The short-term goals are intended to ensure that the gaming kits were effective in eliminating barriers to adoption and providing therapists with a basic understanding of how to set up and use gaming technologies. Intermediate goals assess whether the initial training and program execution created supplied participants with the foundational knowledge and adaptable skills sets needed to tackle more complex client needs and gaming applications. Finally, the long-term assessment would determine whether therapists and clients go beyond the application of gaming in the context of therapy sessions and go out of their way to adopt adaptive gaming technologies into their lives after discharge.

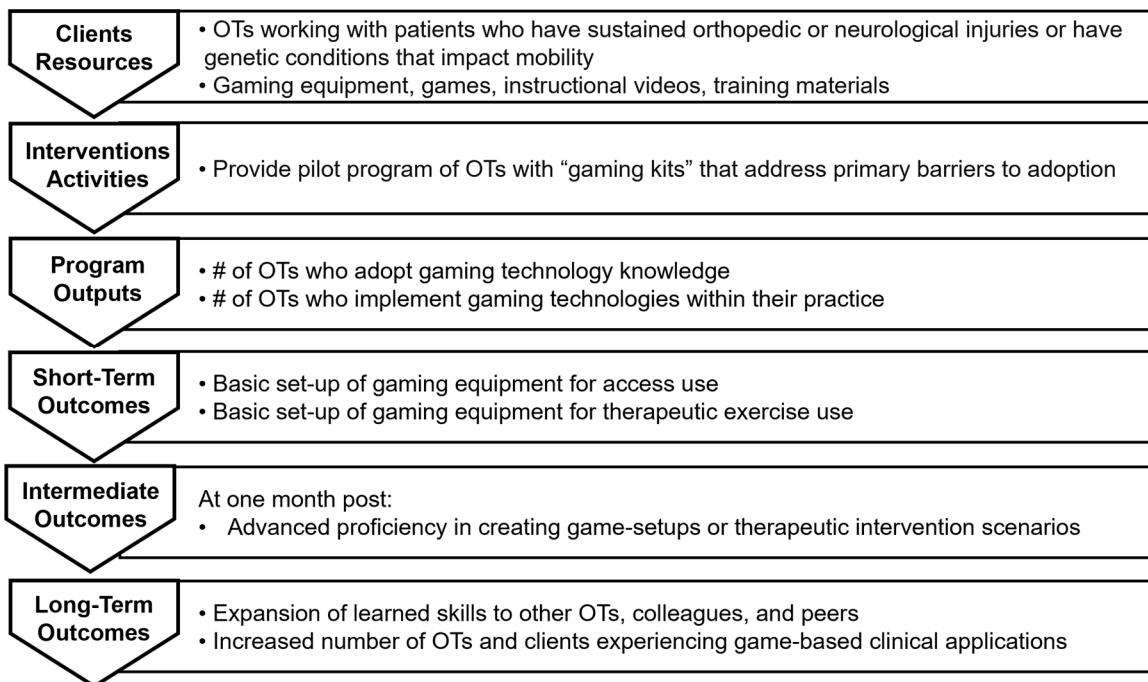


Figure 9. Simplified Logic Model

A simplified logic model for the proposed program evaluation research showing expected program inputs and outputs and short, intermediate, and long term anticipated

outcomes.

Preliminary Exploration and Confirmatory Process

When engaging stakeholders, meetings will be held virtually. This is to accommodate the wide array of geographic locations that stakeholders may reside in. Stakeholders who will be part of the preliminary exploration meetings include the researchers and data scientists from Boston University and Xbox, the insurance representative, and an occupational therapist who would fit the same inclusion criteria as the actual pilot study participants to provide insights from a practicing clinician perspective.

The background documentation these groups will be provided include a literature review of current research that explores the use of game-based treatments in OT interventions for clients with neurological or physical disabilities that impact movement, strength, and coordination. This literature review would reveal the current evidence that supports prolonged activity tolerance and higher engagement in therapy when game-based interventions are used. It would also provide insights on the current gaps in research pertaining to the use of gaming technologies in occupational therapy interventions. At a high level, these gaps include a lack of current research that uses newer gaming technologies that have been released within the last five years. The majority of current research on this topic focused on the use of the Nintendo Wii as the “game-based intervention (Lopes et al., 2018).” Within the past three years, newer adaptive gaming inputs that would provide occupational therapists more flexibility when it comes to adapting physical exercises to a client’s “just right challenge” as they engage

in gaming therapy, such as the Xbox Adaptive Controller, have been released. Prior to the meeting, participants will also receive copies of the program's simplified and full logic models and reading materials about the use of gaming in therapeutic settings.

In this meeting, the initial goals, strategies, "business case," and intent for the program will be presented. At this time, stakeholders will have an opportunity to ask questions and provide feedback. Stakeholders will be reminded that they have been asked to participate in this program given their subject matter expertise in each individual area that they will contribute knowledge toward. Therefore, they should not hesitate to be candid in their feedback. Once there is consensus on the overall intent of the project, we will discuss the actual program evaluation research methods. This is intentionally introduced as a two-part process. First, it is imperative that all stakeholders are in agreement regarding the value that a program like this brings to the healthcare and gaming industry. The program's design must align with the vested interests of all stakeholders involved. Once this is established, it will be easier to drive consensus on the program evaluation research process, as everyone will be starting the analysis from the same foundational point of view on why it's needed.

As the group discusses the research questions, design elements, and insights on the most effective and appropriate ways to collect data from the target populations, the premise of open communication will continue to be reinforced. The initial approach will include a step-by-step process of brainstorming an "outline" that addresses each of those items. It will be an open conversation among group members, where all ideas will be captured and noted. If it appears as though the group is having a difficult time reaching a

consensus, additional efforts will be employed to ensure the final process is in alignment with as many group members as possible. This approach would involve introducing anonymous online surveys that each group member would fill out. In the survey, every option discussed for potential research questions, design elements to include, and data collection methods will be offered. Stakeholders will be able to fill out the survey anonymously, indicating which options they feel should be included via multiple choice. They'll also be given an open response form in which they can provide more context about why they feel a certain question or design element should or should not be included. This approach will ensure that all members of the stakeholder group have an opportunity to voice their opinion and have it heard.

Program Evaluation Research Questions by Stakeholder Group

The focus of research questions will vary among healthcare stakeholders as compared to industry stakeholders from Xbox. Table 5 outlines the targeted outcomes and goals for this program and discusses how the data related to each of those outcomes can support the overall efficacy of the program. This data can also work to affirm individual stakeholder groups that the program is worthy of continued investigation and support, as the outcomes are valuable to all stakeholders involved including occupational therapy practitioners, their managers, their patients, and the creators of the gaming equipment and games being used.

Table 5. Program Evaluation Research Questions by Stakeholder

Stakeholder or Stakeholder Group	Types of Program Evaluation Research Questions
The primary researcher	<p><i>Qualitative:</i> Was the program content and delivery sufficient in eliminating the following barriers to adoption:</p> <ul style="list-style-type: none"> • Cost associated with acquiring equipment • OT-based training on gaming use in therapy • Receiving management support <p><i>Quantitative:</i> Was the program effective in:</p> <ul style="list-style-type: none"> • Increasing perceived participant confidence while using game-based interventions • Increasing activity tolerance times of the participant’s patients • Increasing functional outcomes of the participant’s patients as determined by standardized assessment score comparisons.
Persons actively involved in program delivery: Occupational therapists	<p><i>Qualitative:</i></p> <ul style="list-style-type: none"> • Was the training content sufficient to begin using game-based interventions with patients? • Was there a need for additional training videos or modules? • Was the training content presented at the correct level of knowledge for those new to gaming? • Did the gaming “kits” include the necessary equipment needed to create therapeutic gaming set-ups that provide the just-right challenge to all patients? • Were there any barriers to gaming adoption that were not addressed by the program? <p><i>Quantitative:</i></p> <ul style="list-style-type: none"> • Did participants gain needed skills to adopt gaming technology into their daily, weekly, or monthly practice? • Did participants gain perceived confidence in their ability to use game-based interventions to produce functional client outcomes?

	<ul style="list-style-type: none"> • Did participants gain perceived competence with regard to using gaming equipment and creating hardware set-ups that are appropriate for each individual patient's needs? • Did recipients of the intervention improve in terms of increased activity tolerance and increased functional outcome measures?
<p>Facility, educational institution or organization administration or management</p> <p>OT management</p>	<p><i>Qualitative:</i></p> <ul style="list-style-type: none"> • Was the delivery of the gaming kits + learning material sufficient in supporting your therapists' ability to use gaming in practice? • Does the use of game-based interventions match organizational goals? • Were program participants sufficiently prepared to apply the learning content in their clinical practice? • Were there any negative consequences of participating in the program from an organizational or quality of care standpoint? • Did recipients of game-based interventions and family members report a favorable experience with the care received? • How did the participation of your employee in this program influence your perspective on gaming technologies as a clinic manager? <p><i>Quantitative:</i></p> <ul style="list-style-type: none"> • Will the research data show that the intervention led to improved functional outcomes, faster outcomes, and longer activity tolerance than standard interventions? • Can the research data be used to demonstrate improved quality of care given the occupation-based care it provides to clients? • Has the program positively impacted employee reported job-satisfaction? • Are outcomes consistent with the proposed theoretical justification of flow and distraction through engagement? • Is delivery of the program more costly than other means of delivery? • Did participation in the program impact work productivity for participants?

<p>Funding agencies, advocacy organizations, including AOTA, policymakers.</p> <p>Xbox Stakeholders</p>	<p><i>Qualitative:</i></p> <ul style="list-style-type: none"> • Do recipients of game-based intervention report higher levels of engagement and enjoyment during game-based treatment sessions? • Do recipients express a desire to purchase their own Xbox gaming equipment post-discharge to continue playing? • Do participants feel as though the Xbox gaming ecosystem provides necessary accessibility supports to allow for patient engagement regardless of current functional status? • Do participants feel as though further donations or involvement from Xbox can create a valuable partnership where donation of equipment and software can be exchanged with meaningful research insights? <p><i>Quantitative:</i></p> <ul style="list-style-type: none"> • How many participants purchased additional products and services from the Xbox platform (more games, additional hardware, etc.) beyond what was provided in the gaming kit? • What is the average dollar amount participants spent on additional products and services throughout the duration of the study? • Can the research data be used to support the efficacy of game-based interventions as producing increased functional outcomes through the Xbox Adaptive Controller? • Can the research data be used to support the efficacy of gaming as an effective therapeutic modality?
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Research Design

Formative and Qualitative Design

Initial research will be conducted via a pilot program of 20 occupational therapists that have not used gaming equipment prior to this program. The primary research question this program looks to answer is whether the intervention, in this case the

deployment of the “gaming kits” with training and equipment included, are effective in driving adoption of gaming technologies among the participants who previously have not adopted this approach into their practice.

There will be two experimental groups. The inclusion criteria for group A will include OTs who have been practicing for at least 3 years and have not considered including game-based interventions into their practice previously. The inclusion criteria for group B will include OTs who have been practicing for at least 3 years and have expressed a previous desire to include game-based interventions in the past but have not actively initiated any processes to do so. The formative, qualitative data for this program will be collected via semi-structured interviews and survey questions. Using a pre-test post-test study design, the effectiveness of the program in terms of overall adoption of game-based technology in practice among the two groups will be determined. Further, a between-group comparison of qualitative data can be assessed to determine the relationships between prior expressed interest in adopting gaming therapy, and lack of previous interest when it comes to overall adoption of regular gaming use in therapy interventions between both groups.

Summative and Quantitative Design

The summative approaches for the evaluation of this program include a quasi-experimental design that collects quantitative data. This allows researchers and stakeholders to gauge individual aspects of program efficacy based on numerical values. This data will be collected via pre and post surveys that ask participants subjective questions such as their perceived confidence in using game-based technology with

clients. It will also gather objective numerical data such as the number of times gaming technologies were used with patients throughout the course of the program. Given the small population size, statistical significance is unlikely. However, the outcomes of this study, if favorable, could provide the support needed to run a larger-scale study involving enough participants to accurately assess statistical significance when it comes to determining the program's efficacy in increasing regular gaming technology adoption among OTs for use with client interventions.

Research Methods

Confidentiality and Security of Stored Participant Data

Efforts to maintain confidentiality, privacy, and the secure storage of personal data will be prioritized. Throughout the program, participants (OTs) will be anonymized and only identified via an assigned code name. This code is needed to maintain visibility on whether a participant is in group A or group B. Additionally, this coding is needed to compare pre and post-test outcomes for participants. Participants will express informed consent in writing to document their approval of their anonymized data being used for research purposes. Throughout the course of the study, participant contact information and associated code spreadsheet will be saved in a secure, offline location on a local hard drive within a secured facility that requires two-factor authentication to access. Upon completion of the program, data and confidential information will continue to be kept in a secure location until the date specified by research governing bodies like the IRB suggest deleting.

Formative and Qualitative Data Collection Methods

Participants will be recruited via a quick online survey that helps researchers determine whether the potential participant meets inclusion criteria. As stated previously, general inclusion criteria requires that participants are OT practitioners who work primarily with clients receiving OT services due to orthopedic or neurological diagnoses that impact functional movement or use of one or both upper extremities and have been in practice for at least 3 years. Participants will then be sorted into group A and group B based on whether they have or have not expressed a previous desire to adopt game-based technology into their practice. The formative data will be collected remotely. Semi-structured interviews will take place via a secured online video chat platform such as Microsoft teams. The interviews will be recorded, with participant information anonymized and recordings kept in the same secure location with two-factor authentication as the code spreadsheet.

The interviews with each participant will be scheduled over the duration of a single week. The initial pre-test interview will be conducted 1 week after each participant receives their gaming kit. Prior to the interview, participants will be asked to explore the components of the kit, but not yet begin watching any of the training materials and documentation. Following the completion of the program (approximately 3 months post-receiving the gaming kit), the same process and measures will be used to conduct the post-test semi-structured interviews.

Formative and Qualitative Data Management and Analysis

Qualitative interviews will be conducted by the primary investigator and two trained research assistants via Microsoft Teams® video call, which will provide automatic transcription. Interviews and transcription will be recorded via Microsoft Teams®. The transcribed audio files will then be uploaded to a qualitative data analysis program such as NVivo™ to code and theme the data, which will be saved electronically using two-factor authentication security. NVivo™ qualitative analysis outputs, including tallies of automatically coded data the subsequently identified themes, will be manually cross checked with audio files from interviews for accuracy by the primary researcher and two research assistants. This analytical approach will use explanatory methods to ultimately determine any causal relationships between program participation and the overall adoption of game-based technologies.

Summative and Quantitative Data Collection Methods

The quantitative data collection will also take place remotely. Participants will receive their pre-and post-test surveys via online forums like google forms. The same recruitment processes and inclusion criteria defined previously apply. Reliability will be ensured through a comparison of participant's survey question responses to the information they provided in their formative semi-structured interview responses. The independent variable in this program evaluation would be the gaming kit.

Dependent variables would include Likert-scale ratings between 1-10 on the therapist's perceived confidence in their ability to create game-based interventions that target client outcomes pre and post training. Additionally, objective measures such as the

number of patients they used game-based interventions with daily, weekly, or monthly as compared to the entirety of their patient load will be asked.

Summative and Quantitative Data Management and Analysis

After completing the initial recruitment survey, participants will be coded and grouped into group A (previous interest in adopting gaming) and group B (no previous interest in adopting gaming). Coded data will be kept secure in an excel file with two-factor authentication limiting access to the primary investigator. Using the coded data, online survey results will be downloaded with responses saved without identifying information and organized within a secure excel spreadsheet as noted above. The numerical data collected from the surveys will be analyzed using either Excel or SPSS software. Statistical analysis will seek to establish causality between the intervention of receiving gaming kits, and the outcome of regular adoption of game-based therapy in practice. Pre- and post-test data will be compared using a univariate analysis of variance, with overall comparison of group A and group B using a univariate ANOVA analysis. These analyses will determine the gaming kit's efficacy on increasing perceived confidence, competence, and actual use of gaming interventions and determine if previous interest in gaming played a significant role in these outcomes.

Anticipated Strengths and Limitations

The anticipated strengths of this evaluation plan are multi-faceted. The decision to exclude participants with previous experience using gaming devices will ensure that no bias is introduced when determining the efficacy of the intervention in increasing competence and confidence using game-based technologies. Additionally, the creation of

two participant groups, group A which will consist of therapists with no prior desire to learn about gaming technologies, and group B, which will consist of therapists who have expressed prior interest in learning gaming technologies, will provide an opportunity to explore whether or not previous interest has an impact on the overall efficacy of the program. This awareness can then be documented in evaluation reports to note potential bias.

There are also multiple limitations of this program evaluation. External factors including the fact that many participants likely do not have control over the patients they are assigned can result in participant's receiving an unusual number of patients who would not be game-based intervention candidates during the course of the study. A lessened scope of appropriate clients to practice newly acquired gaming skills with can ultimately impact perceived confidence, competence, and use for individual participants. Additional factors like cultural or social perceptions around gaming in general of patients and caregivers present during intervention sessions can deter participants from using game-based interventions as often as they'd like with applicable patients

CHAPTER SIX – Dissemination Plan

Disseminating the findings of this program’s evaluation research will play a critical role in expanding gaming technology knowledge and use among the occupational therapy profession. In this chapter, short- and long-term dissemination goals are provided. Subsequent sections discuss the primary targeted audiences who will receive this information, the key messages that pertain to each of their vested interests and priorities, and methods that will be used to evaluate the success of dissemination efforts.

Dissemination Goals

Short Term Goals

Implementation of a novel training program that the occupational therapy community can leverage to acquire knowledge and skills needed to utilize adaptive gaming equipment in therapy treatment sessions to produce functional gains, regardless of the program participant’s prior knowledge in this area at the start of the program.

Long Term Goals

Game-based interventions are recognized as a viable, effective intervention among public and private insurance providers, occupational therapy profession governing bodies like the American Occupational Therapy Association (AOTA), and commercial gaming manufacturers like Xbox, Nintendo, and PlayStation.

Target Audiences

The primary targeted audience for the key messages of this doctoral project is the occupational therapy community. This includes practicing occupational therapists working with client populations who have sustained injuries or illnesses that impact

functional movement, strength, and range of motion. The secondary audience that the key messages of this doctoral project will benefit consist of leaders in the commercial gaming industry. Specifically, key stakeholders and business executives at commercial gaming companies who have demonstrated prior interest or support in the creation of accessible gaming experiences for players with disabilities will be sought out.

Key Messages for Primary Audience

The following key messages have been created for occupational therapists who are the primary targeted audience members.

1. Approximately 70% of the population in the United States play video games, making gameplay a highly prominent aspect of modern-day culture that serves as a vehicle for finding joy, connection, and a sense of belonging for those who engage (Entertainment Software Association, 2021). In order for the occupational therapy profession to continue to provide client-centered and occupation-based services, a basic understanding of adaptive technology use, specifically in gaming contexts, is critical in ensuring the continued growth and development of our profession as a unique service that promotes independence in all meaningful aspects of a person's life.
2. According to the current body of evidence-based literature, the use of video game-based occupational therapy interventions has shown to have positive impacts on activity tolerance, pain tolerance, client enjoyment, and overall client engagement in therapy sessions (Langan et al., 2018; Levac et al., 2017; Tatla et al., 2015; Thomson et al., 2016). Despite these promising results, the vast

majority of occupational therapists remain unfamiliar with gaming technologies due to a lack of awareness that such technologies exist, a perceived lack of time available to learn new skills, perceived lack of management support in using these technologies with clients, and high costs of necessary equipment.

3. The program created for this doctoral project has been shown to effectively eliminate the primary barriers to gaming adoption through equipment donations paired with occupational therapy-focused modular trainings that efficiently teach program participants with no previous experience in gaming how to leverage gaming technologies during treatment sessions. Therefore, through additional funding and evangelization of this program, larger populations of occupational therapists can easily begin leveraging these technologies in treatment sessions with applicable clients to promote faster, more effective, and more enjoyable functional gains while maintaining the profession's core tenets of providing occupation-based care.

Key Messages for Secondary Audience

Key messages for the secondary audience, which includes gaming industry stakeholders such as business executives at Xbox, would address the following points:

1. Despite the negative sentiment that often surrounds video game culture, evidence-based literature reviews have shown promising insights regarding the highly beneficial role video games can play in promoting health, well-being, and quality of life among the disability community (Jones, 2021; Britnell & Goldberg, 2002). However, primary barriers to video game adoption among therapists and

customers with disabilities alike include high costs and steep learning curves associated with acquiring and using gaming technologies (Hills et al., 2016; Jones, 2021; Levac et al., 2017; Thomson et al., 2016). Dedicated programs that work to reduce costs for these communities in addition to enhanced user documentation and accessibility support can mitigate these barriers, resulting in increased sentiment around the positive effects of gaming, thus elevating the Xbox brand and shedding a new, positive light on the culture of gaming as it exists today.

2. As companies like Xbox look to expand their product reach to as many players as possible, an understanding of currently untapped markets is important. When it comes to people with disabilities or temporary injuries, occupational therapists are often one of the first and sometimes only professionals tasked with introducing assistive technologies and problem-solving independence in technology-related tasks. Direct partnerships with the occupational therapy community that provide games and equipment at reduced costs in return for higher levels of exposure to untapped customer segments who may have been otherwise unaware of Xbox's accessibility ecosystem and capabilities creates a business scenario in which everyone benefits, including the clients with disabilities who can now engage in gaming once again through adaptive set-ups created by their occupational therapists.
3. As Xbox looks to improve current designs and form factors of their existing hardware and game titles, established partnerships with occupational therapists

can serve as a steady source of user feedback for teams across Xbox. Given the direct connections the OT profession has with people with all types of disabilities, ages, and levels of functional performance, this partnership can serve as an easy means of getting unreleased products directly in the hands of actual users with disabilities. These users and their therapists can then provide rich, invaluable feedback on their experiences using the product in order to inform future iterations of the design to ensure the product is accessible to as many players as possible.

Key Message Delivery

Key messages should be delivered to targeted audience members by a spokesperson who is well-known, well-respected and has a track record of being able to influence the perceptions and subsequent actions of relevant audience members. When these key messages are delivered by an established and trusted leader within one's organization, this can help ensure that the message delivery has high visibility and is given serious consideration.

An ideal spokesperson for the primary audience (occupational therapists) would be the president-elect of the American Occupational Therapy Association, Dr. Alyson Stover. Dr. Stover's level of expertise in the occupational therapy community combined with her broader influence on the profession as a whole within the United States will ensure that key messages are broadly shared and well-received.

An ideal spokesperson for the secondary audience (business executives at Microsoft) would be Jenny Lay-Flurrie, the Chief Accessibility Officer at Microsoft.

Jenny is both a leader and driving force of accessibility initiatives across the technology industry as a whole. Additionally, she is a highly respected leader with known familiarity of Microsoft's business priorities, business structure, and overarching roadmap of future accessibility initiatives. Jenny's experience, expertise, and dedication to accessibility make her an ideal candidate to speak to stakeholders about the key messages of this program.

Dissemination Activities and Techniques

Multiple approaches can be taken in disseminating program information and evaluation results to targeted audiences. These approaches include written information via published papers within peer reviewed journals, OT Practice magazines, or AOTA newsletters. The use of electronic media like online continuing education platforms or webinars will also be used. Finally, person-to-person contact approaches like conferences, presentations, and workshops will be leveraged. The following sub-sections identify the dissemination activities and techniques that will be used for primary and secondary targeted audiences.

Primary Target Audience

1. Written Information

- a. The first priority would be publishing a peer-reviewed journal article in a relevant and respected journal like the American Journal for Occupational Therapy (AJOT). Following the conclusion of this program and data insights on its efficacy in eliminating barriers to adoption of gaming technologies, this article will be written and submitted by the founder of

the program. This peer reviewed journal article is a necessary first step in evangelizing the gaming and OT movement through a credible source that can be referenced to in future communications, including those noted below.

- b. Following acceptance of this journal article, a newsletter from AOTA sent to members who have subscribed to email updates or via OT Practice magazine will be prioritized. The newsletter is intended to promote visibility of this new body of knowledge and the practice opportunities that can come of it on a larger, more casual platform. It will provide initial exposure to newsletter readers, as these AOTA members are also likely to visit the AOTA website and attend conferences or online workshops.

2. Electronic Media

- a. Next, presenting this information the AOTA website will be prioritized via a free online academic course available to OTs looking to fulfill their continuing education credits. By creating an online CEU course that discusses the findings of this program evaluation, as well as ways to get started with acquiring gaming technology and how to use it with clients on a platform like AOTA's free CEU offerings, this will ensure wider spread visibility and participation in the course itself. An online course will also be prioritized over in-person conferences or workshops to reach a broader audience than only those able to attend the annual AOTA conference each year.

3. Person-to-person Contact:

Finally, in-person workshops at conferences like AOTA will be prioritized. These hands-on opportunities to learn about evidence-based research supporting gaming use in treatment interventions, as well as actionable steps to acquire and use gaming technologies in practice will allow those who have had initial exposure via online articles or academic courses to ask further questions and expose colleagues and peers who are also in attendance.

Secondary Target Audience

1. Person-to-person Contact:

- a. The secondary target audience of business executives at Microsoft would be more straightforward and would include an initial briefing with the Chief Accessibility Officer on the intended goals of establishing a partnership between Xbox and the occupational therapy community to ensure alignment in priorities and direction.
- b. Next, broader stakeholder meetings with executives within the Xbox organization would be prioritized. These meetings would also be in-person presentations with a slide deck of visuals that support the primary asks and goals being presented.

2. Electronic Media:

- a. Given the confidential nature of current and future Microsoft projects, this information and means of disseminating key information following initial planning must be kept within person-to-person meetings within a small group

of key stakeholders at the company and cannot be shared via newsletters or online documentation, even within the broader internal Microsoft employee community.

Dissemination Activity Budget

Estimated costs for dissemination activities are provided in Table 6. These costs would include video recording personnel, hourly video editing rates, travel and airfare costs, as well as conference registration costs for primary dissemination activities.

Table 6. Dissemination Activity Costs

Dissemination Activity	Budget
Video Recording for CEU Course	\$1,500
Video Editing for CEU course	\$1,000
Conference Registration	\$495
Travel (airfare and hotel)	\$1,500
	Total: \$4,495

There are no anticipated costs for secondary audience dissemination activities, as these types of business-natured conversations can likely occur via online video conferencing platforms and would not require additional travel budgeting.

Evaluation of Dissemination Efforts

When evaluating dissemination efforts, the following criteria will be used to determine how successful the dissemination activities were in driving stakeholder buy-in and support.

Evaluation of Primary Audience Dissemination Activities

Following the implementation of primary audience dissemination activities, the following objective data will be assessed:

- The number of times the peer-reviewed journal article has been cited in other sources 1 year post-publish.
- The number of participants who sign up for the free online continuing education course on AOTA's website throughout the duration of the course being available.
- The number of attendees who participated in the in-person workshop at AOTA national conference.
- Results of a country-wide survey sent by AOTA that gathers metrics on the number of OTs in the United States who are currently regularly using or addressing adaptive gaming with their clients (to be sent prior to all dissemination activities, then 1 year after the conclusion of all dissemination activities for this audience).

Evaluation of Secondary Audience Dissemination Activities

Following the dissemination of key program messages to Chief Accessibility Officer Jenny Lay Flurrie, an occurrence of the following "next steps" will be considered an indication of successful dissemination:

- A follow-up meeting or continued communication to plan "next steps" is requested by Jenny or another Microsoft/Xbox stakeholder.
- A larger dissemination platform in which Jenny can share key messages with broader company stakeholders and relevant teams is scheduled.

- A formal partnership program in Microsoft/Xbox supplies gaming kit equipment at reduced costs in exchange for product promotion and accessibility feedback is created.

Conclusion

The goal of this project is to ultimately increase the number of occupational therapy practitioners who have the necessary skills and confidence needed to address adaptive gaming applications with their clients. This will be achieved by creating a program that addresses primary barriers to OT adoption of gaming equipment and competencies in using said equipment. Following positive outcomes of this program in eliminating barriers to gaming use, the dissemination of these results to key targeted audience members will be critical in carrying out the program for longer periods of time. Given this, the primary targeted audiences for results dissemination include leaders within the American Occupational Therapy Association (AOTA), as well as leaders and business executives at Xbox. Messaging from key stakeholders in the OT community like AOTA will be important in evangelizing the importance and efficacy of this program to ensure further adoption by more OTs. Additionally, establishing partnerships with the creators and manufacturers of the gaming products being used by therapists will be critical in cutting down future program costs and establishing multiple sources of financial and marketing support for this program.

CHAPTER SEVEN – Funding Plan

Executive Summary

The Gaming and Occupational Therapy Adoption Training (G.O.A.T.) Program is designed to address current barriers to gaming technology adoption experienced by occupational therapists. This program focuses on eliminating the following barriers to adoption: 1. lack of research supporting the efficacy of game-based therapy interventions, 2. limited funding to pay for gaming hardware and software, 3. lack of training on use of gaming technologies for clinical applications, and 4. Perceived lack of manager support. This program seeks to mitigate these barriers by providing participants with a donated “starter kit” of gaming hardware and games, and a series of modular learning tutorials that expand participant knowledge and understanding of how to use gaming as a clinical modality. Ultimately, the intent of this program seeks to increase the overall adoption and use of gaming technologies among occupational therapy practitioners. The initial year one pilot program will have about 20 participants. Pending positive results, the program will be re-established in year two expanding the participant count to ~150 OTs.

Local Resources

This program will leverage the following local resources to ensure that efforts are grounded in a community-based approach to drive optimal results:

- **Local volunteers:** Volunteers from the local gaming and disability community can contribute to this program by donating their time to be featured in instructional training videos. By ensuring that real players with disabilities are featured in training content, program participants can gain a realistic perspective of how to

approach creating adaptive gaming set ups for clients with disabilities to address their current functional deficits.

- **Local Merchant Materials:** The Xbox Gaming for Everyone and Social Good teams (located in the greater Seattle area) can contribute by donating gaming hardware such as Xbox consoles, Xbox Adaptive controllers, and basic switch buttons to create ~20 “starter kits.” Additionally, a donation of download codes that provide participants access to a large volume of different games and game genres can be provided.
- **Local Nonprofits:** Local accessibility non-profit organizations can contribute to this program by agreeing to donate adaptive gaming hardware such as analog joysticks.
- **Local Experts:** Local accessibility and occupational therapy experts can contribute to this program by reviewing training content drafts and offering feedback on how to improve the clarity and efficacy of training materials for the intended audience.

Overview of Program Expenses

Budget Item	Year One	Year Two	Cost Justification
• Personnel	Total: \$14,800	Total: \$6,100	
Training Content Author/Instructional Designer	\$50/hour x 80 hours = \$4,000	\$50/hour x 10 hours = \$500	Training content to be written by an experienced subject matter expert versed in instructional design and knowledge transfer. Year two costs minimized to include only minor updates to current training based on program evaluation feedback.
Program Manager	\$50/hour x 40 hours = \$2,000	\$50/hour x 10 hours = \$2,000	Program manager to organize and oversee all workstreams related to program launch including organizing content reviews, managing content upload to web platforms, and scheduling filming sessions.
Film Production Crew (x3)	\$800/video x 8 videos = \$6,400	\$800/video x 3 videos = \$2,700	A crew needed to film instructional videos and edit content. Year two costs reduced to only include additional videos that capture updated console/controller functionalities that did not exist during year one production.
Front-End Web Developer/Software Engineer	\$60/hr x 20 hours = \$1200	\$60/hr x 5 hours = \$300	A dedicated software engineer is needed to create the training website interface, and upload training content (writing and videos) into the website's code.
Researcher	\$60/hour x 20 hours = \$1,200	\$60/hour x 10 hours = \$600	A trained researched in data analysis and statistics is needed to scope research efforts and data collection
• Consultants	Total: \$3,200	Total: \$2,250	
OTs (x5)	\$50/hour x 5 hours x 5 OTs = \$1,250	\$50/hour x 5 hours x 5 OTs = \$1,250	OT consultants are required to "flight" the end-to-end training experience and provide feedback on how it can be improved from a user perspective prior to launch.

Therapeutic Gaming Experts(x3)	\$65/hour x 10 hours x 3 experts = \$1,950	\$65/hour x 5 hours x 3 experts = \$975	Experiences experts in the use of therapeutic gaming are required to provide subject matter expertise level review of training content and validate clinical application information present in the training
• Supplies	Total: \$8,200	Total: \$43,000	
Xbox One S Consoles	\$0 (Donation)	\$250/console x 20 kits = \$5,000	A console host device is preferred over PC gaming given typical hospital/clinical Wi-Fi bandwidth issues.
Xbox Adaptive Controllers	\$0 (Donation)	\$100/controller x 20 kits = \$2,000	The Xbox Adaptive Controller is essential in providing a “hub” that facilitates connection between joysticks and switch button input and controlling gameplay.
Gaming Inputs <ul style="list-style-type: none"> • Joystick • Switches 	Joystick type 1 (\$70 each) x 20 kits = \$1,400 Joystick type 2 (\$70 each) x 20 kits = \$1,400 Switch buttons (\$20 each) x 5 per kit x 20 kits = \$2,000	Joystick type 1 (\$70 each) x 150 kits = \$10,500 Joystick type 2 (\$70 each) x 150 kits = \$10,500 Switch buttons (\$20 each) x 5 per kit x 150 kits = \$15,000	Two joystick form factors (one for patients with limited fine motor control and one for patients with limited gross control) will provide basic coverage to accommodate a wide array of therapeutic applications. Switch buttons are needed so they can be placed in space for patient activation while providing the “just right challenge” to facilitate therapeutic outcomes.
Mounting Equipment	\$85/mounting arm x 2 arms per kit x 20 kits = \$3,400	\$85/mounting arm x 2 arms per kit x 150 kits = \$25,500	Mounting equipment is essential in providing participants with flexibility regarding where in space they can mount switch buttons to optimize “just right challenge” potential based on the patient’s current range of motion.
GamePass Codes	\$0 (donated)	\$30/3 month subscription code x 150 kits = \$25,500	Xbox GamePass is a subscription service similar to Netflix or Hulu but for games. This service will provide participations with access to

			over 150 different games for the duration of the program to ensure they have a means to access games that resonate with each patient's age, interests, cognitive functioning, and level of mobility.
• Communications	Total: \$600	Total: \$1,200	
Participant Coordinator	\$30/hour x 5 hours/week x 4 months = \$600	\$30/hour x 10 hours/week x 4 months = \$1,200	The participant coordinator will manage intake of screener surveys, organize contact lists, and be the primary liaison for all communications between participants and the research team.
• Instruction	Total: \$144	Total: \$144	
Host site for training content	\$12/month x 12 months = \$144	\$12/month x 12 months = \$144	The modular training content will need a host website where it is contained. This website can be accessed via password authentication only.
• Program Evaluation	Total: \$1,338	Total: \$1,338	
Program Evaluation Survey Host	Microsoft 365 Subscription \$12.50/month x 12 months = \$150	Microsoft 365 Subscription \$12.50/month x 12 months = \$150	Microsoft 365 subscription is required in order to access Microsoft Forms – a survey creation platform that allows raw data to be exported to excel.
Data analysis program	IBM SPSS Software x \$99/month x 12 months = \$1,188	IBM SPSS Software x \$99/month x 12 months = \$1,188	Statistical analysis software will be required when analyzing data.
Dissemination Activities			
Video Recording for CEU Course	\$1,500		
Video Editing for CEU course	\$1,000		
Conference Registration	\$495		
Travel (airfare and hotel)	\$1,500		
	Total: \$4,495	Two-year total = \$55,532	Grand total = \$83,814

Funding Sources

Given the visibility and exposure to Microsoft/Xbox Gaming Hardware and Software products that this program will provide participants and their clients, the primary funding source for this program is anticipated to come from Microsoft in the form of corporate donations and corporate grants. If additional funding is required, large game accessibility advocacy and non-profit organizations will be asked to contribute. The primary target for this funding source would include various research grant and funding programs like the Intervention Research Grant Program provided by the American Occupational Therapy Federation (AOTF), crowd sourcing platforms, and research funding from academic institutions like Boston University.

Table 7. Overview of Potential Funding Sources

Grant	Support	Requirements	Deadline
AOTF Intervention Research Grant (IRG) Program	Option 1. \$100,000 Option 2. \$50,000	The primary investigator has a terminal research degree or OTD with advanced research training.	2022-2023 Timeline to be determined
Gamers Outreach	Varies	N/A	N/A
Microsoft/Xbox corporate donation or partnership program	Varies	N/A	N/A
Crowd Sourcing Platforms (Go Fund Me, Kickstarter, etc.)	Varies	N/A	N/A
Boston University - Sargent College Student Research Grant	Awards up to \$5000	N/A	N/A

Conclusion

The goal of this program is to increase the use of gaming, a meaningful occupation for a growing number of current and future clients, in occupational therapy intervention services given evidence-based research supporting the use of game-based interventions in increasing participation, activity tolerance, and overall enjoyment of therapy sessions. Ultimately, this program can be carried out in two phases: an initial pilot exploration study, and a larger follow-up study with significantly more participants for a relatively low cost of about \$82,000 total. This includes cost allocations for dedicated resources such as program managers, instructional designers, and subject matter experts across multiple domains to ensure that the program is provided in a way that best supports the learning, cost, and other support needs of occupational therapy practitioners looking to adopt gaming. While the overall intent of the program is to increase OT adoption of gaming technologies, anticipated halo effects on the overall state of the game accessibility industry are anticipated. Through close partnerships with Microsoft/Xbox for funding and overall program creation, this program also has the potential to serve the needs of both entities through the generation of positive PR around gaming as having positive societal impact among the disability community and accessibility customer feedback in return for Xbox product evangelization and exposure to currently untapped customer markets such as the OT population that will come as part of this partnership.

CHAPTER EIGHT – Conclusion

The intent of this doctoral project was to evaluate the role that increasingly popular technologies like video games play in the provision of occupational therapy services. The evidence captured throughout the course of this project asserts the notion that engagement in gameplay is a highly prevalent occupation among individuals of all ages. This means that occupational therapy practitioners should be knowledgeable and proactive in familiarizing themselves with these technologies in order to address independence goals among clients who consider gaming meaningful.

Further, with age, disability is inevitable. The current generation of young gamers who have grown up with gameplay as a staple of their day-to-day lives will ultimately become the adult and geriatric clients occupying the hospital rooms and outpatient clinic appointments of the near future. A failure to accept and adopt the constantly growing body of technological advancements that many consider a cornerstone in their daily activities means an inability to adequately address the independence goals of all current and future clients. In order to maintain the profession's current status as a client-centered, occupation-based, service that grounds assessment and intervention provision in contemporary and emerging evidence, OT practitioners of all ages and years of experience must demonstrate a general openness and acceptance of the intersection between technology and client care.

The evidence base presented throughout this paper supports this argument, while acknowledging the fact that proper support mechanisms and resources must be established to facilitate this kind of knowledge transfer. The approach taken with this

project was multifaceted. First, a high volume of gaming use and prevalence among national and global populations was established. This type of data was critical in determining specific technologies that are most relevant to current and future client populations. It is simply not feasible for occupational therapists to have a thorough understanding of all modern technologies.

Next, the use of gaming as a viable and effective intervention modality was established. Though very specific results could not be determined due to limited bodies of research and small population sizes, a base establishment of viability and efficacy that asserts implications for further exploration was needed before pursuing this topic further. Additionally, evidence that this type of knowledge is truly lacking among occupational therapist populations was sought out to establish the need for a program that assists in gaming technology knowledge transfer among occupational therapists. Finally, this project sought to identify systemic barriers actively contributing to low knowledge and adoption rates. By identifying the presence of these barriers, an approach to mitigate this issue could be addressed in a well-informed and data-driven manner. The outcomes of this program will ideally drive gaming knowledge and adoption across the profession.

While this project specifically focused on gaming technologies, a similar mindset can be applied to all forms of technology and general advancements in treatment modalities supported throughout recent evidence-based outcomes. Ultimately, the occupational therapy profession must give careful consideration to the ever-changing personal and environmental contexts that influence the lives, and therefore the treatment approaches, taken with our clients.

APPENDIX A – Gaming Kit Components

<p>1 <u>Xbox One S</u></p> 	<p>1 <u>Xbox Adaptive Controller</u></p> 
<p>5 <u>Spec Switches</u></p> 	<p>5 <u>Jelly Bean Switches</u></p> 
<p>2 <u>Micro Lite Switches</u></p> 	<p>2 <u>Mounting Arms</u></p> 
<p>2 <u>Adaptive Joysticks</u></p> 	<p>1 year subscription to <u>Xbox Game Pass</u></p> 

APPENDIX B – Executive Summary

Introduction

The occupational therapy profession provides therapeutic interventions intended to help clients develop, recover, or maintain ways to engage in occupations they find meaningful. In order to perform the core roles and responsibilities of this profession, occupational therapy (OT) practitioners must continuously acquire knowledge that supports their ability to provide client-centered, occupation-based, and outcome-oriented care (American Occupational Therapy Association, 2021). Today, acknowledging the role that technology plays in a client’s ability to engage in meaningful occupations is critical in providing this quality of care. The presence of gaming technologies specifically has exponentially grown in both the United States and global communities within the past 10 years. In 2021, there were nearly 227 million Americans who play video games regularly, including two thirds of adults, and nearly three quarters of children under 18 (Entertainment Software Association, 2021). Further, a large body of evidence-based research exists today supporting the use of game-based therapy sessions in producing higher levels of client engagement and enjoyment, prolonged activity tolerance, and increased pain tolerance as compared to traditional therapy modalities like dumbbells, arm bikes, and other exercises that are not occupation-based (Aramaki, et al., 2019; Jung et al., 2020; Colder Carras et al., 2018).

Given these insights, a deeper understanding of commercial gaming technologies and the ways in which gameplay experiences can be adapted or altered via assistive technologies by occupational therapy practitioners to enable gameplay despite the onset

of injury or illness is crucial to the growth of the profession. Similarly, this deeper understanding of commercial gaming technologies is critical in enabling the use of game-based therapeutic modalities during client treatment sessions, allowing therapists and clients alike to reap the benefits of prolonged activity, tolerance, heightened engagement, and increased enjoyment during otherwise painful or monotonous therapeutic exercises.

Despite the promising clinical and professional benefits that come with increased knowledge and understanding of the gaming space, occupational therapy practitioners in the United States remain largely unaware of how gaming technologies work, how they can support clients in engaging in gameplay despite injury or illness, and how gaming technologies can be leveraged in treatment sessions to optimize therapeutic outcomes (Liu, 2015; Bulmaro et al., 2018; Levac et al., 2017, Glegg & Levac, 2018; Seifert, et al., 2017). This lack of knowledge, however, can be largely attributed to systematic barriers that prevent OTs from acquiring gaming devices and locating specialized training resources regarding the use of gaming technologies in the context of safe and effective client care (Jones, 2021). Therefore, the goal of this project was to create a program that reduces or eliminates the barriers OTs commonly face when attempting to acquire the equipment and knowledge needed to adopt gaming technologies into their scope of practice.

Overview of Key Findings

Previous related studies examined the efficacy of game-based interventions on various aspects of targeted functional outcomes (Liu, 2015; Bulmaro et al., 2018; Levac et al., 2017, Glegg & Levac, 2018; Seifert, et al., 2017). Given the promising foundation

established in this research, this project instead focused on exploring the current state of gaming knowledge and adoption among occupational therapists in the United States.

With preliminary findings showing relatively low adoption rates of gaming technology and general gaming knowledge among OTs, the remainder of this project's research then focused on identifying potential barriers likely contributing to this lack of gaming technology and knowledge acquisition among occupation therapists (Levac et al., 2017, Glegg & Levac, 2018). From this research, the primary barriers identified by occupational therapy practitioners included:

- High costs of gaming devices, controllers, and games not supported via clinic budgets.
- Lack of readily available and easily discoverable training on the use of gaming technologies in a therapeutic environment.
- Perceived lack of time to dedicate to learning gaming technologies.
- Perceived lack of support from management or peers regarding the active use of gaming in a clinic setting (Jones, 2021).

Given these factors, additional research aimed to identify applicable learning theories that would best guide the creation of educational training materials on gaming technologies needed to alleviate applicable barriers to gaming adoption experienced by OTs discussed previously. The Cognitive Flexibility Theory was chosen based on research exploration results. The Cognitive Flexibility Theory focuses on the notion that learning materials should be presented in a way that facilitates the learner's ability to structure information learned in adaptive ways to mitigate changing situational demands.

Learning materials are presented through multiple channels and perspectives, including case studies that capture different implication contexts (Jonassen, et al., 1992; Spiro, et al., 1988).

The Program

The Gaming and Occupational therapy Adoption Training (G.O.A.T.) program is intended to increase occupational therapy practitioners' knowledge, competence, and overall confidence in using video games in practice for client leisure or functional outcome purposes. The primary elements of this program work to directly reduce or eliminate barriers to gaming adoption most cited among occupational therapists. This is accomplished through the following program components:

- **Barriers related to cost:** Program participants receive a fully funded or reduced cost “gaming kit” that contains necessary hardware components (game console, controllers, adaptive buttons, and switches) and software components (games, subscription services) to address barriers associated with high equipment costs.
- **Barriers related to Management and Peer Support:** Program participants receive online documentation and reports outlining the current prevalence of gaming as a meaningful occupation among many clients. Additionally, they receive a literature review of evidence-based practice supporting the use of games in therapeutic interventions to produce more effective client outcomes that can be shared with the participant's management and peers to increase knowledge and support.

- **Barriers related to lack of time, available training, and resources on therapeutic applications of gaming in OT:** Program participants are given access to a modular online training system that can be viewed at their discretion and is easily navigated via indexed topics to address barriers associated with lack of available training and lack of time to dedicate to learning gaming technologies. The following modules are intended to promote knowledge transfer that drives participant competence and confidence in performing key tasks related to gaming use with clients:
 1. Basic set-up and troubleshooting of gaming consoles
 2. Overview of software-based assistive technologies provided by the console platform to support client's needs (Screen Readers, Colorblind Filters, Audio Settings, Caption Settings, and more)
 3. Overview of hardware-based assistive technologies required for physical access to gaming inputs for clients with limited mobility (switch buttons, adaptive joysticks, mounting equipment, Xbox Adaptive Controller).
 4. Overview of game titles and genres optimized for adaptive or therapeutic play
 5. Action Module: Creating a comprehensive adaptive gaming configuration for individual clients that enables gameplay for leisure
 6. Action Module: Creating a comprehensive adaptive gaming configuration for clients that challenge clients to perform repetitive tasks or exercises via gaming input to ultimately address the targeted functional outcomes of an

individual client

The final component of the program includes a research-based evaluation plan to determine the efficacy of program components in ultimately increasing the adoption of gaming familiarity and use among occupational therapists. The program evaluation study includes a pre-post test design that asks participants to rate their perceived competence and confidence in performing a multitude of tasks and behaviors related to the use of gaming and client care. Additionally, opportunities to provide free-response feedback on how the program can be improved will be provided.

Recommendations

In order to scale this program to larger occupational therapy audiences and sustain the acquisition of gaming equipment to be included in the “gaming kits”, a partnership with large gaming technology companies like Xbox is recommended. These partnerships can work to establish a reciprocal relationship between the two parties in which games and equipment can be donated or provided at a reduced cost to program participants. In return, occupational therapy participants can provide invaluable research insights based on their clients’ experiences as they interact with the companies’ products and services. These insights can be leveraged by the company to inform the creation of more accessible products and experiences. Additionally, additional research on the efficacy of game-based interventions in promoting a variety of functional client outcomes that uses modern technologies such as the Xbox Adaptive Controller and novel game titles with enhanced accessibility options and customization abilities is needed (Sosa et al., 2019; Jung et al., 2020, Aramaki et al., 2019; Lopes et al., 2018). However, such studies are dependent on

expanding the current number of occupational therapists who have access to and knowledge of how to use these new technologies with clients.

General Conclusions

The current body of evidence-based research supports the use of gaming technologies as a meaningful occupation among many that can be used as a therapeutic modality to promote functional outcomes. When used, many clients report higher levels of enjoyment and experience prolonged activity and pain tolerance. Despite these insights, many occupational therapy practitioners face systemic barriers to adopting gaming technologies into their practice. This program works to reduce those barriers to achieve the goal of increasing OT adoption of gaming technologies to maintain the profession's core tenets of providing client-centered, occupation-based, and evidence-based care.

APPENDIX C – Fact Sheet



The Gaming and Occupational Therapy Adoption Training Program (G.O.A.T.)

Kaitlyn Jones, MS, OTR/L
OTD Candidate



The **Gaming and Occupational Therapy Adoption Training (G.O.A.T.)** Program is multifaceted, and works to support the following goals:

1. The promotion of engagement in videogame play among clients with disabilities as an **effective treatment modality** in producing positive outcomes related to aspects of functional performance, mental health, and quality of life.
2. The elimination of cost-related barriers associated with acquiring gaming equipment through **the donation of modern gaming technologies** (game consoles, controllers, games, and gaming-related assistive technologies) to occupational therapy practitioners.
3. The provision of an **Occupational Therapy (OT)-focused online training program**. Upon completion of the program, OT practitioners will have acquired the game-related knowledge and skillsets needed to successfully implement game-based treatment interventions in their daily practice.



(Source: Michigan Medicine)



Video Gaming Prevalence At-a-Glance

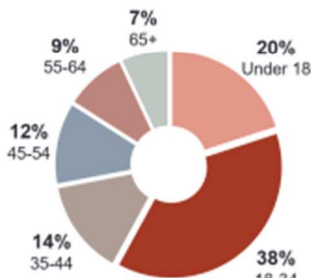
A staple of modern-day culture; A meaningful occupation for current and future clients...

\$200 billion industry

~450 million gamers with disabilities globally

>2 of 3 Americans play games

226.6 million players across all ages in the US



U.S. Gamers by Age (2021)

Top reasons for playing



(Entertainment Software Association, 2021)

Impact on the provision of occupational therapy services

Core responsibilities of the occupational therapy profession require the provision of client-centered, occupation-based, outcome-orientated care (AOTA, 2021). OT adoption of game-based interventions support these core responsibilities in the following ways:

- **Client-Centered:**
 - ✓ With millions of game titles available, clients can easily choose their preferred games or genres to be used throughout treatment sessions.
 - ✓ Engagement in gameplay has been shown to positively impact a multitude of client factors, ultimately producing holistic benefits that can increase overall quality of life.
- **Occupation-Based:**
 - ✓ Data on gameplay prevalence supports the classification of gaming as a meaningful occupation to a vast majority of current and future clients. Therefore, familiarity with these technologies is crucial in providing occupation-based treatments and supporting client access to leisure and social participation activities related to gaming.
- **Outcome Oriented:**
 - ✓ Evidence-based research supports the use of game-based interventions in promoting the following benefits, resulting in quicker, more effective overall functional outcomes (as compared to traditional, non-gaming interventions):
 - Higher levels of client engagement and enjoyment during therapy sessions
 - Prolonged activity tolerance
 - Increased pain tolerance

(Aramaki, et al., 2019; Jung et al., 2020; Colder Carras et al., 2018)

Program Components

Application Process: Complete the program's intake form in which you will provide information about your current client population, and agree to participate in future survey-based feedback tools regarding your experiences with learning and using gaming technologies.

"Gaming Kits"

If selected, you'll receive the following "gaming kit" funded by Team Xbox, grants, and donations.



Training Modules

1. Literature Review
2. Gaming 101: Basics of Console Set-up and Gameplay
3. Adaptive Gaming Hardware Overview
4. Adaptive Gaming Software Overview
5. Therapeutic Applications: Use of Gaming Scenarios to Promote Functional Outcomes
6. Documentation: Ensure your Game-Based Session is Reimbursable by Insurance

Scan the QR Code for References and Further Reading Materials



APPENDIX D – Research Survey

*This survey contained multiple logic-based scenarios in which the participant's answer to a previous question dictated future questions presented to ensure that data gathered was relevant to the participant's actual experience. The following list includes *all* potential survey questions participants could have been presented and does not reflect the order or scope of questions that actual participants may have received based on logic formulas.

What setting do you currently work in as an occupational therapist?

*Note: If your typical work setting or client population has been changed due to COVID-19, please respond to the following questions in the context of what your typical work environment, client populations, etc. were **prior** to COVID-19.

- School-based
- Private Practice/Clinic
- Hospital – Acute Care/ICU
- Inpatient Rehabilitation
- Skilled Nursing Facility
- N/A – I am not currently an occupational therapist
- N/A - I am not currently practicing with clients (in academia, changed roles, retired, etc.)

How long have you been practicing occupational therapy?

- New Graduate
- 2-3 years
- 4-7 years
- 8-11 years
- 12-15 years
- 16+ years

What client populations or diagnoses do you currently work with? (Please check all that apply)

- Pediatrics
- Geriatrics
- Neuro Rehabilitation
- Orthopedic
- Brain Injury
- Spinal Cord Injury
- Other (Free Response)

Have you ever used game-based technologies during treatment sessions with your clients? (Examples include - but not limited to: Nintendo Wii, Xbox, Xbox Kinect,

iPad/Tablet games & apps, Virtual Reality devices, Rehabilitation-specific technologies with gamification nature)

- Yes
- No

Which of the following game-based technologies have you used with clients **in the past?** (Please check all that apply).

- Nintendo Wii
- Nintendo Wii + Balance Board
- Xbox 360, Xbox One, Xbox Series X|S
- Xbox Adaptive Controller
- Custom-modified game controllers
- iPad/Tablet Games
- Playstation
- Nintendo Switch Games
- Rehab-specific technologies with gamification nature that are only available to healthcare professionals for purchase such as those on or similar to this list: <https://www.neurorehabdirectory.com/product-category/virtual-reality-exercise-games/>
- PC/Computer Games
- Other (Free Response)

Please check all applicable factors that you feel contributed to **why you no longer use gaming in practice?**

- Equipment was broken
- Equipment was stolen/lost
- Lack of management support
- Too much effort and/or time for set-up
- Lack of space for gameplay and/or storage
- The technology was getting updated or becoming obsolete too quickly
- Lack of interest from client population
- Lack of efficacy
- Other (Free Response)

Are there any gaming technologies that you wish to use **in the future** but have not yet acquired or used with clients?

- Yes
- No

Which of the following game-based technologies would you be interested in exploring to use with clients **in the future?** (Please check all that apply)

- Nintendo Wii
- Nintendo Wii + Balance Board
- Xbox 360, Xbox One, Xbox Series X|S

- Xbox Adaptive Controller
- Custom-modified game controllers
- iPad/Tablet Games
- Playstation
- Nintendo Switch Games
- Rehab-specific technologies with gamification nature that are only available to healthcare professionals for purchase such as those on or similar to this list: <https://www.neurorehabdirectory.com/product-category/virtual-reality-exercise-games/>
- PC/Computer Games
- Other (Free Response)

Can you please rank the level of impact in which you perceive the following factors had on why you **have NOT** yet used these technologies?

No Impact	Little Impact	Moderate Impact	High Impact	Significant Impact
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Scale:

Items:

- Cost of necessary gaming equipment
- Ease of Use (therapist learning, set-up, teaching patients, etc.)
- Availability of training resources on how to use the technology
- Lack of time to learn the new technology
- Perceived efficacy of the technology on client outcomes
- Presence of evidence-based research supporting the efficacy of the technology on specific client outcomes
- Perceived space requirements to use the technology in practice
- Perceived level of support from management
- Fear of denial of insurance reimbursement costs for treatment sessions using gaming technology
- Perceived lack of interest in game-based treatment sessions among my primary client populations
- Perceived level of support from peers, coworkers, other therapists in the clinic, etc.

Do you currently use game-based technology with clients during treatment sessions?

- Yes
- No

Which of the following game-based technologies do you **currently** use with clients? (Please check all that apply).

- Nintendo Wii
- Nintendo Wii + Balance Board
- Xbox 360, Xbox One, Xbox Series X|S
- Xbox Adaptive Controller
- Custom-modified game controllers
- iPad/Tablet Games
- Playstation
- Nintendo Switch Games
- Rehab-specific technologies with gamification nature that are only available to healthcare professionals for purchase such as those on or similar to this list: <https://www.neurorehabdirectory.com/product-category/virtual-reality-exercise-games/>
- PC/Computer Games
- Other (Free Response)

How did you/your clinic, hospital, etc. acquire the gaming hardware, controllers, games, and any other necessary equipment that you **currently** use? (Please check all that apply)

- Personal donation (I bought the equipment myself)
- Donation from another organization (i.e. charity organization, non-profit, or for-profit group)
- Equipment covered by clinic budget
- Grant awarded funding
- Other (Free Response)

How often do you use game-based interventions with clients?

- Daily
- 2-4 times a week
- Weekly
- Bi-weekly
- Monthly
- Other (Free Response)

What specific client outcomes do you target when using gaming technologies during treatment sessions (Please check all that apply)

- Strength
- Range of Motion
- Fine Motor Skills
- Attention
- Cognition (Memory, Processing, Decision-making, etc.)
- Vision (Visual Tracking, Visual Processing, etc.)
- Hand-eye Coordination
- Mental Health

- Other (Free Response)

In general, did you find any evidence that game-based therapeutic interventions resulted in improved client outcomes?

- Yes - I observed (empirically or anecdotally) improvements in my client's targeted goals
- Yes - I observed (empirically or anecdotally) improvements in client outcomes, however, they were subsidiary to the client goals I was targeting with the game-based interventions.
- Maybe - Improvements were made but I am unsure whether or not the game-based interventions specifically facilitated these improvements
- No - I did not experience any improvements in client outcomes using game-based interventions
- Other (Free Response)

Did you document your gaming sessions as reimbursable time for a treatment session?

- Yes - I actively use and bill insurance for game-based interventions during client treatment sessions
- No - Gaming technologies are used outside of "treatment" time for programs like "computer groups," "adaptive gaming groups," "leisure exploration groups," etc.
- Other (Free Response)

Are there any gaming technologies that you wish to use **in the future** but have not yet acquired or used with clients?

- Yes
- No

Which of the following game-based technologies would you be interested in exploring to use with clients **in the future**? (Please check all that apply)

- Nintendo Wii
- Nintendo Wii + Balance Board
- Xbox 360, Xbox One, Xbox Series X|S
- Xbox Adaptive Controller
- Custom-modified game controllers
- iPad/Tablet Games
- Playstation
- Nintendo Switch Games
- Rehab-specific technologies with gamification nature that are only available to healthcare professionals for purchase such as those on or similar to this list: <https://www.neurorehabdirectory.com/product-category/virtual-reality-exercise-games/>
- PC/Computer Games
- Other (Free Response)

Can you please expand upon your current perceptions or feelings toward the implementation of game-based technologies in occupational therapy practice or any other additional information you feel would provide valuable insights regarding this topic?
[Open Response]

APPENDIX E – Program Evaluation Research Questions

Sample Survey Questions

Please rank your answers on a scale from 1 (extremely unconfident) to 10 (extremely confident) for the following questions:

1	2	3	4	5	6	7	8	9	10
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Extremely Unconfident			Neutral				Extremely Confident		

Question 1: How confident are you in your ability to set up, connect, and power on the equipment in your gaming kit (Xbox Console, Xbox adaptive controller, adaptive joysticks, switch buttons).

Rationale: The inclusion criteria for participants states that they must not have used gaming with clients in the past regardless of awareness or desire to do so without action. This question assesses the participant’s baseline familiarity with setting up the standard Xbox equipment needed before adaptive control set-ups that promote functional movements can begin. This baseline can also be an important variable to consider when determining efficacy of learning materials on participants. If participants have previous familiarity with using game consoles in general, it could give them an advantage when it comes to learning about adaptive gaming.

Question 2: How confident are you in your ability to choose and download appropriate games for your client-base for use in treatment sessions?

Rationale: While the physical set up of gaming hardware is one half of the knowledge base needed, the other is a familiarity with different game genres, and the ability to identify games that are appropriate for use in therapeutic gaming activities. For example, some games may be far too easy for a client and not provide a “just-right challenge,” while other games that are more complex may be far too difficult in general, let alone for use in therapy and can lead to frustration and minimal “activity tolerance” challenge if the player’s character dies every couple of minutes. Information about properly choosing games is covered in the intervention training. This question, when pre and post survey scores are analyzed, would provide insights on that aspect of the training.

Question 3: How confident are you in your ability to choose and connect appropriate adaptive inputs (switches and joysticks) to provide basic access to gameplay for your clients?

Rationale: The other half of the challenge is, as mentioned, the ability to take a wide array of switch buttons and adapted joysticks, connect them to the Xbox adaptive controller, and set these inputs up in a way that allows individuals with limited mobility in one or both upper extremities to engage in the same gameplay that those with fully functioning hands and high levels of dexterity can while using a standard controller. This often means determining where and how these inputs should be mounted. For example, if a player cannot use their right hand at all, can the buttons typically activated by a player's right hand be mounted by the player's head, foot, etc. so gameplay can still be engaged? Visualizing and understanding the foundational basis of this task is the first step in ensuring therapists can then begin to slightly adjust or move inputs in space in a way that promotes "exercise" as part of the intervention. For example, if the participant OT can determine that placing two buttons on a table directly in front of the player will allow them to "jump" and "fire" in the game, the next step would be potentially moving these buttons further away and wider apart from the player, making them practice weight shifting and dynamic balance as they are reaching to press the buttons during active gameplay if balance is currently the functional outcome being targeted.

Question 4: How confident are you in your ability to set up adaptive inputs for use with a client to target functional outcomes?

Rationale: This question is essentially the "follow-up" to the previous question outlined above. This question gauges understanding beyond basic knowledge of joystick and switch set-up and placement but targets the therapist's ability to further adapt their knowledge and use these inputs to promote functional movements that their client currently needs to improve.

Question 5: How confident are you in your ability to document the use of game-based interventions in a manner that will be reimbursable by most insurance providers?

Rationale: Based on the preliminary survey for this program that asked therapists about their main barriers to tech and gaming adoption, fear of insurance reimbursement denial was very high. Part of the training kit also includes a module about documentation of game-based therapy interventions to address these fears and help participants document their use in a way that is accurate but also is more likely to be approved. Comparing pre and post intervention scores for this question will provide visibility on how effective that aspect of the training was.

Question 6: How confident are you in your ability to use game-based interventions with your clients?

Rationale: This question is added to assess reliability and validity of past answers. It also asks participants to think about the holistic process instead of the individual components identified in previous questions and may likely provide additional insights.

APPENDIX F – Learning Module Index of Topics

Index of Learning Module Topics:

Module 1: Understanding the Clinical Implications

- Full Literature Review of Game-Based Intervention Research
- Condensed Summary of Literature Review Findings
- Tips And Approaches for Discussing Gaming Applications with Management and Peers
- Documentation And Insurance Reimbursement Implications

Module 2: Intro to Gaming Hardware

- Set-Up Your Console
- Connect Controllers
- Connecting To the Internet
- Common Hardware Troubleshooting And FAQ
- Intro To Mounting Arms and Other Mounting Equipment

Module 3: Intro to Gaming Software

- Available Settings on Your Console
 - General Settings and Their Functions
 - Accessibility Settings and Their Functions
- Intro To Game Genres and Game Types
 - Racing Games
 - Role-Playing Games
 - Turn-Based Games
 - First-Person Shooter Games
 - Sports Games
 - Survival Games
 - Platform Games
- Intro To Game Accessibility Settings and Applications
 - Locating A Game’s Accessibility Settings Menu
 - Common Accessibility Settings
- Intro To Gamepass
 - What Is Gamepass
 - How Do I Use Gamepass

Module 4: Using the Xbox Adaptive Controller

- Intro To the Xbox Adaptive Controller
 - Controller Ports – 3.5mm
 - Controller Ports – USB
 - Creating A User Profile
 - Using Co-Pilot with The Xbox Adaptive Controller

- Xbox Adaptive Controller Assistive Technologies Overview
 - Switch Buttons
 - Adaptive Joysticks
- Xbox Adaptive Controller Remapping Settings Overview
 - Basic Remapping
 - Legacy Mode
 - Swap Or Inverse Joystick Axis
 - Adjust Stick Sensitivity Curve
 - Adjust Dead Zones

Module 5: Clinical Applications for Gaming Access

- Choosing Appropriate Games for A Client
- Determining Key Game Functions
- Assessing Client Functions in Gaming Contexts
 - Client Movement
 - Client Endurance
 - Client Comfortability
 - Client Social Needs
- Determining Hardware Set-Up
 - Choosing Assistive Technologies
 - Mounting Options
 - Positional Adjustments

Module 6: Clinical Applications for Therapeutic Gaming

- Establishing Functional Movement Goals
- Choosing Proper Games
- Determining Appropriate Assistive Technology Set-Ups
- Grading the Activity

APPENDIX G – Follow-Up Interview Questions

1. Why are you interested in being part of this study?
2. What is the primary population of clients you work with?
3. Please describe your prior experience with gaming in both the therapeutic context as well as personal leisure contexts.
4. How many treatment sessions per week do you feel as though you'd be able to feasibly use gaming within your practice setting?

REFERENCES

- AbleGamers. (n.d.). *Our mission*. The AbleGamers Charity. Retrieved December 22, 2021 from <https://ablegamers.org/impact/>
- American Association of Occupational Therapy (2019). *2019 AOTA Annual Conference and Expo on-site guide*. AOTA. 2019-annual-conference-onsite-guide.pdf (aota.org)
- American Association of Occupational Therapy (2022). *2022 AOTA Annual Conference and Expo on-site guide*. AOTA. Sessions | AOTA INSPIRE
- American Occupational Therapy Association (2021). AOTA 2021 standards for continuing competence in occupational therapy. *American Journal of Occupational Therapy*, 75(Suppl. 3), 7513410040.
<https://doi.org/10.5014/ajot.2021.75S3009>
- American Occupational Therapy Association. (2017). Vision 2025. *American Journal of Occupational Therapy*, 71, 7103420010. <https://doi.org/10.5014/ajot.2017.713002>
- American Occupational Therapy Association. (2020). Occupational therapy practice framework: Domain and process (4th ed.). *American Journal of Occupational Therapy* 74(Supplement_2), 29–67. <https://doi.org/10.5014/ajot.2020.74S2001>
- American Occupational Therapy Association. (n.d.). *Continuing education: Online courses*. Retrieved December 22, 2021 from <https://www.aota.org/Education-Careers/Continuing-Education/AOTACE/Online>

- Anderson, M. & Perrin, A. (2017). *Tech adoption climbs among older adults*. Pew Research Center. PI_2017.05.17_Older-Americans-Tech_FINAL.pdf (pewresearch.org)
- Annema, J., Verstraete, M., Abeelee, V. V., Desmet, S., & Geerts, D. (2010). Video games in therapy: A therapist's perspective. *International Journal of Arts and Technology* 6(1), 94–98. <http://dx.doi.org/10.1145/1823818.1823828>
- Aramaki, A. L., Sampaio, R. F., Reis, A., Cavalcanti, A., & Dutra, F. (2019). Virtual reality in the rehabilitation of patients with stroke: An integrative review. *Arquivos de Neuro-Psiquiatria*, 77(4). 268–278. <https://doi.org/10.1590/0004-282X20190025>
- Bányai, F., Griffiths, M.D., Király, O. (2019). The psychology of Esports: A systematic literature review. *Journal of Gambling Studies* 35, 351–365. <https://doi-org.ezproxy.bu.edu/10.1007/s10899-018-9763-1>
- Belchior, P., Yam, A., Thomas, K., Bavelier, D., Ball, K., Mann, W., & Marsiske, M. (2019). Computer and video game interventions for older adults' cognitive and everyday functioning. *Games for Health Journal* 8(2), 129-143. <https://doi.org/10.1089/g4h.2017.0092>
- Bigelius, U., Eklund, M., & Erlandsson, L. (2009). The value and meaning of an instrumental occupation performed in a clinical setting. *Scandinavian Journal of Occupational Therapy*, 17, 4–9. <https://doi.org/10.3109/11038120802714880>
- Britnell, S., Goldberg, J. (2002). The Relationship Between Engagement in Meaningful Activities and Quality of Life in Persons Disabled by Mental Illness.

Occupational Therapy in Mental Health. 18(2), 17–44.

https://doi.org/10.1300/J004v18n02_03

Bulmaro, V., Glegg, S., Lambert, N., Schneider, A., Barnard, R., Lohse, K., Hoens, A.,

Van der Loos, M. (2018). Application of commercial games for home-based rehabilitation for people with hemiparesis: Challenges and lessons learned. *Games for Health Journal* 7(3). 197–208. <https://doi.org/10.1089/g4h.2017.0137>

Child's Play. (n.d.). *About us*. Retrieved December 22, 2021 from

<https://www.childsplaycharity.org/site/about>

Colder Carras, M., Kalbarczyk, A., Wells, K., Banks, J., Kowert, R., Gillespie, C.,

Latkin, C. (2018). Connection, meaning, and distraction: A qualitative study of video game play and mental health recovery in veterans treated for mental health and/or behavioral health problems. *Social Science & Medicine* 216(10), 124–132.

<http://dx.doi.org.ezproxy.bu.edu/10.1016/j.socscimed.2018.08.044>

ContinuED (n.d.) *CEU courses for OTs search: 'video game.'* Occupationaltherapy.com.

Retrieved December 22, 2021 from <https://www.occupationaltherapy.com/ot-ceus/all/#/term:video%20game>

Craig Hospital. (n.d.). *Adaptive Gaming Resources*. Retrieved December, 22, 2021 from

<https://craighospital.org/services/assistive-technology/assistive-tech-gaming-resources>

Davis, S. (n.d.). *Use of games in occupational therapy* [PowerPoint Slides]. University of

North Carolina. <http://www.cs.unc.edu/Courses/comp585-s15/Research/OccupationalTherapy.pdf>

- Duggan, M., (2015). *Gaming and gamers*. Pew Research Center.
<http://www.pewinternet.org/2015/12/15/gaming-and-gamers/>
- Eakman, A. M., & Eklund, M. (2010). Reliability and structural validity of an assessment of occupational value. *Scandinavian Journal of Occupational Therapy*, 18(3), 231–240. <https://doi:10.3109/11038128.2010.521948>
- Entertainment Software Association. (2020). *2020 essential facts about the video game industry*. Final-Edited-2020-ESA_Essential_facts.pdf (theesa.com)
- Entertainment Software Association. (2021). *2021 essential facts about the gaming industry*. <https://www.theesa.com/wp-content/uploads/2021/08/2021-Essential-Facts-About-the-Video-Game-Industry-1.pdf>
- Erlandsson, L., Eklund, M., & Persson, D. (2010). Occupational value and relationships to meaning and health: Elaborations of the ValMO-model. *Scandinavian Journal of Occupational Therapy*, 18(1), 72–80.
<https://doi.org/10.3109/11038121003671619>
- Gaimin Staff. (2019, October 17). How Many Gamers Are There? Retrieved May 03, 2020, from <https://gaimin.io/how-many-gamers-are-there/>
- Gamers Outreach. (n.d.). *Hospital waiting list*. Retrieved December 22, 2021 from <https://gamersoutreach.org/hospital-waiting-list/>
- Gera, E. (2013, October 21). Wii no more: Nintendo halts production of system. *Polygon*.
<https://www.polygon.com/2013/10/21/4861464/wii-no-more-nintendo-halts-production-of-system>

- Gleeson, S. (2017). *Regaining lost function with the help of video games*. Michigan Health. Retrieved December 22, 2021 from <https://healthblog.uofmhealth.org/health-management/regaining-lost-function-help-of-video-games>
- Glegg, S., Holsti, L., Velikonja, D., Ansley, B., Brum, C., Sartor, D. (2013). Factors influencing therapist's adoption of virtual reality for brain injury rehabilitation. *Games for Health Journal* 16(5). 385–401. <https://doi.org/10.1089/cyber.2013.1506>
- Glegg, S., Levac, D. (2017). Enhancing clinical implementation of virtual reality: An evidence-based perspective and call to action. *International Conference on Virtual Rehabilitation (ICVR)*1–7. <https://doi.org/10.1109/ICVR.2017.8007488>
- Gough, C. (2019, September 18). U.S. average age of video gamers 2019. Retrieved May 03, 2020, from <https://www.statista.com/statistics/189582/age-of-us-video-game-players- since-2010/>
- Granic, I., Lobel, A., Engels, C.M.E. (2014). The benefits of playing video games. *American Psychologist* 69(1), 66–78. <https://doi.org/10.1037/a0034857>
- Hills, C., Ryan, S., Smith, D. R., Warren-Forward, H., Levett-Jones, T., & Lapkin, S. (2016). Occupational therapy students' technological skills: Are 'generation Y' ready for 21st century practice? *Australian occupational therapy journal*, 63(6), 391–398. <https://doi.org/10.1111/1440-1630.12308>

- Huff, G. (2020, October 20). *The Nintendo Switch was announced four years ago as of today*. DualShockers. The Nintendo Switch Was Announced Four Years Ago as of Today (dualshockers.com)
- Iruthayarajah, J., McIntyre, A., Cotoi, A., Macaluso, S., & Teasell, R. (2017) The use of virtual reality for balance among individuals with chronic stroke: A systematic review and meta-analysis. *Topics in Stroke Rehabilitation*, 24(1), 68–79.
<https://doi.org/10.1080/10749357.2016.1192361>
- Johansen, T., Strom, V., Simic, J., & Rike, P. (2020). Effectiveness of training with motion-controller commercial video games for hand and arm function in people with cerebral palsy: A systematic review and meta-analysis. *Journal of Rehabilitation Medicine* 51(1), 1–10. <https://doi.org/10.2340/16501977-2633>
- Jonassen, D., Ambruso, D. & Olesen, J. (1992). Designing hypertext on transfusion medicine using cognitive flexibility theory. *Journal of Educational Multimedia and Hypermedia*, 1(3), 309–322.
- Jones, K. (2021). [Unpublished raw data from a survey about the use of gaming among occupational therapists]. Boston University.
- Jones, K., Coté C. (2019). Adapted Video-Game Controller Use Following Upper-Extremity Injury and Amputation: From Fun to Functional! *American Journal of Occupational Therapy*, 73(4_Suppl_1), 7311505089p1.
<https://doi.org/10.5014/ajot.2019.73S1-PO2005>
- Jorgensen, M. G., Laessoe, U., Hendriksen, C., Nielsen, O. B., & Aagaard, P. (2012). Efficacy of Nintendo Wii Training on Mechanical Leg Muscle Function and

Postural Balance in Community-Dwelling Older Adults: A Randomized Controlled Trial. *The Journals of Gerontology. Series A: Biological Sciences and Medical Sciences*, 68(7), 845–852. <https://doi.org/10.1093/gerona/gls222>

Jung, S., Song, S., Lee, D., Lee., K., Lee., G. (2020). Effects of Kinect video game training on lower extremity motor function, balance, and gait in adolescents with spastic diplegia cerebral palsy: A pilot randomized controlled trial. *Developmental Neurorehabilitation* 24(3) 159–165. <https://doi.org/10.1080/17518423.2020.1819458>

Langan, J., Subryan, H., Nwogu, I., & Cavuoto, L. (2018). Reported use of technology in stroke rehabilitation by physical and occupational therapists. *Disability and Rehabilitation: Assistive Technology*, 13(7), 641–647. <https://doi.org/10.1080/17483107.2017.1362043>

Levac, D., Glegg, S., Colquhoun, H., Miller, P., & Noubary, F. (2017). Virtual reality and active videogame-based practice, learning needs, and preferences: A cross-Canada survey of physical therapists and occupational therapists. *Games for Health Journal* 6(4), 217–228. <http://doi.org/10.1089/g4h.2016.0089>

Liu, L., Cruz, A.M., Rios Rincon, A., Buttar, V., Ranson, Q., Goertzen, D. (2015) What factors determine therapists' acceptance of new technologies for rehabilitation: A study using the Unified Theory of Acceptance and Use of Technology (UTAUT), *Disability and Rehabilitation*, 37(5), 447–455. <https://doi.org/10.3109/09638288.2014.923529>

- Lopes, S., Magalhaes, P., Pereira, A., Martins, J., Chaleta, E., Rosario, P. (2018). Games used with serious purposes: A systematic review of interventions in patients with cerebral palsy. *Frontiers in Psychology* 9(1712), 1–12.
<https://doi.org/10.3389/fpsyg.2018.01712>
- Medbridge. (n.d.) *Occupational therapy courses*. Retrieved December 22, 2021 from
<https://www.medbridgeeducation.com/course-catalog/#/occupational-therapy>
- Microsoft. (n.d.). *Xbox adaptive controller faq*. Xbox Support.
<https://support.xbox.com/en-US/help/account-profile/accessibility/adaptive-controller-faq>
- Microsoft. (n.d.). *Xbox adaptive controller faq*. Xbox Support.
<https://support.xbox.com/en-US/help/account-profile/accessibility/adaptive-controller-faq>
- Nicholson, V. P., Mckean, M., Lowe, J., Fawcett, C., & Burkett, B. (2015). Six Weeks of Unsupervised Nintendo Wii Fit Gaming Is Effective at Improving Balance in Independent Older Adults. *Journal of Aging and Physical Activity*, 23(1), 153–158. <https://doi.org/10.1123/japa.2013-0148>
- Nielsen Foundation. (2019). *Millennials on millennials: Gaming media consumption*. Nielsen Company, LLC. <https://www.nielsen.com/wp-content/uploads/sites/3/2019/06/millennials-on-millennials-gaming-media-consumption-report.pdf>

- Persson, Dennis & Erlandsson, Lena-Karin. (2010). Evaluating OVal-9, An Instrument for Detecting Experiences of Value in Daily Occupations. *Occupational Therapy in Mental Health*, 26, 32–50. <https://doi.org/10.1080/01642120903515284>
- Reid, D. (2004). A model of playfulness and flow in virtual reality interactions. *Presence: Teleoperators and Virtual Environments*, 13(4), 451–462. <https://doi.org/10.1162/1054746041944777>
- Rideout, V., & Robb, M. (2019). *The common sense census: Media use by tweens and teens*. Commonsense Media. 2019-census-8-to-18-full-report-updated.pdf (commonsensemedia.org)
- Rideout, V., & Robb, M. (2020). *The common sense census: Media use by kids age zero to eight*. Commonsense Media. https://www.commonsensemedia.org/sites/default/files/uploads/research/2020_zero_to_eight_census_final_web.pdf
- Rideout, V., & Robb, M. (2020). *The common sense census: Media use by tweens and teens*. Commonsense Media. <https://www.commonsensemedia.org/sites/default/files/uploads/research/2019-census-8-to-18-full-report-updated.pdf>
- Rodriguez-Santos, L. (2012). *Gaming systems and geriatrics: A guide for the use and identification of gaming systems and games within occupational therapy interventions* [Master's thesis, University of Puget Sound]. Sound ideas Digital Archive.

https://soundideas.pugetsound.edu/cgi/viewcontent.cgi?article=1055&context=ms_occ_therapy

- Ryd, C., Malinowsky, C., Ohman, A., Kottorp, A., Nygard, L. (2018). Older adults' experiences of daily life occupations as everyday technology changes. *British Journal of Occupational Therapy*. 81(10). 601–608.
<https://doi.org/10.1177/0308022618774525>
- Scherer, R., Siddiq, F., Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education* 129(2019), 13–15. <https://doi.org/10.1016/j.compedu.2018.09.009>
- Seifert, A., Stotz, N., Metz, E. (2017) Apps in therapy: Occupational therapists' use and opinions. *Disability and Rehabilitation: Assistive Technology*, 12(8). 772–779.
<https://doi.org/10.1080/17483107.2016.1262912>
- Sosa, G., & Luciana, L., (2019). The effects of video game training on the cognitive functioning of older adults: A community-based randomized control trial. *Archives of Gerontology and Geriatrics* 80(1), 20–30.
<https://doi.org/10.1016/j.archger.2018.04.012>
- Special Effect. (2021). *Game Access: Xbox Adaptive Controller*. Retrieved December 22, 2021 from <https://gameaccess.info/page/4/?s=xbox+adaptive+controller>
- Spencer, P. (2018, May 16). *Accessible gaming with the Xbox Adaptive Controller*. Xbox News. Accessible Gaming with the Xbox Adaptive Controller - Xbox Wire

- Spiro, R.J., Coulson, R.L., Feltovich, P.J., & Anderson, D. (1988). Cognitive flexibility theory: Advanced knowledge acquisition in ill-structured domains. In V. Patel (ed.), *Proceedings of the 10th Annual Conference of the Cognitive Science Society*. Hillsdale, NJ: Erlbaum. [Reprinted in Ruddell, R.B. & Ruddell, M.R. (1994). *Theoretical Models and Processes of Reading* (4th Ed.). Newark, DE: International Reading Association.]
- Staiano, S., & Flynn, R. (2014). Therapeutic use of active videogames: A systematic review. *Games for Health Journal* 3(6), 351–365.
<https://doi.org/10.1089/g4h.2013.0100>
- Summit Professional Education. (n.d.). *Live, webinar, and online CE courses*. Retrieved December 22, 2021 from <https://summit-education.com/ce?currentPage=%2Fce%2Foccupational-therapist&referrer=https%3A%2F%2Fsummit-education.com%2Fce%2Foccupational-therapist>
- Tatla, S. K., Shirzad, N., Lohse, K. R., Virji-Babul, N., Hoens, A. M., Holsti, L., Li, L. C., Miller, K. J., Lam, M. Y., & Van der Loos, H. F. (2015). Therapists' perceptions of social media and video game technologies in upper limb rehabilitation. *JMIR Serious Games*, 3(1), e2. <https://doi.org/10.2196/games.3401>
- Thomson, K., Pollock, A., Bugge, C., & Brady, M. C. (2016). Commercial gaming devices for stroke upper limb rehabilitation: a survey of current practice. *Disability and Rehabilitation: Assistive Technology*, 11(6), 454–461.
<https://doi.org/10.3109/17483107.2015.1005031>

- U.S. Department of Education (2016). *National education technology plan*. Office of Educational Technology. NETP16.pdf (ed.gov)
- United Nations Human Rights Council. (2016). *Thirty-second session: The promotion, protection, and enjoyment of human rights on the internet*. United Nations General Assembly. <https://t.co/eDVU61Oqiw?amp=1>
- Valdés, B. A., Glegg, S., Lambert-Shirzad, N., Schneider, A. N., Marr, J., Bernard, R., Lohse, K., Hoens, A. M., & Van der Loos, H. (2018). Application of Commercial Games for Home-Based Rehabilitation for People with Hemiparesis: Challenges and Lessons Learned. *Games for Health Journal*, 7(3), 197–207.
<https://doi.org/10.1089/g4h.2017.0137>
- Vogels, E. (2019). *Millennials stand out for their technology use, but older generations also embrace digital life*. Pew Research Center.
<https://www.pewresearch.org/fact-tank/2019/09/09/us-generations-technology-use/>
- Walker, B. (2014). The acceptance and use of virtual gaming as an intervention strategy for older adults in occupational therapy. *Games for Health Journal* 3(6), 333–340.
<https://doi.org/10.1089/g4h.2014.0062>
- Wattanapisit, A., Wattanapisit, S., & Wongsiri, S. (2020). Public health perspectives on eSports. *Public Health Reports*, 135(3), 295–298.
<https://doi.org/10.1177/0033354920912718>

- Webster, A. (2013, October 21). *Game over: Nintendo ends production of the original Wii*. The Verge. Game over: Nintendo ends production of the original Wii - The Verge
- Wilson, M. (2017, October 25). *Exclusive: Microsoft has stopped manufacturing the Kinect*. Fast Company. Exclusive: Microsoft Has Stopped Manufacturing The Kinect (fastcompany.com)
- Yacoby, A., Zeilig, G., Weingarden, H., Weiss, R., & Rand, D. (2019). Feasibility of, adherence to, and satisfaction with video game versus traditional self-training of the upper extremity in people with chronic stroke: A pilot randomized controlled trial. *The American Journal of Occupational Therapy* 73(1), 1–14.
<https://doi.org/10.5014/ajot.2019.026799>

CURRICULUM VITAE

