2021

Adaptive Gaming as an Occupation: Motor Phenomena and Lived Experiences

Christina Floyd *Dominican University of California*

Melanie Blaisdell *Dominican University of California*

Madeleine Pope *Dominican University of California*

Audrey Metzger *Dominican University of California*

Donna Chen Tubig *Dominican University of California*

See next page for additional authors

https://doi.org/10.33015/dominican.edu/2021.OT.09

IRB Number: 10826

This thesis, written under the direction of the candidate's thesis advisor and approved by the program chair, has been presented to and accepted by the Department of Occupational Therapy in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy.

Christina Floyd, Melanie Blaisdell, Madeleine Pope, Audrey Metzger, Donna Chen Tubig, Lauren Andaya, and Christine Vincent
Candidate

Julia Wilbarger, PhD, OTR/L
Program Chair

Laura Greiss Hess, PhD, OTR/L
First Reader

Author(s)

Christina Floyd, Melanie Blaisdell, Madeleine Pope, Audrey Metzger, Donna Chen Tubig, Lauren Andaya, and Christine Vincent

Adaptive Gaming as an Occupation: Motor Phenomena and Lived Experiences

by

Lauren Andaya, Melanie Blaisdell, Christina Floyd, Audrey Metzger, Madeleine Pope,

Donna Chen Tubig, and Christine Vincent

A culminating capstone project submitted to the faculty of Dominican University of California in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy

Dominican University of California

San Rafael, CA

May 2021

Abstract

Purpose: This qualitative study examined the lived experience and motor phenomena that occur in people with disabilities during the occupation of video gaming. Historically, the occupation of video gaming, also referred to as *gaming*, has not been inclusive of individuals with disabilities due to the design of traditional video gaming controllers. Typical gaming controllers require fine motor control, finger dexterity, and in-hand manipulation to grasp and use the controls on the device. Although, many people with disabilities do not have the fine motor skills required to access these devices, creating a barrier for this population to engage in the occupation of gaming. Through a literature review, the researchers found that current research is primarily focused on gaming utilized as a remedial therapeutic approach to rehabilitation. However, gaming has yet to be empirically examined as an occupation. To address the gaps in literature, the following research questions were developed: (1) What are the lived experiences of gamers and their families utilizing an adaptive gaming device? and (2) What motor phenomena can be observed during the occupation of gaming as evidenced by video, audio, and field notes data?

Methods: Researchers of this study established a weekly Games Club, which included four participants (N=4), ages 5-27, who engaged in an adaptive gaming experience using the Microsoft Xbox™ Adaptive Controller. The gamers and their families participated in one session of Games Club; the COVID-19 pandemic required the subsequent gaming sessions to be cancelled. Semi-structured interviews were conducted at baseline and follow-up to examine the lived experiences of families and gamers. Observational data was collected through field notes and audio/video recordings during game play to develop motor phenomena themes.

Results: Preliminary qualitative analyses of lived experience and motor phenomena were conducted from the first session of Games Club. The following themes were developed to

illustrate gamers' lived experiences: Customization, Belonging and inclusion, Enjoyment, and the Impact of COVID-19. Motor phenomena themes that developed from coding observational data included: Collaboration, Motor analysis, Switches and placement, Multiple body points of contact, Changes in Motor Engagement, and Attention and enjoyment.

Discussion/OT Practice Implications: The results of this qualitative pilot study indicated that adaptive gaming is a meaningful and intrinsically motivating occupation that promotes inclusion for individuals with disabilities. Adaptive gaming also has the potential to be both socially and motorically beneficial for gamers. The Xbox™ Adaptive Controller allows occupational therapists to grade the activity to create a customizable "just right challenge" for the gamer. Occupational therapists who wish to incorporate adaptive gaming into their practice have the potential to promote inclusion and socialization for individuals with disabilities.

Acknowledgments

We would like to express our deepest gratitude to the families, gamers, our local speech language pathologist (SLP) collaborator, the Dominican University of California Department of Occupational Therapy, and lastly our outstanding faculty advisor, Dr. Laura Greiss Hess, PhD, OTR/L. We would not have been able to complete this research without the willingness and support from the participants and their families. We had participants travel upwards of two hours to come experience this Games Club, and we appreciate their dedication and passion to create something meaningful and contribute to our research. We would also like to thank our colleagues, “Gamer Gurlz” and “Larry’s Ladies” for providing a collaborative editing session in the beginning of our proposal design. Dr. Julia Wilbarger, PhD, OTR/L was our second reader, and we appreciate her dedication and valuable constructive feedback on our literature review. Due to confidentiality reasons, we are unable to identify our local SLP collaborator, however this would have simply not been possible without his passion for serving others, imagination, and creativity to establish this Games Club, as well as his facility and connections where we were able to make this all happen.

Table of Contents

List of Tables

List of Figures

Background and Introduction

Introduction

Video gaming, herein referred to as "gaming," is an occupation that involves aspects of play, social interaction, problem solving, motor skills, and entertainment (Parham & Fazio, 2008). Playing video games is an occupation that many individuals enjoy regardless of their age, race, gender, socioeconomic status, or disability. The term "occupation" in this study refers to an activity that an individual either wants or needs to do, and is meaningful to them. Until recently, individuals with disabilities were unable to fully engage in this occupation due to the historically limiting design of the industry's controllers and gaming devices. Given the latest adaptive gaming technology (Xbox™ Adaptive Controller - xbox.com), we now have the opportunity to examine the lived experiences of the individual, their families, and peers as they participate in this more inclusive gaming occupation. Now that mainstream gaming technology can be adapted to provide access for individual needs, occupational therapists have a unique opportunity to empirically examine this occupation and contribute to the assistive technology scholarship.

Occupational Therapy Services

Occupational therapists (OTs) work across the lifespan to assist individuals in accomplishing daily tasks through the therapeutic use of meaningful occupations after injury, disease, impairment, disability, or any other functional limitation (AOTA, 2004a). It is an OT's role to address the meaningful occupations of our client's choice, including leisure, play, and social participation. Meaningful occupations are daily activities that individuals find rewarding, fulfilling, actively engaging, and are important for life function. Additionally, participating in meaningful occupations has physical, mental, and emotional benefits that improve overall quality of life. For example, OTs work with children with disabilities in order to meet developmental

milestones through the occupation of play. Play is a crucial component of early childhood that boosts creativity and teaches social behaviors that include helping, co-operating, turn-taking, empathizing, and trusting others (Parsons et al., 2019). In order for individuals with disabilities to have the opportunity to participate in play, OTs create strengths-based and client-centered interventions. This involves highlighting the strengths of the client and engaging them in their areas of interest in order to improve areas of weaknesses. These interventions may also require adaptation of the task itself, the materials used, or the environment to best meet the needs of the client.

Occupations

The American Occupational Therapy Association (2002) describes occupations as the therapeutic use of activities of daily living (ADLs), instrumental activities of daily living (IADLs), and activities under the categories of education, work, play, leisure, social participation, and rest and sleep to increase independence and quality of life. One of the most important occupations for children is play, which can be classified as physical, mental, and/or social play. Play is defined as "any spontaneous or organized activity that provides enjoyment, entertainment, amusement or diversion" (Parham & Fazio, 2008, p. 448). Children with disabilities often lack the opportunities for varied play due to physical or social limitations, and therefore would benefit from enhanced and adapted play facilitated by occupational therapists. Gaming is an occupation that falls under the category of "play" and is often inaccessible for children and adults with disabilities to engage in due to decreased in-hand manipulation and fine motor skills required for the standard gaming controller.

Gaming can be described as the interaction between the player and the screen in which the player manipulates the movement of the game through handheld controllers, keyboards, or

touchpad. Consoles used in gaming may include but are not limited to: Playstation Virtual Reality (VR), Wii, Xbox™ Kinect, and GameCube, each having a unique controller and specific games. Gaming utilizes an electronic device and typically requires manipulation of a controller to reach the ultimate goal of the game. Gaming is also an individual or social occupation facilitated by single or multiplayer use. By including gaming as an occupation, children are given the opportunity to engage in play individually or socially, reach developmental milestones, and are motivated to participate because of the fulfillment they experience when gaming.

Literature Review

Gaming Benefits and Application to Individuals with Disabilities

Socialization Benefits of Gaming

Gaming has a social component and provides opportunities to promote prosocial behaviors. Prosocial behaviors are positive and helpful behaviors that are intended to promote social acceptance and friendship. Harrington & O'Connell (2016) evaluated the impact of a prosocial video game, a game in which the player must successfully maintain positive affective relationships through sharing, cooperation, and empathy. Examples of prosocial video games include *Animal Crossing* and *Super Mario Sunshine*. The researchers found that students had increased prosocial behaviors, such as "helping behaviour, cooperation and sharing, normative behaviour, and affective relationships," (Harrington & O'Connell, 2016, p. 655), across all socioeconomic statuses and disabilities. Prosocial behaviors and exposure to prosocial content can be a means for teachers and parents to help develop empathic concern and improve effective relationships in youth (Harrington & O'Connell, 2016). Development and implementation of these prosocial behaviors in children can transmit to their daily lives and interactions with others and have the potential to result in positive outcomes at school and at home. Additionally, dual-user or two player games afford children of all abilities the opportunity to participate. In a study that implemented cooperative and competitive video games, gaming provided an opportunity for children with disabilities to have social integration in school through a dual-user system, indicating gaming can increase play and socialization for children with disabilities (Preston et al., 2016).

Motor Benefits of Gaming

Video games have previously been used in occupational therapy practices as a therapeutic intervention due to their positive effect on treatment outcomes and their motivational quality in clients with disabilities. Various studies have demonstrated that by implementing active video gaming (AVGs) as therapy, children with cerebral palsy (CP) exhibited increased gross motor function following the gaming intervention (Page et al., 2017), smoother muscle movement patterns (Sandlund et al., 2014), as well as increased balance, gross motor functions, and participation in ADLs as a later outcome (Luna-Olivia et al., 2013). A systematic review of nineteen studies examined gross motor skills in non-typically developing children after playing AVGs (Page et al., 2017). Following the gaming intervention, Page et al. (2017) reported outcomes that indicated improved balance, ball skills, coordination, running, and jumping.

Machado et al. (2017) studied the effects of Xbox™ 360 Kinect games implemented as physical rehabilitation for children with CP. Similar to previous studies, interventions assessed balance and coordination, and results displayed significant improvement in both areas after the rehabilitation (Machado et al., 2017). Rowland et al. (2016) created a conceptual model to implement the use of AVGs to increase physical activity participation for youth with disabilities. Based on this model, AVGs offer a new frontier to promote physical activity and address common physical activity barriers for children with gross motor impairments (2016). Due to the strong evidence of multiple studies, AVGs used in therapeutic intervention programs have supported improved gross motor function for children with CP.

Evidence from these studies support the use of gaming for gross motor improvement in children with CP. However, the exclusion criteria limited the participants based on their motor abilities, resulting in less inclusivity for the CP population. Standard controllers were used in this study, requiring proper grasp and finger dexterity to control the device, therefore excluding those

with upper extremity or dexterity limitations. Further research is needed to evaluate the use of adaptive gaming equipment on motor functions, specifically during the playing time. This would expand the range of participants, create more generalizable and inclusive results, and give an understanding of how motor functions are influenced during the occupation of gaming rather than just a post rehabilitation outcome.

Benefits of Gaming in an Academic Environment

Research has shown that the implementation of gaming in the classroom has academic benefits. In a study by Bugmann (2016), typically developing children showed improvements in academic areas such as mathematics and science after completing a video game that targeted these main areas. The previous research has not only focused on the academic benefits of gaming, but also the prosocial behaviors that result from gaming in the classroom (Parsons et al., 2019; Harrington & O'Connell, 2016). Gaming creates opportunities for social interaction with peers that in turn facilitate improvement in areas such as cooperation, turn taking, asking for help, and helping others (Parsons et al., 2019).

Through semi-structured interviews and questionnaires, Parsons et al. (2019) and Harrington and O'Connell (2016) have shown teachers reported positive reactions regarding the use of gaming in their classrooms. They reported that a multiplayer collaboration game was beneficial to assist children in taking turns, asking for help, and assisting peers while playing the game. By taking a step further and incorporating adaptive gaming in the school setting, the occupation of gaming becomes an opportunity for children with disabilities to engage with peers in school. In addition, some literature may suggest gaming has the potential to improve handwriting skills in children. In a study focusing on hand dexterity and function, combining therapy with video games in a school environment can improve the efficiency of hand mobility

needed for writing, turning pages in books, and manipulating common objects seen in a classroom (Luna-Olivia et al., 2013).

Gaming as an Occupation

For children growing up in a technologically-savvy world, gaming has become a common leisure and social occupation (Chandry & Dunford, 2010). Typically developing children have the access and ability to interact with their peers through gaming, while children with disabilities are unable to fully participate. However, introducing assistive technology for children with disabilities can enhance their participation in their occupations and roles (Chantry & Dunford, 2010). Adaptive gaming technology presents an opportunity for children with disabilities to explore the potential of gaming as an occupation. Adaptive gaming is a relatively new concept that has come into the public's eye as our technological age has reached new heights. To further support and spread awareness of gaming as an occupation for children with disabilities, future studies must focus on the qualitative impact of gaming on participants in order to understand how and why it is an occupation for them. Due to the lack of qualitative, longitudinal, and single-subject design studies, further research examining gaming as a phenomenon must be done to provide concrete evidence to support gaming as an occupation for disabled individuals.

Barriers to Gaming for Children with Disabilities

Barriers in Gaming Consoles

Previous researchers have implemented a variety of consoles in their studies, including the Wii nunchuck, Xbox™ Kinect, virtual reality, telerehab, PlayStation eye toy, and interactive computer play (ICPs). However, these commercially available consoles have limitations when accessed by those with disabilities. Within the research studies, the Wii remote was the most

utilized gaming platform due to its size and shape; however, users with disabilities needed assistance with grasping the controller, pressing buttons, and maintaining grip of the controller (Robert et al., 2013; Standen et al., 2011). Studies that used consoles such as virtual reality, Xbox™ Kinect, Wii, and ICPs did not include participants who were unable to engage in moderate exercise, had an injury or disability, were diagnosed with severe hemiplegic or diplegic cerebral palsy, insufficient hearing, or upper extremity flaccidity (Howcroft et al., 2012; Luna-Oliva et al., 2013; Machado et al., 2017; Robert et al., 2013; Standen et al., 2011; Tarakci et al.,2019). Therefore, gaming has not been a fully inclusive occupation due to access limitations of commercially available consoles.

Lack of participation in gaming can also be due to one's motor deficits including: delayed fine motor abilities, difficulty in reaching, and limited grasp, all of which interfere with holding the controller and manipulating the buttons (Sandlund et al., 2014). The complex design of game controllers can cause those with motor impairments to feel frustrated and limit access to gaming as an occupation (Standen et al., 2011). Without adaptive gaming equipment, those with disabilities may find it difficult to feel included in the occupation of video gaming. This may lead to isolation and a lack of social interaction with other peers while playing video games.

Social Barriers

Social barriers stem from a lack of inclusive and accessible opportunities. Social barriers create unequal opportunities, or in other words, occupational injustice. Occupational injustice is described as the restriction of participation in everyday occupations for individuals and populations. Children with disabilities may experience the social barrier of isolation due to a lack of acceptance from peers, possibly resulting from their peers' limited experiences with individuals with disabilities (Abbot & McConkey, 2006). The presence of occupational injustice

provides an opportunity to educate the peers of children with disabilities on the importance of social inclusion and equal participation in social occupations. Adaptive gaming is one example of providing social inclusion within a group setting. Children with disabilities deserve the opportunity and the access to play with their peers and feel included through the social occupation of adaptive gaming.

Clinician's Limited Comfort with Assistive Technology

According to Leuty et al. (2013), some therapists are reluctant to incorporate assistive technology (AT) into their practice due to lack of training and experience with computer hardware and software. Additionally, therapists have described emotional factors, such as technology-related anxiety, as a barrier to integrating assistive technology into their practice (Leuty et al., 2013). Long and Perry (2008) distributed a survey assessing AT training to 380 pediatric physical therapists and nearly half of them reported less than adequate training in AT and a lack of confidence in their ability to deliver AT services. Therapists reported five limitations that prevented them from implementing AT in their practice: knowledge of types of pediatric disabilities, AT service delivery systems, working with families regarding AT and AT services, collaborating with other service providers, and legislation, regulation, and policy related to AT services (Long & Perry, 2008). Interestingly, the majority of the physical therapists reported confidence in recognizing the benefit of AT and AT services, but reported low confidence in working with high-tech devices, identifying qualified suppliers of AT and AT services, and identifying sources of funding (Long & Perry, 2008). This implies there is a strong lack of accessibility for therapists to implement AT into their practice. The lack of proper training and inability for clinicians to feel confident in effectively implementing and accessing

AT negatively impacts clients' abilities to fully participate in their valued occupations (Long & Perry, 2008).

Gaps in Literature

Gaming Not Measured as an Occupation

Due to the limited amount of evidence regarding adaptive gaming as an occupation, it is crucial for occupational therapists to conduct further research examining this topic. The majority of research has focused on the impact of adaptive gaming as a rehabilitation intervention on groups of children with neuromotor disabilities (Machado et al., 2017; Page et al., 2017; Jannink et al., 2008). Future research should focus qualitatively on how adaptive gaming impacts a child's gaming experience, as well as their physical and social engagement.

Lack of Adaptive Gaming Research

Social engagement is a crucial component in the lives of children and adolescents because of the role it plays in development and building social skills. However, social engagement can be limited in children with disabilities during gaming if they are unable to participate due to access limitations and inability to manipulate the controller (Sandlund et al., 2014). With an adaptive gaming device like the Xbox™ Adaptive Controller (Figure 1) the player is able to connect multiple switches (e.g., joysticks, buttons) to adapt to the player's physical abilities, and encourage multi player use ("Xbox™ Adaptive Controller: Xbox™", 2019). Once the player has selected the switches that are the best fit, they plug the switches into the auxiliary and USB ports on the back of the Xbox™ Adaptive Controller. The auxiliary and USB ports are labeled to show what port coincides with what button on the standard controller. The user can choose the most effective switches and setup to meet his or her specific physical challenges, allowing the player to control the game regardless of their motor impairment. Multiple switches provide an opportunity for more players to participate simultaneously, and the players can work as a team to reach the ultimate goal of the game. There are limited studies that

focus specifically on the use of adaptive gaming devices during gaming. However, a study by Hsieh et al. (2015) observed an increase in visual-motor coordination and enhanced motor development in children with disabilities. Since the Xbox™ Adaptive Controller only recently became commercially available in 2019, research is needed to examine how this device can afford more inclusivity in gaming as an occupation for those with motor challenges.

Problem Statement

Gaming has historically been an accessible play/leisure occupation for typically developing children yet inaccessible for children with disabilities. While adaptive gaming equipment has been recently introduced, there is a lack of phenomenological research that examines adaptive gaming as an occupation in children with disabilities and observes socialization and motor skills. Additionally, there is a lack of research that evaluates the individual differences experienced during gaming sessions and have only presented findings from the end of the gaming session. Previous research also has been limited to non-adaptive gaming equipment, thus excluding those with motor impairments who could not access the controllers. Given that previous research has focused on rehabilitative outcomes, there is a need for occupation-centered qualitative measurement capturing the phenomena of gaming during the occupation itself and the lived experiences from the participant's voice and context. This occupation-based lens will not only expand the understanding for adaptive gaming within occupational therapy, but also support the inclusion of children with motor disabilities in the social and popular occupation of gaming with their peers.

Research Questions

The research questions that guided this study were: (1) What are the lived experiences of the gamers and their families with gaming as an occupation utilizing an adaptive gaming device? (2) What motor phenomena can be observed during the occupation of gaming as evidenced by video, audio, and field notes data?

Theoretical Framework

Adaptive gaming is an area worthy of study for its potential to produce positive physical and social outcomes for those with disabilities. Within the field of occupational therapy, adaptive gaming has yet to be studied via an occupation-centered lens, making this research novel and especially significant. This study seeks to fill the existing gaps in the literature by exploring how adaptive gaming can enhance one's physical and social well-being using qualitative methods. The theoretical frameworks that are guiding this study are The Participatory Occupational Justice Framework (POJF) and the Person Environment Occupation (PEO) model.

The Participatory Occupational Justice Framework

Occupational justice is described as a justice that recognizes occupational rights, regardless of age, ability, gender, social class, or other differences. In contrast, occupational injustice is the restriction of participation in everyday occupations for individuals and populations. The POJF was first developed by Gail Whiteford and Elizabeth Townsend in 2005 to provide a basis for reflective and collaborative action to address instances of occupational injustice (Whiteford et al., 2018). Uniquely, the POJF identifies its main purpose as facilitating social inclusion by raising awareness and addressing occupational injustice (Whiteford et al., 2018). Identifying social inclusion as a main component of the POJF is powerful because it enables individuals and populations to thrive in doing what is most meaningful to them. Social inclusion focuses on ensuring individuals have opportunities, resources, and capabilities to fully participate in life as well as be supported as contributing citizens in the society in which they live (Whiteford et al., 2018). The POJF includes six epistemological articles that provide a basis for occupational therapists to reflect on everyday practices. The articles focus on human rights, equalized power relations, social inclusion, social and cultural relevance, equitable opportunities

and resources, and agency within adverse environments. The POJF, based on a commitment to these articles, is intended to serve as a blueprint for emancipatory action for each and every client (Whiteford et al., 2018).

POJF and Adaptive Gaming

The POJF supports this research through the recognition that individuals with disabilities have the occupational right to engage in gaming. Article III of the POJF, social inclusion, articulates that occupation-focused objectives ideally address the means and ends of social inclusion for clients. Article V of the POJF, equitable opportunities and resources, asserts collaborative objectives are those ideally aimed at ensuring more equitable opportunities and resources are available for individuals to exert optimal levels of control and choice in everyday occupations (Whiteford et al., 2018). If gaming is a meaningful occupation to an individual with a disability, there should be ample opportunity for them to participate. Depriving individuals with disabilities the opportunity to engage in an occupation that they find meaningful is occupational deprivation, or a "state in which people are precluded from opportunities to engage in occupations of meaning due to factors outside their control" (Whiteford et al., 2018, p. 501).

The POJF recognizes that social inclusion, opportunities, and resources are essential for all human beings, especially individuals with disabilities. Adaptive gaming provides increased access and autonomy for individuals with disabilities to engage in the occupation of gaming through the use of adaptive switches and individualized customization. Adaptive gaming also provides generous opportunities for increased peer social inclusion through the use of a multiplayer format, which creates potential access to new social networks for individuals with disabilities. This study seeks to remedy some of the social and access factors that prevent

individuals with disabilities from playing video games while promoting occupational justice by providing a safe and inclusive environment where participants can engage in gaming.

The Person-Environment-Occupation Model

The Person-Environment-Occupation (PEO) model describes the relationship between a person, the environment, and their occupation and its effect on occupational performance (Schell et al., 2014). The person (P) component includes an individual's abilities and disabilities, values, interests, and life experiences (Schell et al., 2014). The environment (E) consists of extrinsic factors that include physical, cultural, institutional and social components. The physical environment includes objects, spacing, decorations, and anything tangible within a room or building (Schell et al., 2014). The cultural environment includes a person's ethnicity and religion, while the social environment includes interpersonal relationships, groups, or organizations (Schell et al., 2014). The occupation (O) is defined as any self-directed task that a person engages in throughout their life, which are typically meaningful to that person (Schell et al., 2014). When all three domains of person, environment and occupation are combined and are evenly overlapped, optimal occupational performance occurs, which creates a "goodness of fit" (Law et al., 1996). An imbalance between the three factors can decrease and jeopardize occupational performance.

The PEO model's application framework begins with identifying occupational performance strengths and barriers. For populations with a disability, accessibility limitations within their environment can cause occupational deprivation. Occupational therapists must address this goodness of fit through environmental modifications so that those with disabilities are not limited in their potential occupations due to their physical condition.

PEO and Adaptive Gaming

The PEO model supports the research by providing the goodness of fit between the individual, their environment that incorporates adaptive gaming, and the occupation of gaming. The participants in this study were interested and motivated to play video games. Without environmental modifications to the gaming equipment, the individual could experience occupational deprivation due to physical and social limitations of their condition. In order to compensate for the individuals' lack of motor abilities, researchers implemented adaptive gaming equipment to increase the functionality of video game play and thus enhance their occupational engagement.

Ethical and Legal Considerations

The *Occupational Therapy Code of Ethics* of the American Occupational Therapy Association (AOTA) is designed to ensure that practitioners are guided by and adhere to the rules and codes throughout their career as occupational therapists. The AOTA Code of Ethics is founded on the core concepts of altruism, equality, freedom, justice, dignity, truth and prudence (AOTA, 2015). The following Principles and Standards of Conduct were also a focus throughout the study: beneficence, nonmaleficence, autonomy, justice, veracity and fidelity (2015). In order to abide by these standards, this study required full board approval from the Institutional Review Board for the Protection of Human Participants (IRBPHP) at Dominican University of California due to the sensitive nature of the volunteer population. The IRBPHP upholds legal guidelines in order to protect the rights and safety of the participants in our study. On December 10th, 2019, Dominican University of California Institutional Review Board for the Protection of Human Participants granted full board approval for the study (IRBPHP IRB #10826).

First, beneficence and nonmaleficence can be defined as preventing harmful acts and promoting good acts or helping others when it comes to the OT practice (AOTA, 2015). Specifically, in this study, the researchers enabled individuals to participate in desired occupations through the use of adaptive gaming equipment. Autonomy of the participants was upheld, as participants have the right to self-determination, privacy and confidentiality as identified in the IRBPHP. Lastly, justice, veracity, and fidelity were sustained throughout the study, as participants were treated fairly, with respect and in a truthful and professional manner.

The agency site was contacted, before recruiting participants, to grant permission for this study (Appendix G). Formal written consent from participants and parent(s) or guardian(s) of interested children was collected (Appendix B). If the participant was under 18 years old and

unable to provide written or verbal consent, the parent or guardian signed a proxy consent form (Appendix C). All participants were given a Bill of Rights which included information pertaining to their rights as a volunteer (Appendix F). Child participants were given an assent form detailing the procedures of the study (Appendix D, E).

Methods

Design

The researchers conducted an in-depth analysis of social and motor behavior of individuals with disabilities during adaptive gaming using a qualitative, single subject design. This qualitative study explored the meaning of adaptive gaming to the participants and their parents, and what phenomena could be observed in gaming, such as motor skills, socialization, affect, engagement and behavior. The gamers participated in a Games Club session to play adaptive video games using the Microsoft Xbox™ Adaptive Controller (Figure 1). The participants and their parent(s) or guardian(s) were interviewed before Games Club, as well as a follow-up interview with open-ended questions sent via email. The participants were observed, as well as audio and video recorded during Games Club. The goal of this study was to explore the meaning of adaptive gaming to individuals with disabilities and their families through their lived experience, as well as outcomes that arose from the occupation of gaming.

Figure 1

The XBox Adaptive Gaming Device

Note*: Xbox™ Adaptive Gaming Device used by participants in Games Club - taken by the researchers at the Games Club*

Population

The population was a convenience sample gathered from a technology resource center located in Northern California. Researchers collaborated with the resource center to recruit participants with a flyer (Appendix I). Participants were chosen based on the presence of a disability and interest in participating in the research study. The participant's (N=4) ages ranged from 5 to 27 and included three males and one female. Inclusion criteria required individuals to be age 5 or older, and to have a disability.

Data Collection

This research study used several methods of data collection. After participants were recruited, a participant intake form was completed using GoogleForms (Appendix K) in regard to demographic, gender, diagnosis, interest in gaming, and any adaptive technology currently being used by the participant. (1) Semi-structured interviews at the resource center were conducted before and after the study to explore the meaning and value of adaptive gaming to children and their families. Questions included information regarding participant's time spent gaming, their current social interactions, current limitations to gaming, and their goals. The in-person interviews were audio recorded using a microphone on a laptop, and transcribed verbatim. (2) Participants were video and audio recorded during Games Club to observe what phenomena occurred during gaming, including but not limited to: motor skills, engagement, affect, and behavior. (3) Researchers collected field notes during Games Club to contribute additional data for observation (Appendix L).

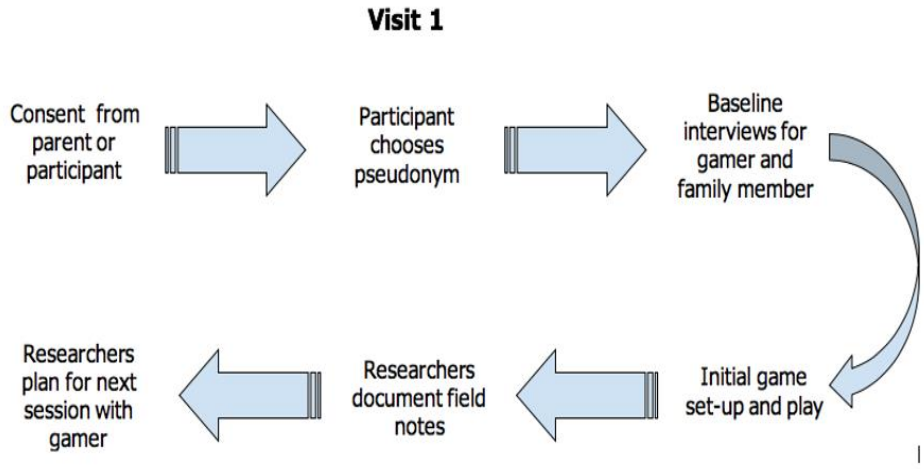
Procedures

The research study consisted of in-person baseline interviews, one in-person visit for all participants, and one follow-up interview conducted through email and online video via Zoom (Figure 2).

The Games Club consisted of one visit to the technology resource center. (1) The initial meeting collected information via the participant intake form (Appendix K), written consent, and baseline interviews for both participant and parent. Next, the researchers customized the adaptive gaming devices in accordance with each participant's unique needs and documented the positions and locations in the field notes form (Appendix L). Participants were given free choice to play games and researchers adjusted equipment to ensure its customization to participants. Audio and video recordings were utilized during each of the sessions, granted permission by the participant**.** (3) The exit interview was conducted for parents and participants through email and online video via Zoom.

Figure 2

Timeline of First Games Club Session



Note: Figure 2 describes the enrollment process and initial Games Club session

Data Management and Analysis

The semi-structured interviews with participants and their parent(s) or guardian(s) and Games Club were audio and video recorded using a smartphone or laptop to document participants' responses and observe the occupation of gaming. The researchers also documented observations and placement of switches utilizing the field notes form (Appendix L). The video and audio recordings were transferred from smartphone and laptop devices to a secure Google drive as well as a password protected external hard drive in a locked cabinet in a locked room at the Dominican University of California campus. This room and cabinet were only available through a research team sign out in the Department of Occupational Therapy. After transferring recordings to an external hard drive, the recordings were destroyed from the original smartphone and laptop devices. Researchers transcribed the interviews verbatim from audio and video recordings using Otter (© Otter.ai, Inc. at https://otter.ai/login) and Temi (temi.com), secure transcription software. All identifying information was removed from transcriptions and field notes, then replaced with pseudonyms to protect participant identity. Participants volunteered to share their medical diagnoses with the researchers to aid in the motor analysis process and contribute to research on adaptive gaming for individuals with disabilities.

Approach to Analysis and Coding Plan

Seven researchers analyzed the data through collaborative open coding to develop a coding manual. The researchers utilized the qualitative constant comparison method in order to code data, categorize, compare and develop themes (Dye et al., 2000). The constant comparison method ensured that the most meaningful content was identified and categorized from the pre- and post- semi-structured interview transcripts of gamers and their families. The constant comparison method ensured that the most meaningful content was identified and categorized from the pre- and post- semi-structured interview transcripts of gamers and their families. The

qualitative themes that emerged from the data were not predetermined by the researchers, but rather emerged from the data via discussion and deep investigation from the researchers. The research questions, POJF, and PEO model, in addition to the literature review, were used as a foundation to inform coding development. Researchers referenced the qualitative coding manual originally created by Saldana (2009) to develop a coding plan. The researchers analyzed the data to identify patterns and themes, categorically grouping them afterward.

Participants were identified by a pseudonym of their choosing and field notes were taken on individual subjects throughout the study. Field notes included data on positioning, switch use and placement, individualized movement patterns, participation in accessing games and social interaction. After the data collection, researchers analyzed individual participant data to determine change in motor engagement, switches and placement, social participation, and the lived experience in gaming.

After in-depth analysis of the video data of each participant, each case was coded separately. The research team held four open coding meetings to determine emerging themes as well as the OT process throughout the sessions. As a result, broad coding categories were developed to create a code book that included “parent codes” as major themes. From there, these themes were broken down further into “child” codes, which were defined as specific sub-categories.

Open coding was followed by specific content coding to identify common themes that were directly related to the lived experiences of gamers and their families. The platform used for both open coding and specific content coding was Dedoose (www.dedoose.com) and the code book was developed by two student researchers and their faculty advisor. Two of the eleven transcripts were coded by the researchers and their faculty advisor to establish interrater

reliability. The remaining nine of eleven transcripts were coded by the two student researchers and they achieved 100% consensus for all coding.

Strategies for Trustworthiness and Controlling Bias

Researchers used qualitative methods to analyze the video and audio recordings of the pre- and post-semi-structured interviews, video data of the gaming sessions, and field notes. Triangulation of the semi-structured interviews, audio and video recordings, and field notes ensured the validity of the data. Rigor was established through team coding development and discussion to reach 100% consensus. The researchers implemented strategies such as employing multiple researchers to code the findings, triangulating the data, and asking open-ended, non-leading questions during the semi-structured interviews in order to prevent potential research bias.

Gamer Recruitment

Three participants were recruited through a flyer advertisement (Appendix I) provided to a technology resource center in Northern California. One participant was recruited through a Dominican University of California Pediatric level I fieldwork site by word-of-mouth. Participants were then contacted via email to schedule the initial Games Club session, with two participants per session. One family member of each gamer was enrolled to participate in the baseline and follow-up interviews. If family members stayed to watch Games Club, they were invited to play with their gamer. Families also completed a demographic and intake form prior to gaming (Table 1).

Table 1

Participant Demographics

Gamer's Chosen Pseudonym	Age	Gender	Ethnicity	Diagnosis	Assistive Technology Used
Kaleiki	27	F	Caucasian	CP	Manual w/c; Power w/c; iPad Mini
Speedy	18	M	Caucasian	CP	Power w/c, Eye gaze communication device
Tigger	8	M	Caucasian	Spastic Quadriplegia CP	Walker; Manual w/c; Voice-activated software
Von Miller	5	M	Choose not to answer	Spastic Quadriplegia CP	Manual w/c

Note: Table 1 above lists demographics of gamers.

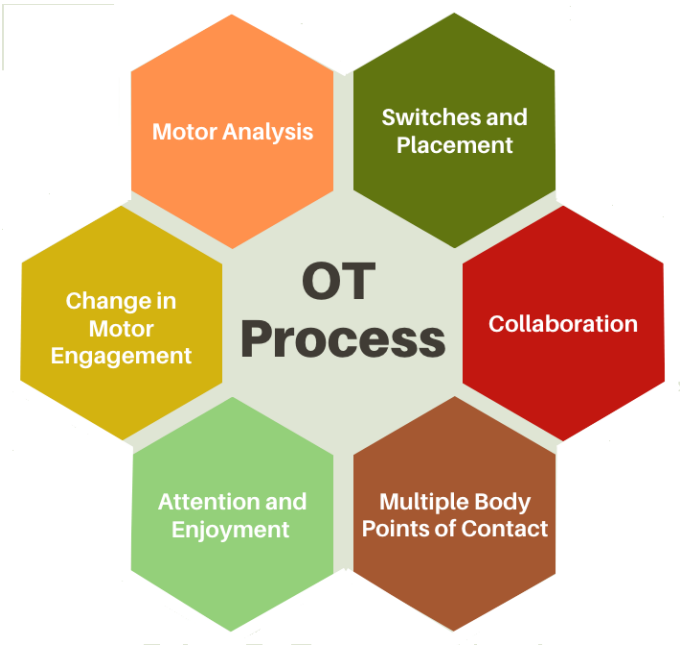
Results

Motor Findings

Video, audio, and field notes data were used to address the research question, what motor phenomena can be observed during the occupation of gaming? This research question focused on the participants' motor skills, socialization, affect, engagement, and behavior observed during the initial games club visit. Subsequent visits were cancelled due to COVID-19. The following major themes within the OT process were found when answering the observed motor phenomena research question: Collaboration, Motor Analysis, Switches and Placement, Multiple Body Points of Contact, and Changes in Motor Engagement (Figure 3). The overlapping themes for the observed motor phenomena and lived experiences included Attention, Enjoyment, and Engagement.

Figure 3

OT Process themes for the motor phenomena aspect



Note. Figure 3 provides a visual representation of the OT Process themes identified from video and audio data, and coding.

Collaboration

During Games Club, the researchers collaborated with a speech language pathologist (SLP) at the resource center to familiarize themselves with the various switches, the history of some of the participants, and for implementation of communication strategies with the participants. The researchers also collaborated with the SLP to recruit participants for the study. Through the collaborative experience, the researchers and SLP were able to determine which switches maximized gaming access and which games were suitable for the level of difficulty the participants played. This collaboration further contributed to the customization of the gaming experience for the participants. The researchers collaborated with the families throughout this process, such as asking the parent some of the participant's motor strengths or challenges, as well as participants' interests.

Motor Analysis

The researchers completed a motor analysis for each participant which evaluated the participants tone, head/neck control, trunk control, and lastly the impact of their braces or splints (if they were wearing them) on their motor control. The researchers made note of the motor challenges experienced by the participants in order to customize their adaptive gaming setup to maximize their switch access. Through this process, researchers were able to determine what body points of contact could be used for switch placement.

Kalieki's motor challenges included right upper extremity (RUE) spasticity and communication through one-word answers. Tigger experienced hypotonicity in his trunk and left upper extremity (LUE) spasticity. Von Miller experienced upper extremity (UE) spasticity and flexor synergy, limited fine motor control, and possible visual deficits that impacted his visual attention. Speedy experienced UE spasticity, and flexor synergy in his LUE.

Switches and Placement

The researchers determined switch use and switch placement based on the motor analysis for each participant. Participants with limited trunk control and upper extremity motor control were fitted with the ultimate switch (Figure 4), which could be accessed with the chin, mouth, or cheek. Participants with limited ROM in their upper extremities and spasticity or flexor synergy were fitted with either a cylindrical squeeze switch (Figure 5), large buttons (Figure 6), joystick switch (Figure 7), proximity switch (Figure 8), or a microlite switch (Figure 9) which required less movement and motor control for use.

Figure 4

Ultimate Switch

Figure 5

Cylindrical Squeeze Switch

Figure 6

Button Switch

Figure 7

Joystick

Figure 8

Proximity Switch

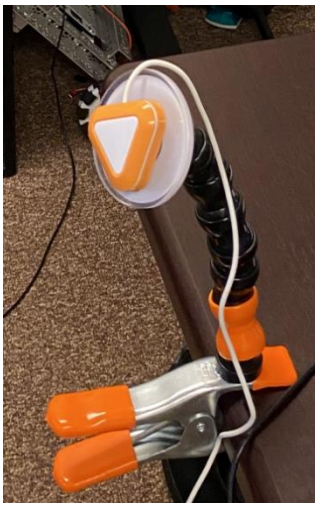


Figure 9

Microlite Switch

Multiple Body Points of Contact

The researchers used a field notes template, seen in Appendix L, to document the switches used and the placement of the switches for the participants. Through this method and continued observation analysis of motor function during game play, the researchers were able to customize and maximize switch use based on the body points of contact. This ultimately increased access to switches, and thus gaming actions and functions during game play. In other words, the more switch access, the more gaming controls and actions each gamer had available to them during play. The researchers were able to try various switches with different body points to find the optimal switch placement and increase body points of contact used. Table 2 provides a summary of participant customized switch placement and points of access.

Table 2

Participant Customized Switch Placement

Participant	Body Point(s) of Contact	Switch and Placement
Kaleiki	3 points of contact	Chin → Ultimate switch (Figure 4) Left hand → Joystick (Figure 7) Right hand → Squeeze cylinder switch (Figure 5)
Tigger	1 point of contact	Right hand → Button (Figure 6)
Von Miller	2 points of contact	Back of head → Proximity switch (Figure 8) Right side of head → Ultimate switch (Figure 4)
Speedy	3 points of contact	Chin → Ultimate switch (Figure 4) Left knuckle → Microlite switch (Figure 9) Right hand → Joystick (Figure 7)

Note. Each of the participants had customized switch placements on various parts of the body, unique to his or her needs. Occasionally, the switch was physically supported by a researcher.

Changes in Motor Engagement

Through video and field notes data, the researchers were able to observe changes in motor engagement of the participants during gameplay, summarized in Table 3. Researchers

observed Kaleiki had chin thrust and neck flexion when using the ultimate switch (Figure 4), as well as after the ultimate switch was removed. She continued to associate the acceleration control with moving her head and neck while also saying “go” despite no longer having access to the switch. This increased her independence in the motor control of the switch. The ultimate switch had been a powerful addition for Kaleiki and through observation of her actions after the ultimate switch had been removed, it was determined the switch was the most effective in increasing her access and maximizing her gameplay capabilities.

Researchers observed Tigger demonstrated improved postural control during gameplay. He also maintained head and neck extension to look at the screen while gaming. Tigger was observed to have increased visual attention and engagement throughout the gaming session due to the change in position of his head and neck, and improved trunk control.

Von Miller had slight improvement in his UE flexor synergy, which could have also been attributed to wearing his arm braces. He was also able to extend his right elbow in order to reach for the joystick (Figure 7). Von Miller had improvements in sustained visual attention from 10 seconds or less at the beginning of the session to up to 20 seconds by the end of the session. Von Miller’s change in tone allowed him to have more switch access. His increased visual attention resulted in more engagement during gameplay.

Speedy had flexor synergy in his LUE at the beginning of the session, which then relaxed and allowed him to have intentional switch access with support by the end of the session. This allowed Speedy to have increased body points of contact and intentional use of the switches.

Table 3

Participant Motor Engagement and Gaming Access

Participant	Motor Engagement	Impact on Access
Kaleiki	Chin thrust Neck flexion	"Go" function using ultimate switch (Figure 4) allowed increased access with additional switches
Tigger	Head and neck extension Increased postural control	Increased visual attention and engagement, and improved trunk control
Von Miller	Improvement in UE flexor synergy Extension R elbow	Increased visual attention and change in tone allowed more switch access and engagement during gameplay
Speedy	Relaxed LUE flexor synergy	Allowed intentional access to switches and increased body points of contact

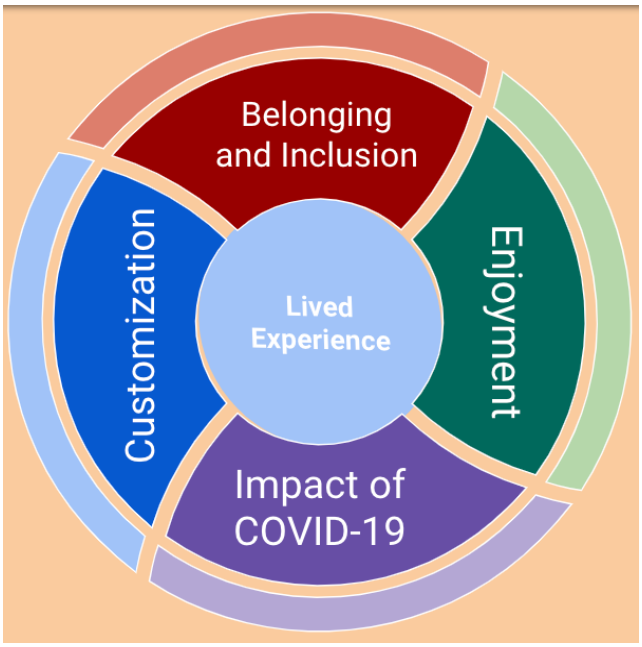
Note: Each of the participants had motor engagement which impacted their access to the game.

Lived Experience Findings

Semi-structured interviews with gamers and their families were utilized to address the research question, "What are the lived experiences of the gamers and their families with gaming as an occupation utilizing an adaptive gaming device?" The qualitative analyses revealed the following major interacting and dynamic themes of: Customization, Belonging and Inclusion, the Impacts of COVID-19, and Enjoyment (Figure 10).

Figure 10

Themes - Lived Experience of Gamers and Families



Note. Lived experience themes included belonging and inclusion, enjoyment, impact of COVID-19, and customization

Customization

The theme of Customization for our purposes is defined as the modification of access points and switches to best suit participants' strengths and abilities. As previously discussed, and found in the literature, a typical gaming console does not have the ability to accommodate individuals with physical differences. However, with the Xbox™ Adaptive Controller (Figure 1) and switches, the researchers were able to observe the needs and skills of each gamer and therefore customize the gaming experience and access to each participant. Each of the participants presented with a primary diagnosis of cerebral palsy, however, all participants demonstrated unique and varied abilities and motor patterns. In the baseline interview with Speedy's mom, she noted how motor limitations can hinder play and leisure activities. She stated:

> Board games don't work due to my son not being able to hold cards or moving a player piece. So being able to operate his Eye Gaze in creative ways or using adapters like switches or other means, allows him to do something that he can contribute to, and we all can play together.

This quote paints a vivid picture of how customization allowed Speedy to participate in the occupation of gaming and then the family could engage together. The other participants also addressed how the customization aspect of the game play allowed them to actively engage and interact with the occupation. Kaleiki, when asked about the different devices stated, “They were all fun to try and I really enjoyed the variety of buttons and switches.” This quote demonstrates how the customizable aspect of the controller caters to different interests. Tigger was noticeably more receptive to sound effects and switches that made noise. As a result, the researchers utilized those types of switches with him during game play to increase engagement.

Belonging and Inclusion

The theme of Belonging and Inclusion is defined by the feeling of being a part of something with others and feeling accepted. The theme of Belonging and Inclusion was visible across all four participants. When the research was unable to continue due to the COVID-19 pandemic, the researchers conducted follow-up interviews via email/Zoom with the participants and their families. Speedy stated in his email,

> Thank you for working with us and giving us this chance to be able for us to be more inclusive with video games. I hope you continue this club again because I definitely want to play video games.

Speedy also stated “It [Games Club] was fun and meant that I could do video games like everyone else.” This illustrates the theme of Belonging and Inclusion because he felt accepted

and similar to other gamers. Some of the parents specifically shared what inclusion and belonging meant to them as a parent of a disabled child. When asked what it would mean for her if her child participated in this Games Club, Tigger's mom stated,

> You heard [Tigger] answer that he loves to play games. But games, the reality of playing games is [that] he's watching other people play games. And so you can see that he wants to have that be a part of his life. But you know, it's something that socially he could do with his peers when there's a lot of barriers in other areas.

This construct of eliminating barriers for participation, equity and inclusion, is a central tenet of assistive technology. As noted, meaningful engagement and inclusion is pivotal to gamers and families alike.

Impacts of COVID-19

The reality of COVID-19 is very unique to the times and greatly impacted the participants, the research, and results. When conducting follow-up interviews with the participants and their families, they all reported how the cancellation of Games Club due to COVID-19 impacted them. When Kalieki and her dad were asked about this unexpected turn of events, Kalieki's dad responded by saying, "we were saddened that we were not able to come back." In another follow-up interview conducted via Zoom, Von Miller's father stated,

> We were hoping that once this [Games Club] was done, we could start implementing some of the learning into our home environment, because as I mentioned, he does have, you know, we have an Xbox at home. We were thinking of getting an adaptive controller, but we wanted to make sure that we fully understood what he liked and what he didn't like and where he was in his process.

As you can see from these example quotes, the families were extremely interested in continuing to utilize the adaptive gaming device and even purchasing one for their child to use at home.

Overlapping Themes

Attention, Enjoyment, and Engagement

The theme of Enjoyment manifested itself through participants' intrinsic motivation and joy while playing video games. The researchers were also able to gather Attention and Engagement observations through video and audio data during the session. The video data recorded all participants smiling and laughing during Games Club. The researchers were client-centered in their design of the games club session and selected games that encompassed their motivation and interests.

Kaleiki had social interests including one day to game with her boyfriend and friends. The researchers introduced her to multiplayer games such as *Rocket League* with this purpose in mind. Kaleiki smiled and laughed when she hit the ball in *Rocket League* and said "go" when she wanted her car to go faster. She also would lean forward in her chair when she was focused on the game she was playing. Kaleiki, who is mostly nonverbal, was effectively able to convey her engagement and enjoyment through one-word answers and with smiling and laughing during gameplay. Kaleiki stated "It was just BIG fun, I was really enjoying the whole experience and hope to get back to it someday," when asked about her experience with Games Club. These quotes beautifully reflect the impact one day of Games Club had for Kaleiki.

Tigger was interested in video games and Disney. The researchers introduced him to a free play *Disney* game, and various other games to practice different controls and gaming styles. Tigger had a noticeable change in attention and engagement when his mom played games with

him, through increased smiling and laughing versus when playing alone. Tigger was able to play with his mom and when asked, *"*How do you feel about your participation in the Games Club?" he answered, *"*I feel happy because I like games." This demonstrated his enjoyment about the anticipation before participating in Games Club.

Von Miller was interested in race car games, football, and playing video games with his brother. The researchers introduced him to *Rocket League, Hydro Thunder,* and *Descenders,* all of which are competitive racing games. Von Miller had hopes of being able to play video games with his older brother at home, who is an avid gamer.

Speedy was interested in socializing and sports. When researchers asked Speedy what type of games he liked, he responded with his eye-gaze communication device that he liked sports, and specifically football. Even though Speedy is nonverbal, his message came across very clearly about his desired interests. The researchers introduced him to *Minecraft*, which is a free play game that can also be played online with others. Speedy had the most switch access and sustained attention when playing *Minecraft* independently.

Discussion

We found that adaptive video gaming devices allowed individuals with disabilities to physically engage and meaningfully participate in the occupation of gaming. By engaging in the occupational therapy clinical reasoning process and collaboration, we customized the gaming experience to each individual and graded the activity to create a "just right challenge" which is central to the PEO model (Schell et al., 2014). By utilizing various switches and determining placement of the switches based on the abilities of the participant and their access points, customization to maximize access and gaming functions were increased. Switches were used to increase participation, while creating opportunities for social engagement by allowing multiple participants to control the game simultaneously. Similar to other studies that have utilized a dual-player system (Preston et al., 2016), we intentionally employed switch use to allow more than one participant to control the same player within the game. Preston et al. (2016) indicated that this type of play increases socialization for children with disabilities. Researchers wanted to hold multiple sessions to increase opportunities for socialization, however due to COVID-19, continuance of Games Club was halted. However, Games Club did allow for participants to become familiar with adaptive gaming through switches and various games and preliminary social gaming with researchers and family members during the initial session that we were able to hold.

Many were disappointed by the abrupt halt to their child's gaming experience due to COVID-19. They felt that Games Club had given their child the opportunity to enjoy a meaningful activity that would ultimately lead to meaningful social interactions with peers. During interviews families expressed their enthusiasm about Games Club, and one family expressed interest in inviting the gamer's sibling to a Games Club session. The same family also

expressed an interest in purchasing the adaptive gaming device at the conclusion of Games Club for home use. The feedback we received from families demonstrated that having access to the adaptive gaming controller to play video games was both a meaningful and enjoyable experience for both the gamers and their families.

We found, through clinical and video observation, that video gaming and the use of switches may contribute to tonal and motor changes including a decrease in flexor synergy as we directly observed. By the end of the first Games Club session, Speedy, a participant diagnosed with spastic quadriplegic CP, utilized three switches simultaneously to accomplish a goal within the game. At the beginning of the session, Speedy required support during gameplay by having one of the researchers play a control for him. By the end of the hour-long session, Speedy was able to intentionally access and navigate switches with his chin and hands using support from the research team through holding the switch stable. The placement of these switches increased body points of contact, and facilitated extension in Speedy's upper extremities, therefore inhibiting flexor synergy during gameplay. In summary, we observed that adaptive gaming may increase participation in the occupation of gaming through customization with switches. The motor phenomena observed during gameplay is specific to each participant. An overall consensus of a motor phenomena was not reached due to the nature of the study and research being cut short due to COVID-19.

Although previous literature is primarily based on a more pediatric population, we feel that gaming is a play and leisure occupation that certainly spans into adulthood for the typical and disabled populations. Our adult participants, Kaleiki and Speedy, were as equally interested and motivated by gaming as our younger gamers, Tigger, and Von Miller. All participants and families regardless of age expressed interest in gaming as a potential social occupation. From

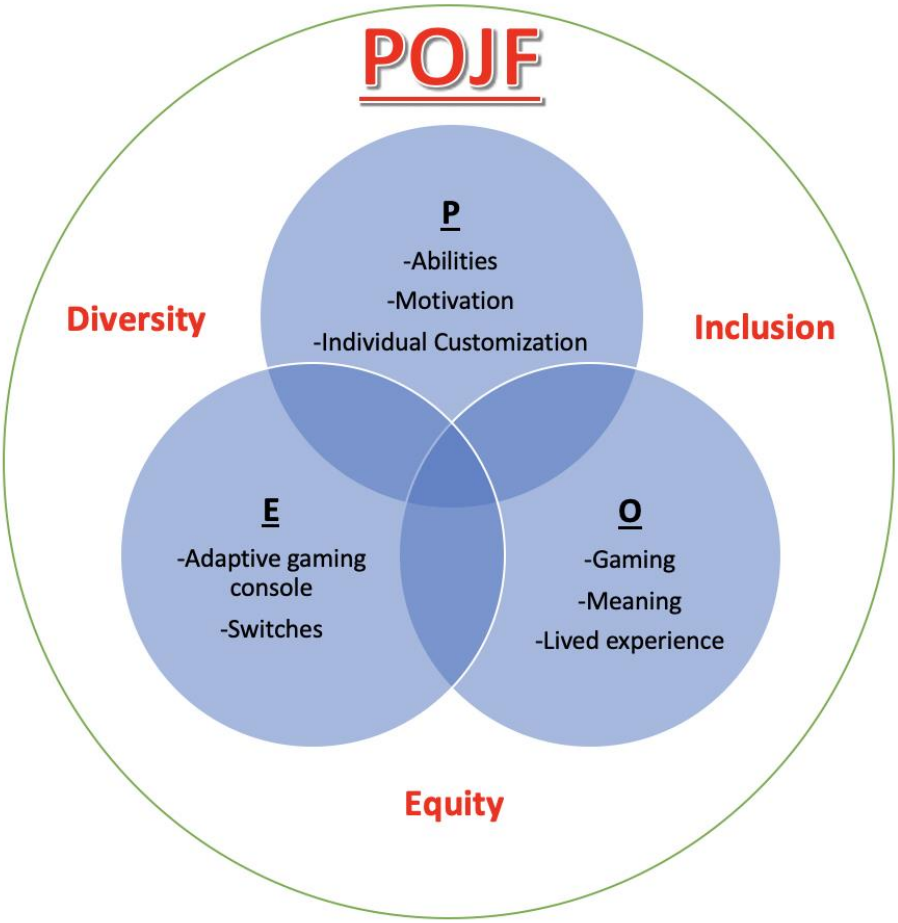
this experience, adaptive gaming can be a meaningful occupation for adults just as much as children. Our participants are reflective of gamers in the non-disabled population. Adaptive gaming creates inclusive opportunities for adults and children with disabilities.

Conceptual Model: Gaming as an Occupation

The results of this research have informed a conceptual model of adaptive gaming that is anchored in the POJF (Figure 11) and PEO model. This study was the first to specifically examine gaming as an occupation via the lived experiences of gamers and their families and the observed motor phenomena during gaming itself. The person (P) in the PEO model represents the participant's interests, motivations, and motor abilities. The process included analyses focused on their motor abilities and customized choice and placement of switches. Through adaptive gaming, specifically the customization for access, the participant was not limited by their deficits, but rather given equal opportunity to engage in the gaming. The environment (E) represents adaptive gaming consoles and switches. The environment is now adapted with a better, customizable console which also contributes to increased inclusion and equity within gaming. The occupation (O) represents the meaningful activity of gaming. Gaming is now an accessible, equitable and inclusive occupation due to customizable consoles with switches. The central concept of POJF encompasses a pathway to identify and reflect on occupational justice issues. When disability is considered as diversity, design and access provide an equitable avenue toward meaningful engagement in occupations. Adaptive gaming contributes to occupational justice of individuals with disabilities by making a once inaccessible occupation, accessible.

Figure 11

Conceptual Model: Gaming as an Occupation



Note. Figure 11 demonstrates gaming as a means and ends through the integration of the POJF and PEO models and to reflect on disability as diversity

Conclusion

Adaptive gaming has created a new and valuable opportunity for individuals with disabilities to engage and fully participate in the occupation of gaming. Throughout this research, gaming was motivating and a source of enjoyment. Access and inclusion were possible by employing the collaborative OT process, including careful consideration of motor abilities and points of access. Researchers also observed motor phenomena, such as decreased spasticity and flexor synergy, during adaptive gaming. The potential of motor variations during game play can

further support adaptive gaming in OT practice. With continued support and customization, gaming can become an accessible and inclusive occupation for individuals with disabilities. Further, engagement in gaming opens up socialization opportunities with peers, friends, and siblings. This previously inaccessible occupation can now promote inclusion at school, at home, and in the community.

Limitations

Research limitations included only collecting data within the geographical location of Northern California, as well as convenience sampling for recruitment. The sample size was relatively small, and all recruiting participants had a primary diagnosis of cerebral palsy. Future research should include a broader sample. The global pandemic related to COVID-19 had an immense impact on the research study as only one gaming session was conducted rather than the several as originally planned in the research design. Future research employing multiple games sessions would be able to gather data from the participants over time and provide opportunities to observe multiple phenomena including any motor changes, opportunities for increased socialization, and gaming proficiency with increased access. In the future, OTs can utilize aspects of adaptive gaming not only with their clients but advocate for the use of adaptive gaming as an occupation and educate others on the importance of this inclusive and engaging occupation. Further research could also allow for siblings or peers to participate in Games Club, to evaluate multiplayer adaptive gaming and the impact of social interactions. In the future, adaptive gaming could ultimately be evaluated from a school or home setting to determine access and impact within the participant's natural environment.

Implications for Occupational Therapy Practice

Use of occupation as means and ends is a central tenet to skilled occupational therapy. Therefore, gaming can be used as both a therapeutic medium as well as a meaningful occupation. We focused on the latter for this research as it has not been previously studied. The use of adaptive gaming devices has been studied previously for the use of rehabilitation (Machado et al., 2017), however, there is an intrinsic, motivational, and social component to gaming that is now possible and could be used as an intervention tool. Additionally, adaptive gaming can be a rewarding and valuable occupation for those that are interested. Gaming is no longer limited to able bodied individuals and therefore occupational therapists can broaden their practice to become familiar and knowledgeable of adaptive gaming as a meaningful occupation to be explored by their clients with disabilities. By becoming aware of the possibilities and opportunities of access that comes with adaptive gaming, occupational therapists can increase the socialization and inclusion for the individuals with disabilities. The Xbox™ Adaptive Controller (Figure 1), a commercially available and mainstream gaming console, affords inclusion to a previously inaccessible occupation for those with disabilities.

Adaptive gaming allows the gamer the potential to play independently or with others, which can increase inclusion with peers and social engagement. Customizable access via switches also allows for an OT to cater to a client's strengths and create a "just right challenge" in order to meet motoric and/or social goals. By looking at a client's current functioning and abilities, OTs can customize the switches and their placement for the client to participate in the gaming occupation. Through this collaborative process, OTs are also able to build therapeutic relationships with their clients and create occupational opportunities that may have not been accessible before.

The POJF informs occupational justice issues, such as limited access to gaming, consequently limiting individuals' access to a meaningful and desired occupation. With the PEO model, OTs identify how the individual can engage in their desired occupation within their environment. For adaptive gaming, OTs complete a motor analysis to determine the current function and strengths of the client. Then, OTs customize the switches and placement to create an environment that increases switch access and engagement in adaptive gaming. The PEO model is a model for OTs to customize adaptive gaming to the needs of the client and create opportunities for clients to participate in gaming as an occupation in multiple settings.

Lastly, OTs can potentially utilize this in the school setting as a social occupation for children with disabilities and their peers. For example, a child in a wheelchair may not be able to run on the playground with their peers but could engage in a video game via an adaptive device, thus creating a play occupation that's accessible and inclusive.

References

Abbot, S., & McConkey, R. (2006) The barriers to social inclusion as perceived by people with intellectual disabilities. *Journal of Intellectual Disabilities, 10*(3), 275-287.

American Occupational Therapy Association. (2002). Occupational therapy practice framework: Domain and process. *American Journal of Occupational Therapy, 56*, 609–639.

American Occupational Therapy Association. (2004a). Definition of occupational therapy practice for the AOTA Model Practice Act. retrieved from https://www.aota.org/-/media/Corporate/Files/Advocacy/State/Resources/PracticeAct/Model%20Definition%20of%20OT%20Practice%20%20Adopted%2041411.pdf

American Occupational Therapy Association (2015). Occupational therapy code of ethics. *American Journal of Occupational Therapy*, *69*(Supplement 3), 6913410030p1. http://dx.doi.org/10.5014/ajot.2015.696S03

Bugmann, J. (2018). Can elementary school students really benefit from using video games at school? *Review of Science Mathematics & ICT Education, 12*(1), 23-40.

Chantry, J., & Dunford, C. (2010). How do computer assistive technologies enhance participation in childhood occupations for children with multiple and complex disabilities? A review of the current literature. *British Journal of Occupational Therapy*, *73*(8), 351-365.

Dye, J. F., Schatz, I. M., Rosenberg, B.A., & Colemans, S. T. (2000). Constant comparison method: A kaleidoscope of data. *The Qualitative Report*, *4*(1), 1-10. Retrieved from http://nsuworks.nova.edu/tqr/vol4/iss/8

Harrington, B., & O'Connell, M. (2016). Video games as virtual teachers: Prosocial video game use by children and adolescents from different socioeconomic groups is associated with

increased empathy and prosocial behaviour. *Computers in Human Behavior*, *63*, 650-658. http://dx.doi.org/10.1016/j.chb.2016.05.062

Hsieh, H. C., Lin, H. Y., Chiu, W. H., Meng, L. F., & Liu, C. K. (2015). Upper-limb rehabilitation with adaptive video games for preschool children with developmental disabilities. *American Journal of Occupational Therapy*, *69*, 1-5. http://dx.doi.org/10.5014/ajot.2015.014480

Jannink, M. J., Van Der Wilden, G. J., Navis, D. W., Visser, G., Gussinklo, J., & Ijzerman, M. (2008). A low-cost video game applied for training of UE function in children with cerebral palsy: a pilot study. *CyberPsychology & Behavior: The Impact of the Internet, Multimedia and Virtual Reality on Behavior and Society, 11*(1), 27-32. https://www.liebertpub.com/doi/10.1089/cpb.2007.0014

Law, M., Cooper, B., Strong, S., Stewart, D., Rigby, P., & Letts, L. (1996). The person-environment-occupation model: A transitive approach to occupational performance. *Canadian Journal of Occupational Therapy*, *63*(1), 9-23.

Leuty, V., Boger, J., Young, L., Hoey, J., & Mihailidis, A. (2013). Engaging older adults with dementia in creative occupations using artificially intelligent assistive technology. *Assistive Technology: the official journal of RESNA*, *25*(2), 72-79. https://doi.org/10.1080/10400435.2012.715113

Long, M. T., & Perry, F. D. (2008). Pediatric physical therapists' perceptions of their training in assistive technology. *Physical Therapy*, *88*(5), 629-639.

Luna-Oliva, L., Ortiz-Gutiérrez, R. M., Cano-de la Cuerda, R., Piédrola, R. M., Alguacil-Diego, M., Sánchez-Camarero, C., & Martínez Culebras, M. del C. (2013). Kinect Xbox™ 360

as a therapeutic modality for children with cerebral palsy in a school environment: A preliminary study. *NeuroRehabilitation, 33*(4), 513–521. doi: 10.3233/NRE-131001

Machado, F. R. C., Antunes, P. P., De Moura Souza, J., Dos Santos, A. C., Levandowski, D. C., & Alves De Oliveira, A. (2017). Motor improvement using motion sensing game devices for cerebral palsy rehabilitation. *Journal of Motor Behavior, 49*(3), 273-280.

Page, Z. E., Barrington, S., Edwards, J., & Barnett, L. M. (2017). Do active video games benefit the motor skill development of non-typically developing children and adolescents: A systematic review. *Journal of Science and Medicine in Sport, 20,* 1087-1100.

Parham, L. D., & Fazio, L. S. (2008). Play in occupational therapy for children (2nd ed.). St. Louis, MO: Mosby Publishers.

Parsons, S., Karakosta, E., Boniface, M., & Crowle, S. (2019). Prosocial games for inclusion: Interaction patterns and game outcomes for elementary-aged children. *International Journal of Child-Computer Interaction, 22,* 1-11. https://doi.org/10.1016/j.ijcci.2019.100142

Preston, N., Weightman, A., Gallagher, J., Holt, R., Clarke, M., Mon-Williams, M., & Bhakta, B. (2016). Feasibility of school-based computer-assisted robotic gaming technology for upper limb rehabilitation of children with cerebral palsy. *Disability & Rehabilitation:Assistive Technology, 11*(4), 281–288.https://doi-org.dominican.idm.oclc.org/10.3109/17483107.2014.932020

Robert, M., Ballaz, L., Hart, R., & Lemay, M. (2013). Exercise intensity levels in children with cerebral palsy while playing with an active video game console. *Journal of Physical Therapy, 93*(8), 1084-1091.

Rowland, J. L., Malone, L. A., Fidopiastis, C. M., Padalabalanarayanan, S., Thirumalai, M., & Rimmer, J. H. (2016.) Perspective on active video gaming as a new frontier in accessible for youth with physical disabilities. *Journal of Physical Therapy, 96*(4), 521-532.

Saldana, J. (2009). The coding manual for qualitative researchers. Los Angeles. SAGE Publications.

Sandlund, M., Domellöf, E., Grip, H., Rönnqvist, L., & Häger, C. K. (2014). Training of goal directed arm movements with motion interactive video games in children with cerebral palsy - A kinematic evaluation. *Developmental Neurorehabilitation, 17*(5), 318–326. https://doi.org/10.3109/17518423.2013.776124

Schell, B., Gillen, G., & Scaffa, M. (2014). *Willard & Spackman's Occupational Therapy*, 12th ed. Philadelphia: Wolters Kluwer Health/ Lippincott Williams & Wilkins.

Standen, P. J., Camm, C., Battersby, S., Brown, D. J., & Harrison, M. (2011). An evaluation of the Wii Nunchuk as an alternative assistive device for people with intellectual and physical disabilities using switch controlled software. doi: 10.1016/j.compedu.2010.06.003

Tarakci, E., Arman, N., Tarakci, D., & Kasapcopur, O. (2019). Leap Motion Controller–based training for upper extremity rehabilitation in children and adolescents with physical disabilities: A randomized controlled trial. *Journal of Hand Therapy: Official Journal of the American Society of Hand Therapists, 3*(2), 220-228.https://doi-org.dominican.idm.oclc.org/10.1016/j.jht.2019.03.012

Whiteford, G., Jones, K., Rahal, C., & Suleman, A. (2018). The Participatory Occupational Justice Framework as a tool for change: Three contrasting case narratives. *Journal of Occupational Science 25*(4), 497-508. doi: 10.1080/14427591.2018.1504607

"Xbox™ Adaptive Controller: Xbox™." *Xbox.com*, Microsoft, 2019, www.xbox.com/en-US/xbox-one/accessories/controllers/xbox-adaptive-controller.

Appendix A - Participant (Parent / Guardian) Consent Form

DOMINICAN UNIVERSITY OF CALIFORNIA
CONSENT FORM TO BE A RESEARCH PARTICIPANT

1. I understand that I am being asked to participate in a research study on adaptive gaming. The researchers are investigating the lived experience from the perspective of the participants as well as examining the details of what participating in the occupation of gaming (e.g. motor, social and other events). This capstone research project is being supervised by Dr. Laura Hess, Ph.D, OTR/L, Assistant Professor at Dominican University of California.

2. I understand that participation in this research will involve (1) completing an intake form; (2) participating in two audio / video recorded interviews before and after the study about your perspectives on adaptive gaming; (3) participation in 3-6 visits to the resource center for the "Games Club" wherein the sessions will be video and audio recorded.

3. I understand that my participation in this study is completely voluntary and I am free to withdraw my participation at any time.

4. I have been made aware that the interviews will be audio and/or video recorded. All personal references and identifying information will be eliminated when these recordings are transcribed, and all participants will be identified by participant ID number and /or pseudonym only; the master list will be kept by Dr. Laura Hess, in a locked office, password protected desktop computer in a de-identified file, separate from all other research data. All data will be seen only by the research team. All tapes and records will be destroyed after a period of one year following completion of the research project.

5. I am aware that all study participants will be furnished with a written summary of the relevant findings and conclusions of this project. Such results will not be available until after January 2021.

6. I understand that I will be discussing topics of a personal nature and that I may refuse to answer any question that causes me distress or seems an invasion of my privacy at any time. I may elect to stop the interview at any time.

7. I understand that my participation involves no physical risk, but may involve some psychological discomfort, given the nature of the topic being addressed in the interviews. If I experience any problems or serious distress due to my participation, I can ask for a break, and/or I can ask for that portion of the research to stop. I can also withdraw from the study at any time.

8. I understand that if I have any further questions about the study, I may contact

- Melanie Blaisdell at [melanie.blaisdell@students.dominican.edu]
- Lauren Andaya [lauren.andaya@students.dominican.edu],
- Christina Floyd [christina.floyd@students.dominican.edu],
- Audrey Metzger [audrey.metzger@students.dominican.edu],
- Madeleine Pope [madeleine.pope@students.dominican.edu],
- Donna Chen Tubig [donnachen.tubig@students.dominican.edu],
- or Christine Vincent [christine.vincent@students.dominican.edu]

or their research supervisor, Dr. Laura Hess, Ph.D, OTR/L at [laura.hess@dominican.edu or (415) 482-1906.] If I have further questions or comments about participation in this study, I may contact the Dominican University of California Institutional Review Board for the Protection of Human Participants (IRBPHP), which is concerned with the protection of volunteers in research projects. I may reach the IRBPHP Office by calling (415) 482-3547 and leaving a voicemail message, by FAX at (415) 257-0165 or by writing to the IRBPHP, Office of the Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901.

9. All procedures related to this research project have been satisfactorily explained to me prior to my voluntary election to participate.

I HAVE READ AND UNDERSTAND ALL OF THE ABOVE EXPLANATION REGARDING THIS STUDY. I VOLUNTARILY GIVE MY CONSENT TO PARTICIPATE. A COPY OF THIS FORM HAS BEEN GIVEN TO ME FOR MY FUTURE REFERENCE.

Name Date

Appendix B - Proxy Consent Form

DOMINICAN UNIVERSITY OF CALIFORNIA

PROXY CONSENT FOR RESEARCH PARTICIPATION

Purpose and Background

Lauren Andaya, Melanie Blaisdell, Christina Floyd, Audrey Metzger, Madeleine Pope, Donna Chen Tubig, and Christine Vincent, graduate students, and Dr. Laura Hess, Ph.D, OTR/L, Assistant Professor at the Department of Occupational Therapy at Dominican University of California, are doing a research study on the occupation of gaming using an adapted "Games Club."

My child is being asked to participate because s/he has a disability and enjoys playing video games.

Procedures

If I agree to allow my child to be in this study, the following will happen:

(1) complete an intake form; (2) participate in two audio / video recorded interviews before and after the study about your perspectives on adaptive gaming; (3) participate in 3-6 visits to the resource center for the "Games Club" wherein the sessions will be video and audio recorded.

Risks and/or discomforts

1. My child may become uncomfortable or upset during the interviews and/or "Games Club".
2. My child or I may feel uncomfortable discussing sensitive or personal information.
3. My child or I may feel uncomfortable with researchers reviewing personal history.
4. I have been made aware that the interviews will be audio and/or video recorded. All personal references and identifying information will be eliminated when these recordings are transcribed, and all participants will be identified by participant ID number and /or pseudonym only; the master list will be kept by Dr. Laura Hess, in a locked office, password protected desktop computer in a de-identified file, separate from all other research data. All data will be seen only by the research team. All tapes and records will be destroyed after a period of one year following completion of the research project

Benefits

There will be no direct benefit for me or my child from participating in this study, other than contributing to the research. However, my child and I may enjoy participating in the "Games Club" The anticipated benefit of this study is a better understanding of the meaning of adaptive gaming from the perspectives of children and families.

Costs/Financial Considerations

Transportation is required to and from the resource center. Other than that, there will be no financial costs to myself or my child as a result of taking part in this study. Participants are asked to volunteer their time and additional effort to participate in the study outside of their daily routine (e.g. work, school, extracurricular activities).

Payment/Reimbursement

There is no reimbursement for participation in this study.

Questions

I have talked to a researcher of this study and have had my questions answered. If I have further questions about the research study, I may email Melanie Blaisdell, OTS at melanie.blaisdell@students.dominican.edu or call Dr. Laura Hess, Ph.D, OTR/L at (415) 482-1906. If I have any questions or comments about participation in this study, I should first talk with the researchers. If for some reason I do not wish to do this, I may contact the Dominican University of California Institutional Review Board for the Protection of Human Participants (IRBPHP), which is concerned with protection of volunteers in research projects. I may reach the IRBPHP Office by calling (415) 482-3547 and leaving a voicemail message, or FAX at (415) 257-0165, or by writing to IRBPHP, Office of Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901.

Consent

I have been given a copy of this consent form, signed and dated, to keep.

PARTICIPATION IN RESEARCH IS VOLUNTARY. I am free to decline to have my child be in this study, or to withdraw my child from it at any point.

My signature below indicates that I agree to allow my child to participate in this study.

Signature of Participant's Parent/Guardian	Date
Signature of Participant's Parent/Guardian	Date
Signature of Person Obtaining Consent	Date
Signature of Person Obtaining Consent	Date

Appendix C - Child Assent Form - Ages 7-12

DOMINICAN UNIVERSITY OF CALIFORNIA

CHILD ASSENT FORM (AGES 7-12)

Title of Study: Adaptive Gaming as an Occupation: Examination of meaning for individuals with disabilities.

Student Researchers: Lauren Andaya, Melanie Blaisdell, Christina Floyd, Audrey Metzger, Madeleine Pope, Donna Chen Tubig, Christine Vincent

Principal Investigator: Laura Hess, Ph.D, OTR/L

Phone: 415-482-1906**; E-mail:** laura.hess@dominican.edu

You are being asked to be in a research study about video gaming. If you say yes, you will attend a video games club once a week for 3-6 weeks at the resource center. You will play video games using the new Xbox™ Adaptive Controller. There will be other kids in the club who you can play video games with. We will ask you and your parents questions about video games and your time at the games club. We will also be video / audio recording your interviews and while playing the games to help us with our research. We want to learn more about adaptive gaming and what it means to you and your family.

You can decide NOT to be in this study and you can choose to stop at any time.

_____has talked to me and answered all of my questions. I agree to be in this study.

Name _____I am_____years old.

Signature_____Date_____

I have described this study and explained the risks and benefits in language that is understandable to the child. I believe the child understood and has assented to participate in the study.

Signature of Investigator or Person Obtaining Consent Date

Appendix D - Child Assent Form - Ages 13 - 17

DOMINICAN UNIVERSITY OF CALIFORNIA

CHILD ASSENT FORM (AGES 13-17)

Title of Study: Adaptive Gaming as an Occupation: Examination of meaning for individuals with disabilities.

Student Researchers: Lauren Andaya, Melanie Blaisdell, Christina Floyd, Audrey Metzger, Madeleine Pope, Donna Chen Tubig, Christine Vincent

Principal Investigator: Laura Hess, Ph.D, OTR/L

Phone: 415-482-1906**; E-mail:** laura.hess@dominican.edu

You are being asked to be in a research study about video gaming. If you say yes, you will attend a video games club once a week. You will play video games using a new Xbox Adaptive Controller for about one hour. There will be other kids in the club who you can play multiplayer games with. We will ask you and your parents questions about video games and your experience at the games club. We will also be video recording you playing the games to help us with our research.

Being in this study will help you learn how to play video games using the new Xbox™ Adaptive Controller. You will also be able to play games with other kids in the club. You will be helping us learn about how playing video games affect your movement and how you play with others.

You can decide NOT to be in this study and you can choose to stop at any time.

_____ has talked to me and answered all of my questions. I agree to be in this study.

Name _____ I am _____years old.

Signature_____ Date _____

I have described this study and explained the risks and benefits in language that is understandable to the child. I believe the child understood and has assented to participate in the study.

_____

Signature of Investigator or Person Obtaining Consent Date

Appendix E - Research Participant's Bill of Rights

DOMINICAN UNIVERSITY OF CALIFORNIA

RESEARCH PARTICIPANT'S BILL OF RIGHTS

Every person who is asked to be in a research study has the following rights:

1. To be told what the study is trying to find out;

2. To be told what will happen in the study and whether any of the procedures, drugs or devices are different from what would be used in standard practice;

3. To be told about important risks, side effects or discomforts of the things that will happen to her/him;

4. To be told if s/he can expect any benefit from participating and, if so, what the benefits might be;

5. To be told what other choices s/he has and how they may be better or worse than being in the study;

6. To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study;

7. To be told what sort of medical treatment is available if any complications arise;

8. To refuse to participate at all before or after the study is stated without any adverse effects. If such a decision is made, it will not affect h/her rights to receive the care or privileges expected if s/he were not in the study.

9. To receive a copy of the signed and dated consent form;

10. To be free of pressure when considering whether s/he wishes to be in the study.

If you have questions about the research you may contact me at (melanie.blaisdell@students.dominican.edu). If you have further questions you may contact my research supervisor, (Dr. Laura Hess, Ph.D, OTR/L (415) 482-1906) or the Dominican University of California Institutional Review Board for the Protection of Human Participants (IRBPHP), which is concerned with protection of volunteers in research projects. You may reach the IRBPHP Office by calling (415) 482-3547 and leaving a voicemail message, or FAX at (415) 257-0165, or by writing to IRBPHP, Office of Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901

Appendix F - Letter of Permission to Agency Directors

DOMINICAN UNIVERSITY of CALIFORNIA

LETTER OF PERMISSION TO AGENCY DIRECTORS

Dear Colleague,

This letter confirms that you have been provided with a brief description of our graduate capstone thesis research project, which researches the social and motor skills that can be observed through an adaptive gaming club, and that you give your consent for us to visit your resource center to interview and interact with a random sample of your clients. This project is an important part of our graduate requirements as occupational therapy majors, and is being supervised by Dr. Laura Greiss-Hess, Professor of Occupational Therapy at Dominican University of California.

As we discussed in our meetings, we will make every effort to ensure that our data collection does not interfere with your regularly scheduled workshops or therapy sessions, classes and workshops, and that your clients are treated with the utmost discretion and sensitivity. If you have questions about the research you may contact Melanie Blaisdell, or other team members us, at the phone number or email address below. If you have further concerns you may contact our research supervisor, Dr. Hess, at (415) 458-3769 or the Institutional Review Board for the Protection of Human Participants at Dominican University of California by calling (415) 482-3547.

After our research project has been completed in May 2021, we will be glad to send you a summary of our research results. If our request to visit your establishment and implement the adaptive games club with your clients meets with your approval, please sign and date this letter below and return it to us in the enclosed self-addressed, stamped envelope as soon as possible. Please feel free to contact us if you have any questions about this project.

Thank you very much for your time and cooperation.

Sincerely,
Lauren Andaya, Melanie Blaisdell, Christina Floyd, Audrey Metzger, Madeleine Pope, Donna Chen Tubig, Christine Vincent
50 Acacia Ave., Department of Occupational Therapy
San Rafael, CA 94901
Email address: melanie.blaisdell@students.dominican.edu
(831) 333-6344

I agree with the above request

Signature **Date**

Appendix G - Letter of Introduction to Participants

DOMINICAN UNIVERSITY of CALIFORNIA

LETTER OF INTRODUCTION TO PARTICIPANTS

Dear Participants,

We are occupational therapy graduate students at Dominican University completing a research study on adaptive gaming. The researchers are investigating the lived experience from the perspective of the participants as well as examining the details of what participating in the occupation of gaming (e.g. motor, social and other events). This capstone research project is being supervised by Dr. Laura Hess, Ph.D, OTR/L, Assistant Professor at Dominican University of California.

Participation in this research will involve (1) completing an intake form; (2) participating in two audio / video recorded interviews before and after the study about your perspectives on adaptive gaming; (3) participation in 3-6 visits to the resource center for the "Games Club" wherein the sessions will be video and audio recorded.

Participation in this study is completely voluntary and I am free to withdraw my participation at any time. All safeguards to research participants will be adhered to in accordance to our Institutional Review Board IRB.

Please refer to the recruitment flyer provided for additional information.

If there are any questions concerning the research study you may contact us at the email address below or contact our faculty supervision Dr. Laura Hess, PHD, OTR/L at (415) 482-1906 or the Dominican University of California Institutional Review Board for the Protection of Human Participants (IRBPHP) at (415) 482-3547.

Thank you in advance for your participation.

Sincerely,
Melanie Blaisdell

Occupational Therapy Department
Dominican University of California
50 Acacia Avenue
San Rafael, CA 94901
Email: duotadaptivegaming@gmail.com

Appendix H - Flyer

Gamers needed for our study!

Do you or someone you know like video games?

Appendix I - Pre and Post Interview Questions

DOMINICAN UNIVERSITY of CALIFORNIA

Parent Interview Protocol Baseline

Thank you for your participation in this study and taking time to share your personal experiences with our team. We would like to learn more about your perspectives and experiences with adaptive gaming. As we go through the questions, please provide any examples or stories you or your child may have had with adaptive gaming.

1. What does participation in adaptive gaming mean to you and your family?
2. What are you hoping to see as part of this adapting gaming series?
3. Do you have any specific goals or expectations for your child in participating in Game Club?
4. Is there anything you would like to share as we prepare for the adaptive gaming experience?

Parent Interview Protocol Post

Thank you for your participation in this study and taking time to share your personal experiences with our team. We would like to learn more about your perspective and experiences with adaptive gaming now that you've completed the study. As we go through the questions, please provide any examples or stories you or your child may have had with your adaptive gaming experiences.

1. Tell us what adaptive gaming means to you and your family now that you've gone through the study?
2. Do you feel that your expectations or goals for this study have been met? Please explain.
3. Was there anything unexpected or surprising as part of this experience?
4. Tell us about you and your child's experience with Games Club.
5. Tell us about any changes & examples you observed in your child's movements.
6. Tell us about any changes & examples you observed in your child's behavior.
7. Tell us about any changes & examples you observed in your child's socialization.
8. Were there any other changes you noticed?
9. What if anything would you now tell other families, teachers, people in the community about adapted gaming based on your experience in the games club?
10. Is there anything you would change? Please share suggestions and examples.
11. Is there anything else you would like to share? What do you want us to know that is important to you that we didn't ask?

Participant Interview Protocol Baseline

Thanks for joining our games club. We're excited you're here. We want to ask you a couple of questions about gaming, because your ideas are important to us.

1. How do you feel about participating in games club?
2. Is there anything you are hoping for as part of Games Club?
3. Please tell us anything else we should know before we get started.

Participant Interview Protocol Post

1. Tell us about your experiences in games club?
    1. How did you feel coming to games club?
    2. Did anything surprise you about this experience?
2. Did you have a favorite experience? What did you like the most?
3. What didn't you like?
4. Tell us about the switches and how they worked for you?
    1. Is there anything you would change about the switches? Or how you could play the game?
5. Tell us about the games?
    1. Is there anything you would change about the games?
6. Did you notice anything different about yourself while you were gaming?
    1. How your body moved?
    2. How you played with other kids?
    3. Anything else?
7. Tell us how it felt to play a game by yourself?
8. Tell us how it felt to play a game with a friend(s)
9. Would you want to continue coming to a games club? Why or why not?
10. What do you want us to know that is important to you that we didn't ask?

Appendix J - Participant Intake Form

This intake form was completed on a Google Form and it is typed out for convenience below.

General Information
Participant ID #/ Pseudonym:
Date of Birth:
Gender:
Ethnicity:
Diagnosis:
Assistive technology used:

- If yes, what do you use?

What grade are you in?
What type of services do you receive in school?

Gaming:
Do you play video games?

- If yes, what is your favorite video game?

Have you ever used an adaptive gaming device (ex. Xbox Adaptive Controller)

- If yes, what have you used?

Appendix K- Games Club Positioning and Field Notes

DOMINICAN UNIVERSITY of CALIFORNIA
GAMES CLUB POSITIONING AND FIELD NOTES

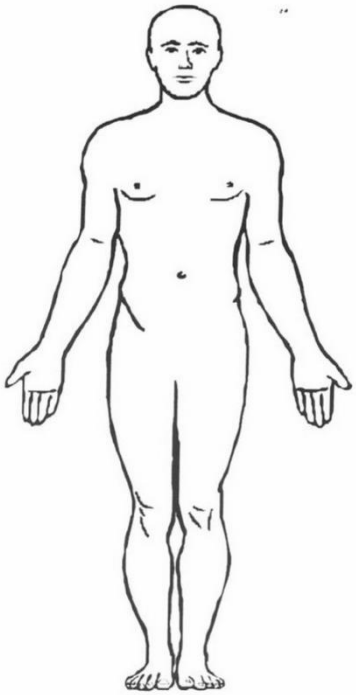
Positioning / Access & Field Notes

Participant number/Pseudonym:_____

Date:_____

Initials of observer:_____

Session Number (circle one) 1 2 3 4 5 6

Equipment Used:	**Put equipment # on diagram below:**
1._____ **2.**_____ **3.**_____ **4.**_____ **5.**_____	

Movement Patterns/Motor Considerations of Parts of Body

Head:

Neck:

Hands:

Wrists:

Knees:

Elbows:

Shoulders:

Field Notes / Observations:

Pictures of Positioning of Adaptive Gaming Devices on Body:

Appendix L - Research Assistant Consent Form

Confidentiality Agreement for Human Subject Research Assistants

Human subject research includes confidential and personal matters, some of which may involve a subject's rights of privacy protected by law, attorney-client privileged communications, and proprietary information. I agree to maintain confidentiality with respect to any private or personal information that I become aware of, or have access to, during the course of my activity as a researcher or research assistant. In providing support to a research project, I am considered a "confidential employee." I am prohibited from releasing information to or discussing information with anyone not employed in this specific research project, except as I am directed by the faculty advisor or as is necessary in the ordinary course of performing my duties in the research activity.

I agree to maintain the confidentiality of these matters while I am working on the research project and following the completion of my work association on this activity.

At all times during my participation, I shall promptly advise the primary investigator and faculty advisor of any knowledge that I may have of any unauthorized release or use of confidential or personal information, and shall take reasonable measures to prevent unauthorized persons from having access to, obtaining, or being furnished with any such information.

Print Name:

Signature Date

The policies were explained to me by:

Name Title

Appendix M - Media Consent Form

Media Consent Form

I, _____, agree to be photographed, videotaped, and/or audio recorded by graduate student researchers associated with the Department of Occupational Therapy at Dominican University of California.

I fully understand and agree that any statements I make or any photographs taken of me may be displayed in public places, duplicated, distributed and/or published by Dominican University of California in a manner including, but not limited, to the following:

[ ] Photographic display
[ ] Audio recording
[ ] Video tape
[ ] Internet
[ ] Website

I release Dominican University of California and their officers, agents, employees, volunteers and/or students from any and all claims that might arise from the use of such statements and/or photographs.

Signature:_____
(Signature of participant)

Signature:_____
(Signature of parent/legal guardian is required for minors to participate.)

Date:_____