THE ROLE OF IMMERSIVE EXPERIENCE

TECHNOLOGY FOR AUTONOMY IN OLDER

ADULTS TRANSITIONED INTO ASSISTED LIVING:

A USER-CENTERED DESIGN APPROACH

By

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Title of Study: THE ROLE OF IMMERSIVE EXPEREINCE TECHNOLOGY FOR AUTONOMY IN OLDER ADULTS TRANSITIONED INTO ASSISTED LIVING: A USER-CENTERED DESIGN APPROACH

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Abstract: The purpose of this study was to explore how immersive experience technology may impact older adults in transition into assisted living; through the perspective of older adults within those assisted living facilities. By creating a preliminary/exploratory study for future applied research, the goal of this study was to gather information on understanding and then specifying the resident's experiences in their transitions and their perspectives on the barriers and benefits in the use of immersive experience technologies prior to transitions. Understanding and specifying user needs are the first two steps in user-centered design, which helped guide this research, and will inform future research in production and evaluation of an immersive experience intervention design. This study was broken up into three phases, Phases 1 and 2 were two focus groups to gather qualitative data and Phase 3 was an online survey questionnaire to gather quantitative responses. The Phase 3 data is only included in the Appendix due to low response rates. Findings of this study revealed that loss of autonomy occurs prior to the transition, following two types of transitions; independent and dependent. The two types of transitions were found to have two different intervention paths, independent transitions leading to limited to no intervention and the dependent transitions having the children as the primary intervention. It was suggested that the virtual walkthrough would help improve autonomy in the independently transitioned older adults, through easing concern during the transition, as well as improving navigation and control within the new assisted living apartment once the transition is complete.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Research Question

How can immersive experience technology help older adults transition into assisted living? Studies have shown that older adults in America are aging at an increasing rate; 19 percent of the population in 2030 will be made up of older adults (Kane, 2013), 70 percent of older adults 65 and older will require long-term care (Kane, 2013), and 50 percent of older adults' experience lack of autonomy indoors (lack of ability to move around home) (Mueller et al., 2014). Previous research indicates that most older adults are resistant to move into long-term care facilities because of unfamiliarity of the environment, and some even experience a decline in cognition (Eckert et al., 2009). One of the ways that older adults feel a loss of control with their cognition is through the transition from their own homes into new environments like new long-term care facilities (Wilcocks et al., 1987). Through research into long-term care transitions, Wilcocks found that older adults experience around 15 different types of elements of the physical environment. One of the dimensions embodies the impact of orientational aids on older adults in the physical environment of long-term care facilities, which negatively impacts older adults' cognition, specifically sense of control (Wilcocks et al., 1987).

When older adults go through a transitional period of moving into long-term care, which include assisted living and skilled nursing facilities, nursing homes, and an environment that

provides medical and personal care (*Long-term care trends and statistics*, 2018) a key competency that declines is loss of control over autonomy (Wilcocks et al., 1987). A sense of control based on daily activities including cleaning, washing dishes, cooking, etc. and basic perception of quality of life, or subjective well-being, is described as autonomy. Autonomy is greatly impacted when transitioning from one's home to an institutional setting (Cobo, 2014). The purpose of this study was to explore how immersive experience technology can impact older adults in transition into assisted living through the perspective of older adults in those assisted living facilities. By creating a preliminary/exploratory study for future applied research, the goal of this study was to gather information on understanding and then specifying the residents' needs of immersive experience technologies. Understanding and specifying user needs are the first two steps in user-centered design (Jokela et al., 2003), which will help guide this research, and prepare future research of production and evaluation of an immersive experience intervention design.

Definitions

This section will provide definitions and key terms, as well as an explanation of the theoretical framework used in this study to provide clarification and context. The definitions in this section will include user-centered design, immersive experience technology, assisted living, and older adults.

User-Centered Design

User-centered design is the process of understanding the need/use, specifying the user, creating design, testing/evaluating the design (Jokela et al., 2003), in order to better understand the needs of individuals transitioning prior to the development of the prototype intervention (Figure 1). Although a variety of different interpretations of the framework exist to represent the user-centered design process, this study will focus on Jokela's representation.

Figure 1

User-Centered Design Framework used as the Theoretical Framework in this Study (Jokela et al., 2003).
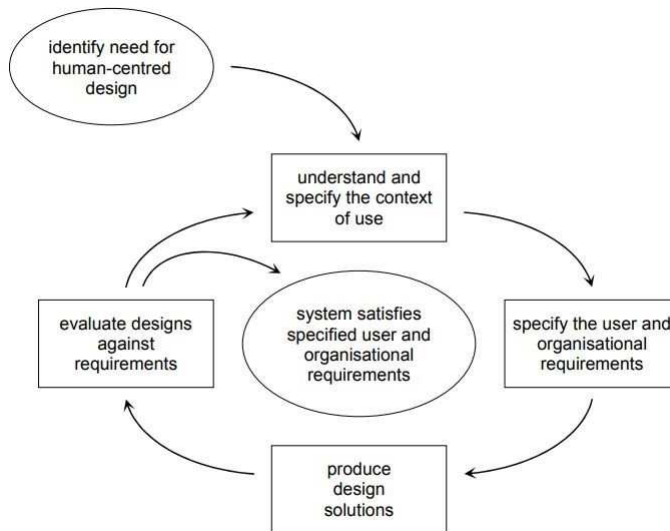
Immersive Experience Technology

Immersive experience technology is a series of characteristics of interactivity, virtual simulation, information processing, and presence (Lee & Park, 2020). The ability to have quick access to controlling activity with the immersive experience, as well as, viewing realistic, high quality and three-dimensional illustration are some examples of immersive experience characteristics (Lee & Park, 2020).

Assisted Living

Assisted living is a facility that provides the option of 24-hour care while promoting independent living through environmental layout and services (Hawes et al., 2003). Assisted living provides one type of long-term care for older adults (Quan et al., 2019).

Older Adults

Older adults are defined as the population of adults 65 and older (*FastStats - Older persons health. Centers for Disease Control and Prevention*, 2021). By 2030, 19 percent of the population in the United States will be made up of older adults (Kane, 2013).

Motivation for Study

The aging process is one that includes many variables that impact older adults and their families, especially in environments that are the most beneficial to quality of life (Gobbens & van Assen, 2017). Variables including loneliness, loss of control, and cognitive decline impact the transition into to the best fit environment (Quan et al., 2019). In some cases, older adults do not have the luxury to age in place, in their own homes, therefore, long-term care facilities exist. Based on the severity of health of the older adult, levels of care are provided – independent living, assisted living, and nursing homes (Quan et al., 2019). The order of level of care is as follows: independent living, assisted living, nursing homes, and memory care (Malone et al., 2008). Independent living is the first level of care and refers to living independently as an older adult and depending on social networks for assistance and support (Verver et al., 2018). Assisted living is the second level, which includes the option for care for the older adults with daily activities, while living in an independent setting (Sanford et al., 2015). Nursing homes are the third level of care and are defined as a live-in intensive care service (Sanford et al., 2015). Finally, memory care is the fourth level of care, commonly referred to as special care units, which include constant care, high security, a locked down facility. Memory care often serves those with living with Alzheimer's and dementia (Sheffer, 2017). With these different levels of care for older adults, assisted living is one that provides more independence. While this study addresses long-term care literature transitions, the research will take place with assisted living residents.

In recent months, a world pandemic (CoViD-19) has dramatically impacted assisted living facilities, putting older adults at higher health risk in their living environments (Applegate & Ouslander, 2020). Due to the advanced age and preexisting health condition of older adults, they are more susceptible to this virus, making the staff in assisted living facilities take extra precautions with quarantine and isolation, as well as infection prevention through cleanliness (McMichael et al., 2020). CoViD-19 presents additional risk to the population of older adults

residing in long-term care facilities and has highlighted the issues of social isolation, inability to receive services, and the difficulty to enter/transition into long-term care facilities safely, increasing stress for this vulnerable population (D'Adamo et al., 2020). Technological interventions are needed now more than ever to reduce stress during transitions for older adults (McMichael et al., 2020). With the current, rapidly increasing older adult population transitioning into assisted living facilities, further research needs to be conducted to better understand how and/or if immersive experience technology can be used as an intervention for these transitions.

Expected Contributions to Literature

Current research does not provide information on benefits and/or barriers of immersive experience technology being used as an intervention during transitions into assisted living facilities. Information needs to be gathered through the framework of user-centered design to understand and specify assisted living residence needs for this type of intervention during transitions into assisted living. With the ability to gather and analyze information on perceived needs of immersive experience technology from older adults, this research will provide the literature with the first two steps of the user-centered design framework of using immersive experience technology as an intervention during transitions into assisted living facilities. This information will help guide future research on the last two steps of user-centered design, that is, designing and testing immersive experience technology in a variety of transitions into assisted living.

CHAPTER II

LITERATURE REVIEW

With the increasing population of older adults transitioning into long-term care(*FastStats - Older persons health. Centers for Disease Control and Prevention*, 2021) the need for interventions to improve their autonomy increases (Mueller et al., 2014). Studies have shown that autonomy can be improved by using virtual reality training (Kizony et al., 2010). User-centered design is used for this study to better understand how immersive experience technology can help improve autonomy in transition into long-term care for older adults. This literature review will first illustrate the theoretical framework of user-centered design, making the relationship of the first two steps with intervention design. Second, this review will examine empirical literature regarding the transitions to long-term care and the impacts of that transition on personal autonomy. Finally, this review will explore the uses of immersive experience technology and its potential benefit as an intervention for older adults in assisted living.

Theoretical Framework

User-Centered Design

Usability is the process of understanding user goals and creating a product to meet users' needs, achieving satisfaction (Jokela et al., 2003). User-centered design, on the other hand, goes further into four different stages in order to achieve usability; understanding required tasks performed in the environment, relationship of function between user and environment,

application/testing of design solution, and evaluation of design (Dwivedi et al., 2012). The use and application of the user-centered design increases user satisfaction because of the specific design outcomes for the user (Johnson et al., 2005).

This study will use the first two steps in the process, understanding the need and specifying the user, to explore the perception and need for immersive experience technology during transitions into assisted living (Figure 1). Research has shown that the integration of virtual environments and user experience has a positive relationship with the perception of architectural settings (Gladden, 2018). By adding virtual immersion into user-centered design process, user experiences are expected to improve through better utilization, value, and meaning of the environment (Gladden, 2018).

Beyond technological applications, user-centered design has been applied to learning methods using smart technology (Dirin & Nieminen, 2015). A study conducted by Dirin suggested that through using user-centered design methods, a product was developed, for older adults, to help meet the needs of mobile learning (Dirin & Nieminen, 2015). This suggests that user-centered design is a process that can be applied to a variety of scenarios and not only the design of physical user environments. User-centered design has also been applied to older adults in recent literature. For example, a study suggested a successful website design for older adults through the employment of user-centered design methods (Hoffman et al., 2020). This population needs were met through the usability and acceptability of a new technological software, while using the website on their own, suggesting increase in control and/or independence (Hoffman et al., 2020). Another study suggested that through the application of user-centered design, a health technology product, "Pocket Personal Assistant for Tracking Health (Pocket PATH)", was developed to meet end-user need of older adult patients (Dabbs et al., 2009). In summary, user-centered design has been used in the studies discussed above to help meet the needs of older adults through the development of technological and learning processes (Dabbs et al., 2009).

Empirical Literature Review

Transitions for Older Adults

 A recent study implied that the reason for making the decision to leave home and move into long-term care facilities is due to economic, social, health (mental and physical) reasons, and home attachment (familiarity, proximity, routine, etc) (Roy et al., 2018). One reason older adults prefer to age in place is the fear of a transition into long-term care, causing loss of familiarity, which is a defining part of home attachment; loss of familiarity is commonly seen in transitions into long-term care due to lack of transitional tools for older adults (Roy et al., 2018). Other factors that were suggested to negatively influences the decision to transition into long-term care include the perception that the older adult would experience loss of autonomy, quality of life, and life satisfaction (Lillo-Crespo & Riquelme, 2018). To help make the decision to transition into long-term care, a key variable was the ability for the older adult to regain a sense of control of the new environment (Lillo-Crespo & Riquelme, 2018).

 When making a transition to a new place, older adults are most likely to be negatively impacted (Scheidt & Norris-Baker, 1999). Some older adults may experience disrupted transition while moving into long-term care facilities, including assisted living, because of the "element of surprise" arising from lack of familiarization with a new environment (Magilvy & Congdon, 2000). Some older adults are forced to relocate due to day-to-day life experiences as well as health emergencies and natural disasters. With limited resources from long-term care communities, the transitions for these older adults become mentally and physically draining (Sanders et al., 2004). There are currently not enough well-known tools or interventions to decrease negative impacts that come with relocation for older adults who make the choice or are forced to transition due to their circumstances (Sanders et al., 2004).

 Even though transitions into new environments may be difficult for many, older adults are impacted at a higher rate due to the span and history of their life experiences (Perry, 2014). Greater connections have been made with possessions and people; as well as increased

participation in social and cultural experiences (Perry et al., 2014). Creating interventions for older adults helps inform them of the benefits of new environments. This can help create familiarity with their life experience. The amount of activity that is allowed and accessible in long-term care facilities may support the variety of life experiences of older adults who are transitioning (McNamara & Gonzales, 2011). Interventions that take place prior to the initial transition may allow for improved accessibility and success in activities that support the sense of individuality of older adults.

Environmental Press

Environmental press is defined as the impact of the environment on a person's competencies (Lawton, 1985). This will help guide the research in understanding older adults' needs in assisted living environments. Environmental press was developed by Lawton and Nahenow (1985) to explain how competencies, function and demand, are impacted based on environmental settings and age. The aging population was impacted by environmental factors, limiting the ability to perform tasks in a space based on cognitive/functional demands. Autonomy, or sense of control, was found to be one of the main competencies impacted due to environmental press for older adults (Lawton, 1985). This model was revisited by Scheidt (2006) based on needs of the aging population. Scheidt found that accessibility, usability, individual level, and group level were new components that contributed to environmental press (Scheidt & Windley, 2006).

Lichtenberg (2000) studied older adults in hospital settings, before and after transition, while examining the impact of the living arrangement on the patients' competencies, specifically the improvement of functional ability (Lichtenberg et al., 2000). Place rules that shape the environment also impacted competencies of older adults (Moore, 2005). Place rules are the basic rules of an environment, which management/staff typically develop for the users; place rules are then used to understand impact of environmental press on older adults (Moore, 2005). Findings have suggested that the hobby room (art and craft room) at a dementia adult care center had the

greatest balance between competence and press, maximizing potential and performance for the older adults (Moore, 2005). Place rules have a positive impact on quality of life through the availability of services in proximity of the environment (Yu et al., 2018). Environmental factors including accessibility to services (medical, food, activity) and transportation improve competencies and decrease environmental press (La Gory & Fitpatrick, 1992). Similarly, autonomy was observed in older adults who had greater awareness of local services and resources (Park & Lee, 2017).

Changes in Sense of Autonomy

Transitions into new environments have shown to impact older adults' sense of self and individuality by limiting their autonomy when entering the new environment without transitional preparation (Wilson et al., 2016). Autonomy is suggested to be perceived by older adults as an independent action, while an outside person, such as staff, provides the actual resource or intervention (Hertz & Anschutz, 2002).

The lack of resources such as therapeutic interventions during transitions to long-term care facilities have created limitations and potential autonomy change in older adults. This is first observed in Wilcocks' (1987) early research on long-term care facilities and their impacts on autonomy of older adults. Wilcocks found the lack of orientational aids in homes and long-term care facilities impacted control in older adults (Wilcocks et al., 1987). This research showed the lack of resources that are provided for older adults during the transition period, suggesting compromised autonomy and/or sense of control, impacting overall experience in the facility. Other research supports the ongoing issue of autonomy in long-term care facilities, that older adults still experience a compromise of autonomy when transitioning into long-term care (Ayalon, 2016). The lack of helpful resources during the admissions period limits the amount of control, or autonomy, that the older adult has when entering the new environment (Reinardy, 1995). Specifically, this research suggested that the absence of adjustment resources in the first

steps of transition limited the control of the older adults' decision making in the environment (Reinardy, 1995).

Cognitive Control in Daily Tasks

Cognitive control helps older adults retain and remember positive information, however, with age there may be a cognitive decline (Mather & Knight, 2005). Previous research indicates that cognition in older adults is impacted when transitioning into new or long-term care environments. This appears in early research studying cortisol levels in older adults when experiencing relocation (Hodgson et al., 2004). In the first few weeks after transition into the new environment, the levels of stress hormones such as cortisol were higher than normal, suggesting an increase in anxiety and depression with some impact on cognition (Hodgson et al., 2004). Other research has suggested that when transitioning into new environments including long-term care, seniors tend to develop cognitive decline, limiting their positive interaction with the environment. Positive cognition during the initial relocation period has been found in older adults who had psychological and therapeutic tools at their disposal prior to the move, creating a sense of acceptance for these individuals who were introduced to mediating psychological resources (Bekhet et al., 2011).

Intervention tools should be created to act as descriptive and explanatory devices for older adults whose mental and physical capacity has been compromised due to disasters, creating unplanned transitions, limiting shock and stress (Sanders et al., 2004). Transitions for older adults are difficult whether planned or unplanned. Survey tools have been created to evaluate quality of long-term care facilities for older adults moving into new environments, specifically "The Consumer Choice Index" (Milte et al., 2019). This tool was made to assess the elements of care, room quality, and functionality of older adults after the transition; however, this does not assess the actual and initial transition period. In order to increase positive outcomes among older adults when transitioning into these new environments, "place-therapies" should be applied as interventions (Scheidt & Norris-Baker, 1999). Creating interventions that prepare older adults for

their new environment through place recognition may aid in the transition process (Scheidt &
Norris-Baker, 1999).

Subjective Well-Being

Quality of life during transition from home to long-term care is reflected in subjective
well-being (Steptoe et al., 2015). Subjective well-being has been linked to life satisfaction and
mood, which could impact outlook on quality of life (Steptoe et al., 2015). Autonomy has been
described as the perception of quality of life (Cobo, 2014). Subjective well-being is part of the
autonomy dimension (Pinquart & Sörensen, 2000). To increase subjective well-being in older
adults who are transitioning into long-term care environments, interventions that introduce
services and environment should be introduced earlier rather than later (Shapiro & Taylor, 2002).
Environmental stimuli should be incorporated in introductory stages of transition to increase
levels of subjective well-being (McNeil et al., 1986).

Immersive Experience Technologies

Immersive experience technologies are tools that maximize perception of reality and limit
physical constraints (Lee & Park, 2020). Immersive technologies can include a variety of
characteristics including easy interactivity, virtual stimulation, sensory information processing,
awareness of presence, and more (Lee & Park, 2020). Immersive experience has been explored
with the older adult population through the application of a variety of technologies ranging from
virtual reality, robotics, augmented reality, and holographics (Lee & Park, 2020). Libin explored
the use of a robotic pet at a nursing home with dementia patients; results showed that the
dementia patients had an increased interactivity rate with the robotic cat, decreasing agitation
(Libin & Cohen-Mansfield, 2004). Augmented reality has been used to reduce the rate of
mortality and increase impact of online consultations for older adults in healthcare settings
(Sirilak & Muneesawang, 2018).

Virtual reality is a tool of immersive experience technologies. Recently, virtual reality
has been used as a training tool for populations with compromised physical and mental abilities

and/or competencies to improve skill sets accordingly (Sveistrup et al., 2004). Physical and

mental therapy may use virtual reality as a therapeutic tool for patients through interactive

applications and games (Sveistrup et al., 2004). Virtual reality is used as a tool for environmental

interior design through memory training to wayfinding (Davis et al., 2017). Calogiuri (2018)

experimented with a 360-degree "nature walk" video, through the view of a head mounted

display on older adults; results suggested an enhanced emotional state and an increased

perception of presence.

However, a gap in research still exists between the use of immersive experience

technologies and impacts on older adults and transitions into assisted living facilities. Table 1 lists

some of the current gaps in literature.

Table 1

Table Summarizing Current Gaps in Literature

Issues Addressed in the Past	Issues That Need Further Exploration
Benefits of immersive experience technology on older population.	Benefits and barriers of immersive experience technology on older adults residing in assisted living.
	Immersive experience technology impacts on autonomy of older adults residing in assisted living.

Chapter Summary

Current research includes information on user-centered design, transitions into assisted

living facilities, perception of needs through the understanding of environmental press and

autonomy, and immersive experience technologies. The application of immersive experience

technology and impact of transitions into assisted living facilities as well as the benefits or

barriers for older adults during the transition remains to be studied. How can immersive experience technology help older adults in their transition into assisted living?

Current research provides enough evidence on the benefits of immersive experience technology with older adults. The literature also suggests that transitions for older adults can cause long-term difficulties, creating negative impacts on autonomy and other competencies impacting environmental press. Additionally, user-centered design can be used to create a variety of products, environments, and more through the process of understanding, specifying, and designing for specific needs. Therefore, this study will use the first two steps of the user-centered design process. This includes understanding and specifying needs of older adults, to exploring how immersive experience technology can impact transitions and whether this technology can benefit the population of older adults living in assisted living facilities.

CHAPTER III

METHODOLOGY

The purpose of this study was to understand how immersive experience technology can help older adults' transition into assisted living using a specific form of virtual reality called immersive technology. This study followed the first two steps of the user-centered design approach through the application of a virtual mock-up assisted living apartment, to analyze and understand how this type of immersive experience may impact transitions into assisted living. The purpose of using user-centered design is to create an understanding of a specific issue to then inform a design decision (Hamisu et al., 2011). User-centered design has guided previous research studies to understand and then improve the design with immersive technologies (Greer & Harris, 2018). In this study, user-centered design consisted of a multi-step process with three phases; Phase 1 was a focus group, Phase 2 was a follow-up focus group, and Phase 3 was an online questionnaire directed at older adults who had transitioned to assisted living. In this chapter, the Institutional Review Board (IRB) and immersive experience development will be disused followed by procedures conducted in the three phases.

IRB Procedures

Oklahoma State University (OSU) (IRB) approval was obtained prior to the start of the study. The IRB application indicated that this would be an online study with a population of older adults, following Coronavirus Disease 2019 (CoViD-19) protocols. The researcher met with an

IRB staff member to ensure compliance. Attached to the application were the following documents (see Appendix A): Phase 1 and 2 recruitment e-mail, Phase 1 and 2 recruitment flyer, Phase 1 and 2 consent form, Phase 1 and 2 questions, Phase 3 recruitment e-mails, Phase 3 recruitment flyer, Phase 3 survey consent form and questionnaire. IRB staff also received a link to the proposed intervention. Phase 1 recruitment began after IRB approval was granted.

Immersive Experience Development

As mentioned in chapter two, virtual reality, a type of immersive experience technology, has been used in wayfinding applications (Davis et al., 2017), and 360 walkthroughs (Calogiuri et al., 2018). The initial intent of the study was to use the OSU Human Environmental Factors Lab (HEFL) to provide a controlled lab environment for older adults to complete a set of tasks in the space, after being shown a virtual walkthrough, using a research group and control group. The HEFL lab is an environment that is provided for both student and faculty research that is configured as a mock-up apartment with a living area, a kitchen and dining space, as well as a half bath. The lab is equipped with a flexible wall system and adaptable environmental technology.

Originally, the virtual walkthrough developed for this study would have been viewed in the Mixed Reality Lab, located next to the HEFL, where participants would view the virtual walkthrough with a virtual reality headset. The research plans were changed due to the CoViD-19 pandemic outbreak; no in-person human subjects research was allowed through OSU. The study was moved onto an online platform using a virtual walkthrough of the HEFL in lieu of the previously planned in-person and virtual tour.

Phase 1 Virtual Walkthrough

The initial virtual walkthrough was developed using a 360-degree camera that was set up in different locations of the HEFL. Using a software called Cupix, the 360-degree images were combined to create the virtual walkthrough of the kitchen, living room, dining room, bedroom, and bathroom in the HEFL (See Figure 2). Hot spots were added, in the form of yellow arrows as

shown in Figures 2 and 4, to allow participants to easily teleport from room to room to get a 360-degree view of each space in the mock-up apartment. The arrows provide the room name, point to the direction of the space, and move the participant to the space.

Phase 2 and 3 Virtual Walkthrough

After this virtual walkthrough was shown in the Phase 1 focus group, suggestions were made by the participants to add a measuring tool to increase usability and benefit of using a virtual walkthrough. The researcher added another hot spot to each wall in the form of a red marker, as seen in Figure 3, to show the width of each wall. The updated virtual walkthrough was shown to the Phase 2 focus group and sent out in the Phase 3 survey link. The ability to improve the usability of the virtual walkthrough was based on user feedback; the researcher was able to follow the user-centered design framework to improve the initial design in an iterative approach in the second focus group and follow-up survey (Jokela et al., 2003).

Figure 2

Virtual Walkthrough Shown in Phase 1 and 2. Living Room View

Figure 3

Virtual Walkthrough shown in Phase 1 and 2. Kitchen View

Figure 4

Virtual Walkthrough shown in Phase 1 and 2. Bedroom View
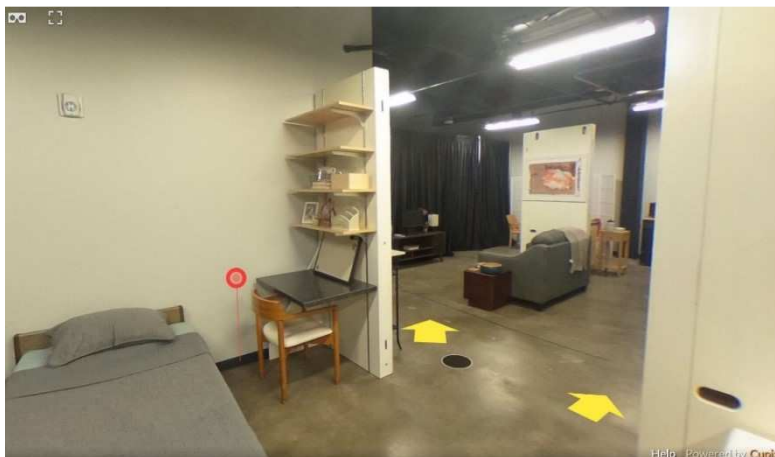
Phase 1 Focus Group

Phase 1 Focus Group Sample Recruitment

After receiving final OSU IRB approval, the researcher initially contacted 15 different assisted living facilities to recruit study participants. However, due to CoViD-19, there were few participants available, even for an online study. E-mails and calls continued to administrators explaining the research, and ultimately, an activities director from Facility 1 agreed to allow the recruitment of residents for study participation. Facility 1 is a retirement community located in

mid-western city that provides a variety of amenities and living options for their residents, including assisted living. The recruitment parameters were that the older adults had to reside in the assisted living community/housing, were age 65 and older, and be cognitively healthy. The initial e-mail also asked for a minimum of eight participants; Facility 1 was able to recruit five qualified residents. A total of five participants were recruited from Facility 1 with ages ranging from 65-95 years old, with an uneven distribution of three females and two males.

Phase 1 Focus Group Methods

Phase 1 focus group took place as an electronic meeting using Zoom software. One week prior to the Phase 1 focus group, the researcher shared, via e-mail, recruitment flyer, consent form, focus group questions, and the virtual walkthrough and virtual walkthrough instructions with the activity's director, who then shared the information with the participants. See Appendix A for all forms and instructions. The activities director acted as the contact between the researcher and the participants, making sure consent forms were given to each participant, and the virtual walkthrough was viewed at least one week prior to the focus group meeting. In addition, the activities director was present during the focus group to facilitate because the researcher could not be onsite due to CoViD-19 restrictions. This was also done to protect the participants' identities. Participants used various types of technology to view the virtual walkthrough including iPads, laptops, and desktop computers.

The Phase 1 focus group lasted approximately one hour and was audio recorded using an iPhone voice memo application. During the focus group, participants were asked a series of questions, and halfway through the hour they were introduced to the virtual walkthrough again as a refresher, followed by more questions regarding the virtual walkthrough. Some participants were more responsive than others due to the sound quality, therefore, some questions had to be repeated by the researcher in order to receive feedback.

Phase 1 Focus Group Questions

Qualitative research has been used to allow individuals from a specific group to tell their stories from their own perception and understanding of the specific subject matter (Patton, 1990). This allows the researcher to gain an understanding of the individuals/groups' experience from their specific perspectives (Patton, 1990). The focus groups for this study were designed to be exploratory, as described by Goodman (2012), to allow the researcher to gain an understanding of the given topic. Before asking the questions, the researcher provided basic information about the focus group protocol and introduced herself as recommended by Creswell (2007).

The Phase 1 focus group was organized to have carefully sequenced, nondirected, and specific questions (Goodman et al., 2012). Open-ended questions, with words including what, why, and how, were used to gain insight on participants' experiences (Goodman et al., 2012). The focus group question fluidity was ensured by following Creswell's (2007s) interview protocol by first asking opening questions, allowing participants to talk about their life and themselves followed by content questions. Probes during the focus group were used as well, including "explain your response", "tell me more", etc., to gain more detail from questions when needed (Creswell & Clark, 2007). The focus group questions for this study were developed using Ayalon (2016) interview questions, Mars (2014) Maastricht Personal Autonomy Questionnaire (MPAQ) questionnaire, Technology Acceptance Model (TAM) (Davis, 1989), and the Older People's Quality of Life questionnaire (OPQOL) (Bowling, 2009). Ayalon's (2016) interview questions provided insight on adjustment for transitions. The MPAQ questionnaire (Mars et al., 2014) was used to gain an understanding of participant degree of autonomy. The TAM questionnaire was used to gain an understanding of perceived usefulness, ease of use, and attitudes towards the virtual walkthrough (Davis, 1989). Finally, the OQPOL questionnaire was used to understand the participant's perceptions of independence, perceived control, health, and general perception of quality of life in their assisted living facility (Bowling, 2009).

Phase 1 Focus Group Meeting

The Phase 1 focus group began with a series of open-ended questions in order to gain an understanding of the background in the participants transition into assisted living. From there, the participants were shown the virtual walkthrough again to refresh their memory and were asked a series of questions to assess their perceptions of the benefits and barriers of this immersive technology, and if this intervention could improve transition outcomes. The following are some of the types of questions included in the focus group: "In general, what types of needs would the virtual walkthrough address if presented prior to an initial transition into AL?", "Would the virtual walkthrough have been beneficial to you prior to your initial transition? If so, why?", "In what ways can the virtual walkthrough be improved for future applications?" (see *Appendix A* for the full list of questions).

At the conclusion of the Phase 1 focus group, the researcher asked if there were any additional comments or questions. Three participants added last minute input that provided great closing information. Three participants had questions about the logistics of the research study and the general reason for it. After receiving these questions and comments, the researcher then thanked each participant, and the meeting was ended.

Phase 1 Focus Group Thematic Analysis

A qualitative inductive content analysis was used following the steps recommended by Elo and Kyngas (2008), including creating open coding and categories, followed by abstraction (Elo & Kyngäs, 2008). Qualitative coding is useful for data analysis because it provides the researcher with an argument for drawing conclusions based on the categories that emerge in developed themes (Suter, 2012). According to Suter (2012), coding in qualitative research is used to develop comparisons between categories and their connections to draw conclusions. Coding is used to organize transcripts by discovering patterns that provide analyses of the text (Auerbach & Silverstein, 2003). Through the coding process, themes are developed to help uncover meaningful relationships gained from an interview and/or focus group transcriptions (Suter, 2012). To

achieve consistency of information throughout the coded themes in qualitative research, the researcher must ensure credibility through consistent checking of the data (Suter, 2012).

The first step of the analysis was transcribing the focus group recording verbatim. The Phase 1 focus group transcript had a word count of 2,078 words and 172 lines. The text was read and reread to get a sense of the whole and check the accuracy of the transcript. After that, essence-capturing codes were assigned to words, sentences, or strings of words that conveyed the same meaning. Quotes from participants were used to illustrate the themes and to keep the interpretation closely linked to the raw data. Themes were presented based on the frequency of their use during the Phase 1 focus group session. All identifying factors of participants were removed; for example, each participant was assigned a pseudonym to protect their identity.

Phase 2 Focus Group

Phase 2 Focus Group Sample Recruitment

After the Phase 1 focus group, the Phase 2 focus group was carried out to gain more feedback from older adults residing in another assisted living facility. E-mails and calls were made again to staff at a variety of facilities regarding their interest in participation in this study; the activities director from Facility 2 accepted the invitation. Facility 2 is a retirement community located in a mid-western city with a variety of living options provided, including assisted living. The recruitment parameters were the same as in Phase 1, that is, the older adults had to reside in the assisted living community, had to be 65 and older, and be cognitively healthy. The activities director was asked to recruit a minimum of eight participants with an even distribution of males and females. The Facility 2 activities director believed that more than 10 residents would be able to patriciate in the focus group, however, some participants once again had limited cognitive abilities and were unable to participate, therefore a total of five participants participated in the Phase 2 focus group. A total of five participants were recruited from Facility 2 with ages ranging from 65-95 years old, with three females and two males.

Phase 2 Focus Group Methods

The Phase 2 Focus Group also was conducted online via Zoom, due to CoViD-19 restrictions. A week prior to the Phase 2 focus group meeting, the researcher shared the same set of documents with the activities director as in Phase 1: e-mail, the recruitment flyer, the consent form, the updated focus group questions, and virtual walkthrough instructions (see Appendix A). In the Phase 2 Focus Group participants gathered in the facility meeting room with the activities director present and facilitating the Zoom call. They were shown an updated version of the virtual walkthrough with the changes suggested by the Phase 1 Focus Group participants. The activities director was also available to provide clarification and technical support for the older adults.

Phase 2 Focus Group Questions

The questions for the Phase 2 focus group consisted of the same 10 questions asked in Phase 1, however, multiple questions were added based on the feedback gained from Phase 1. This procedure follows the user-centered design process of better understanding the needs of the end-users through an iterative process. The following were the questions added to Phase 2 (see *Appendix A*): "Who helped you? How did it feel for you having your children help with the transition?", "How much input did you have in the move?", "Was it important to know measurements of walls to help decide which furniture to bring? When you were thinking about moving your furniture in, did you consider wall measurements? If so, would a measuring tool help in a VR walk-through? Why/why not?".

Phase 2 Focus Group Meeting

The Phase 2 focus group meeting lasted approximately one hour and was audio recorded on the same device used in Phase 1, that is, an iPhone voice memo application. During the Phase 2 focus group meeting, the participants were asked the updated version of the questions. The virtual walkthrough was then shown to the participants halfway through the set of questions, just as in Phase 1, to act as a refresher for the participants. Some questions had to be repeated in the Phase 2 focus group as well due to the low sound quality. The participants called in using one

device, a laptop, that streamed their view onto a bigger monitor while the researcher's view was of the corner of the room. The poor placement of the device contributed to the low sound quality and inability to see the participants. At the end of the Phase 2 focus group, just like in the Phase 1 focus group, the researcher asked for any concluding remarks and/or questions from the participants, thanking them for their participation at the end. This group did not have any closing remarks and/or questions regarding the study, and the meeting ended smoothly.

Phase 2 Focus Group Thematic Analysis

The same literature and steps were referred to as in Phase 1 to conduct the thematic analysis in Phase 2. First, the analysis began by transcribing the Phase 2 focus group recording verbatim, consisting of a word count of 1,849 words and 162 lines. Next, this transcription was read and reread for accuracy. This was then followed by essence-coding where codes were assigned to words, phrases, and sentences that represented the same theme and/or meaning. Quotes were then used to represent these themes and subthemes developed from qualitative coding. Pseudonyms were also assigned to each participant to maintain the confidentiality of their identity.

Phase 3 Online Survey

Phase 3 of this study consisted of sending an online survey to the two activities directors that participated in Phase 1 and 2. The activities directors were given the same parameters as in Phase 1 and 2, however, this time they were asked to provide a minimum of 10 participants from each facility. However, even after this survey was sent out to the activities directors to then distribute to the participants, only 14 responses were gathered. More facilities activities directors were contacted to provide additional survey responses, however, due to CoViD-19 and its restrictions, the researcher was not able to gain the anticipated 20 responses and basic demographic information was generated (see Appendix B).

CHAPTER IV

RESULTS & DISCUSSION

The separate qualitative data analysis of Phase 1 and Phase 2 led to the identification of

three principal themes in each phase, which were then cross analyzed. Phase 1 and Phase 2

consisted of the same themes, including: loss of autonomy, transitions, and responses to the

virtual walkthrough (see Tables 4 and 5). Previous literature on the themes and the user-centered

design framework helped guide the questions and content of the focus group findings. The cross

analysis of the two phases is discussed at the end of this chapter.

Demographics

Phase 1 Focus Group Demographics

Phase 1 focus group included five participants, two male and three females, age range 75-

94, all residing in Facility 1. Each participant was assigned a pseudonym to maintain

confidentiality. Table 2 provides demographic data for the Phase 1 focus group.

Table 2

Phase 1 Focus Group Demographics

	Age	Gender	Pseudonym
Participant 1	94	Male	Bob
Participant 2	93	Female	Mary
Participant 3	92	Female	Hannah
Participant 4	75	Male	Evan
Participant 5	83	Female	Alyssa

Phase 2 Focus Group Demographics

Phase 2 focus group included five participants, two male, and three females, aged 73-91, all residing in Facility 2. Table 3 provides demographic data for the Phase 2 Focus Group.

Table 3

Phase 2 Focus Group Demographics

	Age	Gender	Pseudonym
Participant 1	79	Male	Howard
Participant 2	73	Female	Gloria
Participant 3	91	Male	Jim
Participant 4	84	Female	Sherin
Participant 5	75	Female	Kathy

Phase 1 Focus Group Themes

The following themes and subthemes were derived from the questions asked in the Phase

focus group. The main themes include loss of autonomy, transitions, and responses to virtual

walkthrough and are presented in Table 4.

Table 4

Table of Qualitative Themes with Descriptions in Phase 1

Theme	Definition and Subthemes	Example
Loss of Autonomy	Theme regarding cognitive control in older adults transitioning into assisted living. Subthemes include inability to complete daily tasks and lack of care.	"Okay, well the trigger for me at least was having to handle groceries. Mary had to go on her computer and do the shopping. Then we had to have the deliveries, then we had to put the stuff away and then we had to fix it when we wanted to eat."
Transition	Theme regarding older adult's transition experience into assisted living. Subthemes include word of mouth, help from children and CoViD-19	"Well, my son helped me to decide. He just decided I should be here. So, he made the decision for me. But I've been here four years. My son helped me too, I couldn't do it if he hadn't. It all worked out real fine."
Response to virtual walkthrough	Theme regarding older adults' perception of benefit/barrier of virtual walkthrough if presented when transitioning into assisted living. Subthemes include availability of interventions, impact of family involvement on virtual walkthrough acceptance, cognitive disconnect, inability to visualize physical space and inability to measure walls.	"I think if I were more involved in the move, it would have been helpful, especially knowing the measurement of those wall sizes to know what furniture we could take."

Loss of Autonomy

As discussed in earlier chapters, autonomy declines in older adult populations when they transition into assisted living (Ayalon, 2016, Wilcocks, 1987, Quan et al., 2020). However, findings provided by the Phase 1 focus group suggest that the loss of autonomy begins before the transition because of aging, medical challenges, and other difficulties. The participants in Phase 1 focus group suggested these losses in many cases resulted in the decision to transition into assisted living with two emerging subthemes focusing on these losses: inability to complete daily tasks and lack of adequate care.

Inability To Complete Daily Tasks

One of the main identifiers of loss of autonomy, suggested by Lawton (1985) is the inability to complete daily tasks in the living environment. To better understand the triggers to loss of autonomy individuals often describe their complications of completing daily tasks (Dwivedi et al., 2012). For the participants in the Phase 1 focus group, the inability to complete daily tasks seemed to have an influence on making the move to assisted living. Sherin explains it was due to old age, "You know, as you get older things change and you have to adjust…". A married participant Bob described the reasons behind he and his partner Mary's transition, "We just knew there was assisted living and we were having trouble where we were." He went on to explain their transition to assisted living was due to difficulty completing daily tasks:

> Okay, well the trigger for me at least was having to handle groceries. Mary had to go on her computer and do the shopping. Then we had to have the deliveries, then we had to put the stuff away and then we had to fix it when we wanted to eat.

Alyssa also described that her living situation made it difficult to complete daily tasks, "We lived on a farm, and it just got to where we couldn't do any of the farm work or take care of the property." This inability to complete daily activities in many cases was due to physical or mental decline. Loss of independence led to the inability to take care of themselves on their own, and

ultimately, triggered their move to assisted living. Among couples, when one partner experienced health complications, both partners transitioned into assisted living.

Lack of Care

Phase 1 focus group participants agreed that their responsibilities in their daily lives, as well as their medical condition prior to moving to assisted living were too challenging, leaving them unable to care for themselves. Their struggles to take care of themselves and/or their spouses exemplified their declining ability to maintain an autonomous lifestyle and often prompted their move to assisted living. Four participants transitioned out of private living to assisted living due to the absence of skilled care provided in their homes. Evan explained how lack of care led to the overuse of family members' personal time, *"It was getting to the point where I was having to call my daughter to take me to the doctor's office pretty frequently, and I was invading her work time."* Hannah agreed that her move was out of necessity due to lack of care: "It was out of necessity that I moved into this apartment. I needed more care and that's why I transitioned over here."

Lack of available care quickly appeared to be a common thread between all participants in the Phase 1 focus group. Therefore, the decision to move to assisted living from a lack of care was done so in the hopes that the assisted living facilities would provide additional, better care. This is supported by previous literature as being a deciding factor to choosing to transition into assisted living facilities (*Long-term care trends and statistics*, 2018).

Transitions

The Phase 1 focus group participants provided three subthemes about perception of their transition into assisted living were: word of mouth, help from their children/children taking the lead, and CoViD-19. Quan (2020) suggests that when loss of autonomy occurs, majority of these older adults are not able to age in place, contributing to the transition into assisted living. In general, it appears that the older adults' children were the ones to suggest the idea of transitioning into assisted living due to this loss of autonomy. However, Bob and Mary, who did not have

children supporting their move, knew when it was time for them to transition themselves: "…we just knew it was time to get a little more help with getting through the day." Even though the lack of autonomy was the underlying trigger for transition for most of these participants, the children of the older adults in many cases provided the path to the initial decision to transition into assisted living, whether it was out of concern for their parent(s) health or their own inability to take care of their parent(s) properly.

Word of Mouth

As suggested by McNamara (2011), familiarity is one of the factors for an intervention that would allow for ease of transition into an assisted living facility. Three participants in the Phase 1 focus group mentioned that one of their influences to transition to their assisted living facility was due to word-of-mouth from friends and acquaintances. Mary and Bob received information through word-of-mouth; Bob describes that interaction: "We had had a cousin who had lived in assisted living for several years and we had helped her a lot. So, we pretty well knew what they did and how they did it." Being able to speak with others who had transitioned into a particular assisted living setting appeared to ease the burden in choosing an assisted living facility allowing for a sense of familiarity and trust in the care. Another single female, Alyssa agreed that her transition was due to the familiarity with the assisted living facility, "The reason I wanted that facility is because my mother lived there for over 14 years, and I knew they could do it. So, I didn't…we didn't look anyplace else." Word of mouth and familiarity with the surrounding environment was a contributing factor to the transition into assisted living, which is supported by previous literature (Roy et al., 2018).

Help from Children

Bob and Mary are an example of older adults who transitioned without the help of children, during the pandemic, which limited their exposure to interventions. This independent transition caused the couple a loss of autonomy, specifically through the inability to control the move of their personal items. The lack of intervention from family members available to Bob and

Mary during their transition aligns with previous literature, which suggests that the lack of helpful

resources during the transition can cause a decline of autonomy and control of the older adult

(Reinardy, 1995). These participants were most impacted by the transition with signs of cognitive

decline, and a loss of autonomy during and after the transition. This appears to be due to the

struggles of the move on their own. However, most of the participants experienced help from

their children. In the Phase 1 focus group, it was observed that the participants' children were the

biggest influence in their decision to transition into assisted living because of their recognition of

their parents' loss of autonomy. Specifically, the trend showed that the children were the ones

that took the lead during the transition, and in essence became an intervention for the older adults.

As previous literature suggests, interventions and tools that are established prior to the transition

can improve the older adults' sense of autonomy (Bekhet et al., 2011). Evan explains how his

daughter presented him with information about the facility:

> Well in my case, Kristen and my daughter and I sat down and went through a list of
> questions. Basically, you know, what were the options of what were the things that we
> would have to give up, how our medications were handled, access to my car and things
> like that. About a half an hour of discussion between the three of us. My experience was I
> had three kids that basically took over the job and they did all the measuring, and they did
> all the setup…

The assistance Evan's daughter provided appeared to be the intervention they needed to have a

successful transition. Even though previous literature explains that forced transitions are common

(Sanders et al., 2004), this did not appear to be the case or to have a negative impact on these

participants. In Hannah's case, she felt that her son forced the decision to move on her, but she

explained that she couldn't have done it without his assistance:

> Well, my son helped me to decide. He just decided I should be here, so he made the
> decision for me. But I've been here four years. My son helped me too, I couldn't do it if
> he hadn't. It all worked out real fine.

Alyssa shared how her children took the lead in the decision in finding her and her husband a

good facility: "And one day our kids come and sit down with us, and they thought it was time that

we move to where we are now. I think my kids may have looked at an apartment.". Evan added that they are still dependent on their children, which could be a contributing factor to their lack of perceived autonomy: "…most of us are still dependent a lot on our children. They are the ones that you ought to be asking questions."

It appears that the older adults, even when not by choice, allow their children to completely take over the transition process into assisted living, which might contribute to an initial lack of autonomy after the transition. Yet, when asked how the participants felt about having their children involved in the transition, the participants felt very satisfied with their children's help, especially with their assistance in moving their physical belongings. When asked if the participants would have liked to be more involved in the process prior to the move to assisted living, the participants felt as though they were happy with giving their children the responsibility to take the lead. Three participants made it clear that the decisions were made in mutual agreement. This type of help from the children during the transition is an important intervention for older adults (Hertz & Anschutz, 2002) and an outside person can be the source of providing the intervention. As seen in previous literature (Lillo-Crespo, 2018), and supported by the Phase 1 focus group results, the participants who had originally moved due to their loss of autonomy at home agreed to transition with the help of their children with the hope of regaining their independence and autonomy in their new environment.

CoViD-19

Contrary to the typical transitions that majority of participants experienced, two participants stood out in the Phase 1 focus group. They experienced their transition into assisted living during CoViD-19 without any type of support from their children. Bob and Mary expressed that transitioning during CoViD-19 had a negative impact on their respective experiences. They explained that they were not provided with any information or interventions during their transitions, which impacted their ability to view their new assisted living apartment before moving in: "I don't know that we received any information... So we pretty well moved blind."

One of the biggest challenges that these two participants faced was not being allowed to preview their apartment prior to their move into it. As a result, they were not able to make plans for moving their belongings. The movers they hired ended up moving what would fit, or what they thought would fit, with the rest of their belongings being lost in the move. Mary explained, "So it was a stressful move but a great deal of it was caused by CoViD thing which none of us can help."

Transitioning to assisted living during the pandemic and without the support of their children added barriers to these participants' abilities to move without challenges. These setbacks contributed to their inability to plan their move, plan for the layout of their space, and ensure that their belongings arrived properly. The restrictions imposed as a result of CoViD-19 were major stressors during the transition, with the underlying variable being the lack of helpful intervention available during this time of transition. Mary describes how they were impacted during their CoViD-19 transition, specifically through the loss of belongings:

> When we got here, as I said, we did not get to see this apartment at all before, but our furniture was already set in here and some of it they weren't even able to keep and they just go rid of it. But that was because of the CoViD thing partially and so we still don't know where some our things are.

Although Bob and his wife felt that they needed help during their move, the only service that was provided to them caused stress and enabled the loss of their autonomy by not being able to control their circumstances. Bob goes on to state:

> Well, it was also because the movers underestimated my wife's ability to stack stuff and store stud and put stuff away. Where it would take up much space. They said we were bringing too much stuff and refused to move some of the stuff we wanted. And we still have some empty drawers here without the things to put in it.

Therefore, to limit the shock of transitions in these types of circumstances without limited outside support, as suggested by Sanders (2004), the older adults should be presented with interventions that help plan and prepare for their new environment before their transition.

Responses to Virtual Walkthrough

The subthemes derived from the Phase 1 focus group responses, in response to the virtual walkthrough, consisted of availability of interventions, impact of family involvement, visual/cognitive disconnect, inability to visualize physical space, complaints of inability to measure, inability to visualize personal items, and barriers in the communication breakdown. Syed-Abdul (2019) suggested that older adults have a positive and acceptive perception of virtual reality tools (Syed-Abdul et al., 2019). This research shows some pushback of acceptance by the participants due to the subthemes, specifically family involvement.

Availability of Interventions

Outcomes from the Phase 1 focus group interview are supported by previous literature, which suggests that lack of intervention during transitions can disturb the overall transitional experience and cause greater lack of familiarization with the new assisted living apartment (Magilvy & Congdon, 2000). The Phase 1 focus group results showed inconsistent results regarding the type and availability of interventions and information available to participants before they transition into assisted living. The participants who transitioned independently were not provided with interventions, however, the dependently transitioned participants had their children as the main intervention while receiving other resources through the children. The participants in the Phase 1 focus group were not familiar with or aware of any type of information or interventions available at their facility other than support from family. This may have been the case because most of them had let their children take control of the move. Gathering information from brochures and the internet was also mentioned as an intervention.

Impact of Family Involvement on Virtual Walkthrough Acceptance

Overall, participants who were dependent on their children during the transition did not believe that the virtual walkthrough would have been helpful for them, or they were indifferent. This could be because their children took the lead during their parents' transitions. Three of the participants noted that they would have used the virtual walkthrough if they did not have help

from their children, or if they were unable to take a physical tour of the assisted living facility. Alyssa explained that the virtual walkthrough would not have been helpful for her because her children were the ones in charge of the transition: "It would be maybe for the lads, but not for us.". This type of release of control and decision-making correlates with Reinardy's (1995) observations of the lack of helpful resources during the transition causing and/or limiting autonomy in older adults.

However, it appeared that Bob and Mary, who transitioned independently without the help of children during CoViD-19, saw that the virtual walkthrough could have been beneficial. Bob and Mary may have found this beneficial because they did not have any other tools and/or interventions to help them transition into assisted living, not even their children. Bob explained: "I think it would have been helpful not just on laying out furniture, but just (to see) the general lifestyle assisted living involves, even though we had been around and occasionally visiting others". Mary agreed, "If the virtual walkthrough gave you an idea of what you wanted, yes." Bob and Mary had a better understanding how to use the virtual walkthrough (Lee & Park, 2020); they had experienced the problems associated with choosing what furniture to bring and where to place it. However, participants who transitioned with the help of their children had difficulties with perceiving the benefits of the virtual walkthrough.

Cognitive Disconnect

Outcomes from this research do not necessarily align with those in previous literature, including themes that suggest improved perception and skills through virtual reality tools (Sveistrup et al., 2004). Three participants explained their visual/cognitive confusion and disconnect to the virtual walkthrough. This was due to the inability to understand that they were viewing an "example apartment" (the HEFL) versus their actual assisted living apartment. In addition, there was some disconnect in being asked to recall their feelings at the time of choosing an assisted living apartment. Another issue was the inability to visualize the physical space virtually with their personal items in the space. Unlike previous literature presented by Libin on

the positive impacts of immersive experience technology on assisted living residents (Libin & Cohen-Mansfield, 2004), most of the participants did not have any interaction with virtual walkthrough intervention before this study and were unfamiliar with the technology. Therefore, the principal points of confusion when interacting with the virtual walkthrough could have been due to the lack of previous experience with immersive experience technology and an understanding of its purpose.

Inability to Visualize Physical Space

The participants stated that if given the option, they would rather have a physical walkthrough than a virtual walkthrough because they felt that it would be less cognitively straining. Evan explained the inability to visualize the physical space through the virtual walkthrough: "Well with my inability to visualize, I don't think that the walkthrough of the duplicate of the apartments here would be a much help to me because I wouldn't be able to visualize." This inability to visualize an unknown space and difficulty with cognition appeared in three of the participants in the focus groups, which might have impacted the way the older adults interacted with the virtual walkthrough and their ability to understand it. As suggested by Hodgson (2004), cognition is one of the many factors impacted after the transition into assisted living.

Inability to Measure Walls

Most of the participants in the Phase 1 focus group expressed their concerns about the inability to measure walls, openings, and outlets in the virtual walkthrough, adding to the confusion of the purpose of the intervention. Additional measurement features were added to the virtual walkthrough including a measurement callout following Phase 1 focus group as defined in the iterative user-centered design framework (Jokela et al., 2003). The participants suggested that this would help the virtual walkthrough be more interactive and mirror the physical walkthrough better. Evan explained the benefits of pre-measuring for furniture placement, "Being able to

actually measure was a big help because we were able to come over here and measure what we could bring and what we would have to buy new."

Mary explained, "I think that an architectural drawing that showed where the wall plugins were would have been much more helpful than the walkthrough to see how many plugins were on the wall". Evan then suggested, "I think you would have to supplement with more realism in terms of measurements and in terms of how we could fit things together". While there were mixed reviews of the virtual walkthrough, the desire to have an interactive intervention agrees with previous literature, which suggests a successful intervention tool should include the introduction of not only the environment but also its provided services and other stimuli (Shapiro & Taylor, 2012; McNeil et al., 1986).

Phase 1 Focus Group Summary

The findings from the Phase 1 focus group provided three main themes: loss of autonomy, transitions, and responses to the virtual walkthrough. In each theme, subthemes were found to further support the concept of the theme. The first theme, loss of autonomy, subthemes included inability to complete daily tasks and lack of care. The second theme, transitions, subthemes included word of mouth, help from children, and CoViD-19. The third theme, response to the virtual walkthrough, subthemes included availability of interventions, the impact of family involvement on virtual walkthrough acceptance, cognitive disconnect, inability to visualize physical space, and inability to measure walls. Unexpected findings included the overwhelming involvement and influence of children on the transition and acceptance/benefits of the virtual walkthrough.

Phase 2 Focus Group Themes

The following themes and subthemes were derived from the questions asked in the Phase 2 focus group. Similar to Phase 1, the main themes included loss of autonomy, transitions, and response to virtual walkthrough. Responses and sub-themes and are listed in Table 5.

Table 5

Table of Qualitative Themes with Descriptions in Phase 2

Theme	Definition and Subthemes	Example
Loss of Autonomy	Theme regarding cognitive control in older adults transitioning into assisted living. Subthemes include inability to complete daily tasks and lack of care.	"I experienced polio at an early age, when I was 4. I know now what they called back in those days was post-polio syndrome. It affected both my legs, later my left leg was worse, and I've got a quad muscle that is getting extremely weak, so I had to get a walker."
Transition	Theme regarding older adult's transition experience into assisted living. The subtheme for this theme included help form children.	"So while he was in the hospital our kids moved us over here. When we moved here it was like we've lived here a long time; they (the kids) put everything together great."
Response to virtual walkthrough	Theme regarding older adults' perception of benefit/barrier of virtual walkthrough if presented when transitioning into assisted living. Subthemes include availability of interventions, impact of family involvement on virtual walkthrough acceptance and improved physical environment representation.	"I think if I were more involved in the move it would have been helpful, especially knowing the measurement of those wall sizes to know what furniture we could take. But in retrospect our kids did a good job."

Loss of Autonomy

As in the Phase 1 focus group results, loss of autonomy was observed to occur in the Phase 2 focus group participants before the transition into assisted living. The cause of loss of autonomy was often due to medical issues and lack of care. Medical issues tended to spark from the inability to complete daily tasks. Therefore, the following subthemes are part of the overarching theme of loss of autonomy: inability to complete daily tasks and lack of care.

Inability to Complete Daily Tasks

While the inability to complete daily tasks was the only trigger to loss of autonomy for some, for others the inability to complete daily tasks was caused due to medical issues, forcing

them to make the decision to leave their home (Sanders et al., 2004; Roy et al., 2018). Four participants spoke of their medical issues that caused them to experience loss of autonomy, triggering their transition into assisted living. Howard explained his medical condition that led to his loss of autonomy:

> I experienced polio at an early age, when I was 4. I know now what they called back in those days was post-polio syndrome. It affected both my legs, later my left leg was worse, and I've got a quad muscle that is getting extremely weak, so I had to get a walker.

Whether the medical issue was due to a fall, heart issues, or any other preexisting conditions, the participants explained that they had lost a sense of independence due to their physical health. With the loss of independence, Gloria explained that it was helpful to be in assisted living, "Sometimes I have good days and sometimes I have bad days. And it's been great being here". Gloria's medical condition caused her to have some neurological issues that led to her loss of autonomy and inability to complete daily tasks.

Lack of Care

Another contributing variable to loss of autonomy observed in Phase 2 focus group was the lack of care older adults began to experience during their lives in their private residences. The majority of these participants reported that the lack of care came from family members not having the resources or time to take care of them. Sherin mentions that her daughter was not able to take care of her anymore, "…we were beginning to need more and more assistance from her". For others, the lack of care came from the inability to provide the correct resources to take of their loved ones. Gloria mentions that her children made the decision for them due to her husband's medical issues, "Our kids said it was time because Howard's hearing got so bad that he was in the hospital". Due to these triggers leading to loss of autonomy the older adults reported having to transition into assisted living, with the majority having children there to help them.

Transitions

The participants in the Phase 2 focus group reported that the loss of autonomy prior to their transition was main reason for their transition. However, the participants in the Phase 2 focus group mainly reported that their transitions consisted of help from their children. Kathy stated that her transition was due to the familiarity her family had with the assisted living facility, who helped her move. "My daughter lives right near the community, so after we toured the facility, we decided to move here." Therefore, help from children was the only subtheme observed in the Phase 2 focus group.

Help from Children

All the participants in the Phase 2 focus group reported having help from their children during their transition into assisted living. The participants discussed aid from children even before the question was asked. The children helped the older adults even make the initial decision to transition. Howard explains how his children helped them make the decision and choose the facility: **"**Our children, got two grown children, they helped make the decision for us that we should transition into something that would be helpful to us and Facility 2 sure has. It's been a blessing". Beyond helping to make the decision to transition, children also reported to help move their belongings into the new environments as well. Jim explains how his children helped him actually make the move. **"**Children help me move on a weekend, we rented a moving van on a weekend and moved down here. They helped sell my furniture for me and decorated my apartment". For some participants there was a minimal amount of involvement in the move at all, Gloria mentions how her children conducted the move. "So while he was in the hospital our kids moved us over here. When we moved here it was like we've lived here a long time; they (the kids) put everything together great". Some of the participants were as active in parts of the transition. Sherin explains the decision-making process in her transition. "All the decisions made to move here were no surprise, I mean we had mutual agreements about everything." All reported transitions in Phase 2 were done with the help of children.

Responses to Virtual Walkthrough

The responses that were gathered from the Phase 2 focus group regarding the virtual walkthrough were influenced by the type of transition; that is, being dependent and receiving help from their children. The responses gathered from the Phase 2 focus group provided insight on how the tool could be more helpful; for example, the tool would be helpful during transition, especially if children were not available. This section will discuss the following subthemes: availability of interventions, the impact of family involvement of virtual walkthrough acceptance and improved physical environment representation.

Availability of Interventions

All the participants saw the potential of the virtual walkthrough if other interventions were not a factor or presented to them during their initial transition into assisted living. Gloria shared her perception of why she would find the virtual walkthrough beneficial. "I think the virtual walkthrough is good if you can't get here to see it in person." Because of prior interventions presented to the older adults during their transition into assisted living, they did not think that the virtual walkthrough would have been as beneficial. Three participants mentioned that they were able to actually tour their new assisted living facility and apartment. Sherin mentioned her experience: "My daughter helped make the decision. We toured the building, measured the rooms, see if our furniture would fit and see what we could and couldn't bring." Along with touring the facility, some of the older adults were even given brochures and found more information online, as Gloria mentioned. **"**We had seen brochures and stuff on the internet, but we knew we wanted to go here when we first toured it". Interventions, including family involvement and providing the older adults with different resources, had an impact on the acceptance of the virtual walkthrough.

Impact of Family Involvement on Virtual Walkthrough Acceptance

Acceptance of the virtual walkthrough relied on family involvement for the Phase 2 focus group, specifically in their ability to provide older adults with other resources. Howard explained

that he thought that if children were less involved, he would have had more use for the virtual

walkthrough. "I think if I were more involved in the move, it would have been helpful, especially

knowing the measurement of those wall sizes to know what furniture we could take. But in

retrospect, our kids did a good job." Jim agrees that the virtual walkthrough would have been

helpful without the children's involvement. "I think if I were more involved in the move it would

have been helpful, especially knowing the measurement of those wall sizes to know what

furniture we could take. But in retrospect, our kids did a good job." Three of the participants

reported they would have accepted the virtual walkthrough if children were less involved, but the

following changes had to be made to make the virtual walkthrough more interactive and mimic

the physical environment experience even more.

Improved Physical Environment Representation

The participants in the Phase 2 focus group provided input on how the virtual

walkthrough could be improved to benefit them. In addition to the measurement tool that was

added as a result of feedback from Phase 1 focus group, it was suggested that the virtual

walkthrough could be made more interactive by including callouts of storage areas and

emergency features in the apartment including call buttons, sensors, and other assisted living

emergency functions. Two participants suggested that having a floorplan to refer to would have

been helpful during the virtual walkthrough. Jim began by mentioning the benefits of calling out

outlets, "knowing outlets and door measurements was helpful. (I) wouldn't want to put a

bookcase in front of outlet". Another feature that the Phase 2 focus group participants wanted to

see was the width of doors and entryways. Sherin explains why, "I have a walker so knowing the

width of entryways would have been helpful". Other features needed included emergency buttons

in certain areas, as Howard mentions. "I might add, in the assisted living we've got places in the

bathroom a cord you can pull to call for help. Also, both bedrooms have built-in call buttons."

Finally, another aspect that the participants wanted to see is the location of Americans with

Disabilities Act (ADA) compliant features of the apartment including grab bars and sensors, which Howard goes on to explain in detail due to medical needs:

> "Grab bars are important to know. One thing that impressed my wife and I when we looked at the villa, they had something in the bathroom that where you didn't go in a few hours they would go check on you. Impressed us because told us that it would take care of our needs".

For this population to accept and find benefit from this type of intervention, multiple additional features that would typically be observed during a physical tour would need to be added to the virtual walkthrough. Ultimately the participants wanted the virtual walkthrough to be more interactive and informative.

Phase 2 Focus Group Summary

The Phase 2 focus group findings had the same three main themes found from Phase 1, with some difference in subthemes. The first theme, loss of autonomy, consisted of the inability to complete daily tasks and lack of care; additionally, medical issues played a key role in the loss of autonomy. The second theme, transitions, featured only one subtheme, which was help from children and was reported by all Phase 2 participants, with differing levels in interaction from the children. The third theme was responses to the virtual walkthrough; subthemes included availability of interventions, the impact of family involvement on virtual walkthrough acceptance, and a newly discovered subtheme of improved physical environment representation. Therefore, the major changes found in the Phase 2 versus the Phase 1 focus group were the type of transitions that were reported and the plethora of information on how the virtual walkthrough could be improved.

Phase 1 and Phase 2 Cross Analysis

To follow the iterative process of the user-centered design framework, important questions were added to the Phase 2 focus group that resulted from the Phase 1 focus group findings. These added questions included: "Who helped you? How did it feel for you having your children help with the transition?", "How much input did you have in the move?", "Was it

important to know measurements of walls to help decide which furniture to bring? When you were thinking about moving your furniture in, did you consider wall measurements? If so, would a measuring tool help in a VR walk-through? Why/why not?". While the user-centered design iterative process was followed, the decision was made to report the Phase 1 and Phase 2 findings separately and then conduct a cross analysis. In the cross-analysis between the Phase 1 and Phase 2 focus group findings, similar responses were found. The themes that were developed in the Phase 1 Focus Group included loss of autonomy, transition, and response to virtual walkthrough. The subthemes included inability to complete daily tasks, lack of care, word of mouth, help from children, CoViD-19, availability of interventions, the impact of family involvement on virtual walkthrough acceptance, cognitive disconnect, inability to visualize physical space, and inability to measure walls. The Phase 2 focus group themes were the same but consisted of some different subthemes that included inability to complete daily tasks, lack of care, help from children, availability of interventions, the impact of family involvement on virtual walkthrough acceptance and improved physical environment representation. Some principal differences were found in Phase 2 focus group results; that is, older adults relied on help from their children to transition. The other difference was that in Phase 2 the participants reported more frequently on how the virtual walkthrough could be improved to mimic their experience in physical tours and include elements of interactivity. The Phase 2 findings validated the Phase 1 themes. Additionally, the Phase 2 findings provided explanation of transition types and improvements needed in the virtual walkthrough to provide autonomy improvements after the initial transition for the older adults residing in assisted living. Four factors are discussed in detail in the contribution section below and include: loss of autonomy, transition type, intervention type, and autonomy outcomes.

Contributions

The primary research question was: How can immersive experience technology help older adults in their transition into assisted living? By using the user-centered design framework the researcher answered the question through multiple ways of understanding the user needs and

improving the virtual walkthrough intervention given the participant feedback. The first step

followed was the "understanding and specifying the context of use" (Jokela et al., 2003); this step

was followed through a literature review and implementation of user-center design. The second

step followed was "specifying the user and organizational requirements"; this step was followed

through conducting the two phases of online focus groups. The creation, evaluation, and redesign

of the virtual walkthrough, including adding the measurement tool took place between those two

steps through the iterative user-centered design process.

The theoretical framework of user-centered design helped guide the three phases of the

study: Phases 1 and 2 were separate focus groups. Results were reported separately, as six

additional questions were added in Phase 2 as per the user-centered design iterative process. The

qualitative data from Phase 1 provided some responses to the research question by providing

information on developed themes of loss of autonomy, transitions, and responses to the virtual

walkthrough intervention. The qualitative data from Phase 2 provided further validation of

themes found in Phase 1 including loss of autonomy, transitions, and responses to the virtual

walkthrough with more results regarding the help of children during transitions and improvement

of the virtual walkthrough. The Phase 3 survey had a low response rate (n=14); the data and

analysis are not included in the results section of the thesis; demographics can be found in

Appendix B.

How the loss of autonomy begins before the transition into assisted living is discussed in

this section. Transition types include both independent and dependent transitions, with

independent transitions classified as the older adults who transitioned without the help of children

and/or other interventions. Dependent transitions are classified as the group of older adults who

transitioned with the help of their children as their main intervention. Finally, this section will

address how these interventions can lead to improved autonomy through easing concern and

improving navigation and control. These two main intervention types can begin to restore

autonomy. Figure 5 illustrates these findings starting from loss of autonomy to transition types, to intervention type and finally autonomy outcomes.

Figure 5

Block Diagram Summarizing Research Findings
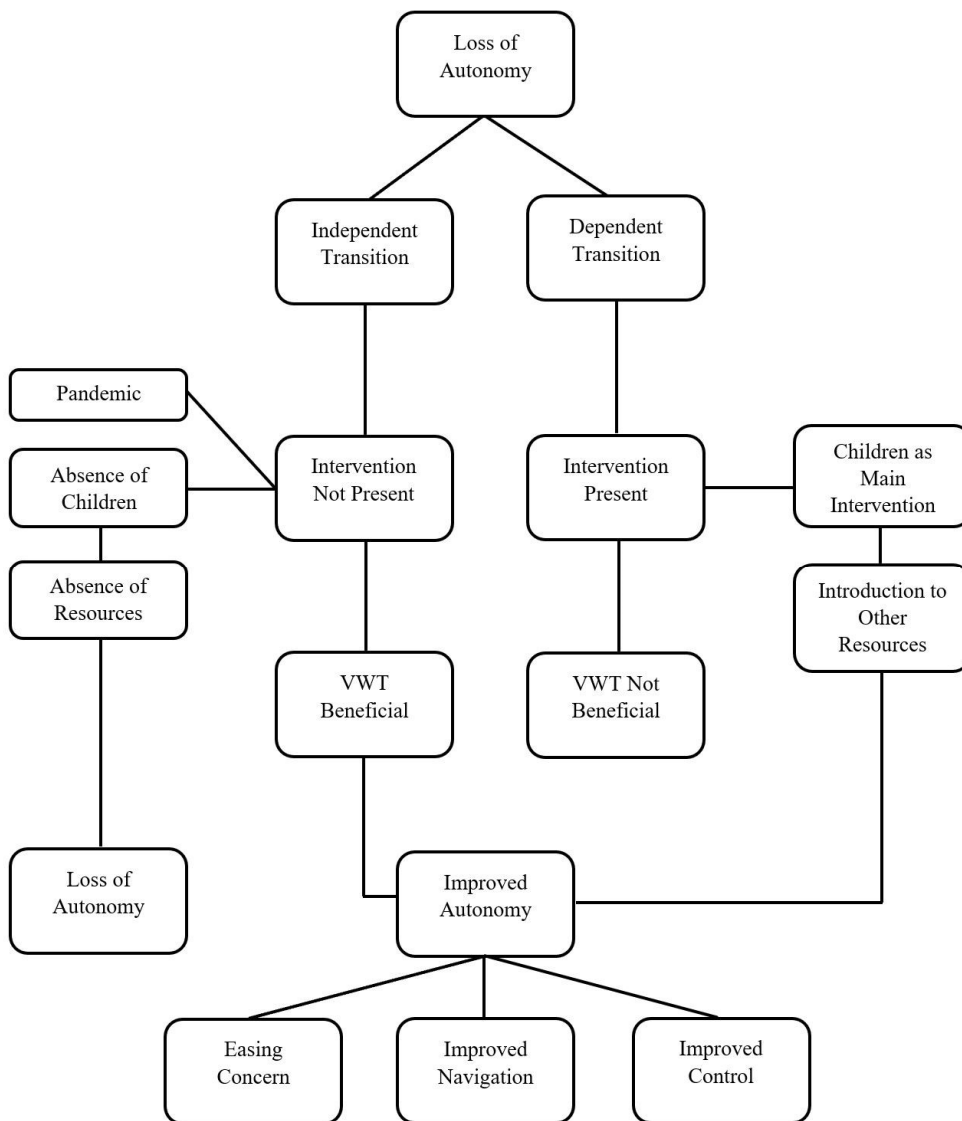
Loss of Autonomy

Loss of autonomy, according to the findings of this study, begins before the transition for older adults; and in most cases, it was the cause for their transition. The independently transitioned older adults were observed to have a negative perception on the loss of autonomy in their transition and were unable to regain their sense of autonomy once they had made the final move. The dependently transitioned older adults were observed to have a positive outlook on their ability to regain their autonomy once their children had taken care of their move. To begin to understand and answer the research question "How can immersive experience technology help older adults in their transition into assisted living?", the researcher needed to understand at what state of autonomy the older adults were when transitioning into assisted living. At the outset of this study, expectations based on previous literature were that older adults at the time of entering assisted living facilities would have a normal cognitive state, suggesting a controlled sense of autonomy/independence (Hawes, et al., 2003, McDougall, 2000, Stone & Reinhard, 2007), with autonomy decreasing after the transition into the assisted living facility. However, our findings suggested that most of the older adults entered assisted living facilities due to their loss of autonomy at home, brought to their attention either by their children or in a small number of cases by their own recognition. Nevertheless, while the findings suggested a presence of loss of autonomy before transitioning into assisted living, the type of intervention available at the time of the transition appears to have the greatest impact on the ability to regain autonomy once the transition is complete.

Transition Type

For majority of our participants, the findings suggested that children involvement was overwhelmingly high when transitioning into assisted living, creating the dependent transition. While this was an unexpected transition type in the findings, most of the participants felt a sense of satisfaction and even expressed the perception of improved autonomy after transition. It was observed that the voluntary release of control and in some cases involuntary release of control,

was beneficial for those transitioning dependently through the help of their children. These results are contradictory to previous literature, which suggests that all transitions negatively influence autonomy (Lillo-Crespo, 2018).

However, those who did not receive help from their children and/or transitioned during the pandemic independently, did not perceive their transition as satisfactory. The independently transitioned older adults experience expressed their continued loss of autonomy. Through the lack of support or intervention, these participants reported a) loss of personal items, b) inability to control the transition, and c) an overall loss of independence after the transition. These overall findings helped provide an understanding of the importance of the type of transitions into assisted living and that the loss of autonomy presented itself before the transition. The dependently transitioned older adults were satisfied after their transition. This aligns with previous literature that suggested that interventions that take place before the initial transition could improve autonomy (McNamara & Gonzales, 2011). This suggests that the children acted as the main intervention tool for this type of transition. Findings also indicated that the independently transitioned older adults were unsatisfied and experienced loss of autonomy. This aligns with previous literature, which suggests that a loss of autonomy is observed in older adults who transition without the help of an intervention (Wilcocks, 1987).

Intervention Type

According to previous literature, there is a lack of intervention occurring during transitions for older adults moving to assisted living (Sanders et al., 2004); however, most of the participants from this study experienced multiple types of interventions during their transition to assisted living, whether an in-person site visit, viewing an online site, or support from their families. The dependently transitioned older adults expressed that they were introduced to floorplans and physical tours as their intervention, however, the overwhelming number of participants had their children as their main intervention tool. It was found that there was a lack of immersive experience interventions when transitioning into assisted living, which was the initial

gap found in the literature review. This is true for both transition group types. Children were found to be the unexpected intervention for the older adults transitioning dependently. Through the help of their children, the older adults were introduced to more interventions including floorplans and physical tours, which previous literature suggested should be provided in an intervention, through environmental stimulus (McNeil et al., 1986). Those participants who experienced the transition without the help of the children or other types of interventions considered that the virtual walkthrough intervention might be a beneficial tool in improving their autonomy before, during, and after the transition into assisted living. The dependently transitioned participants agreed that the virtual walkthrough intervention could have helped if they were in the independently transitioned scenario.

The reason that the virtual walkthrough was not considered as beneficial for those with support was that they already had an intervention at their disposal to aid in their transition and this was their children. The findings also suggest that the children's involvement removes the element of stress for the older adults during the transition, this could contribute to the older adults' loss of autonomy. Previous literature indicates that interventions for transitions into assisted living should include the promotion of autonomy rather than compromised autonomy (Hertz & Anschutz, 2002); this was also observed in this study. Nevertheless, the focus group participants did not seem to perceive this negatively, as the older adults were satisfied with their limited involvement in their transition, allowing their children to take the lead.

The few participants who did not have the support of a family intervention had more difficulty with the transition and adjustment afterward. These findings are supported by previous literature that suggests immersive experience technology in the form of virtual reality can help improve mental abilities (Sveistrup et al., 2004). When this type of scenario was presented to the older adults who had already received help, they agreed that the tool would be beneficial for them as well had they not had the help of their children.

Findings of this study suggest that a virtual walkthrough might not be a necessity for all transitions for older adults and would not provide enough information to replace a physical tour if it were available. The study participants indicated a need to improve the virtual walkthrough interactivity features for it to be of benefit to participants. After the improvement of the virtual walkthrough and corroboration of data from Phase 1 and 2 of the study, it was found that older adults were very accepting of this type of intervention. Previous literature suggested that one of the characteristics of immersive experience technology should be easy interactivity (Lee & Park, 2020) even with older adults (Libin & Cohen-Mansfield, 2004). These findings align with previous literature in the suggestion of virtual reality, a form of immersive experience technology, helped to improve wayfinding abilities (Davis et al., 2017).

Autonomy Outcomes

In this study, two different outcomes were observed after a transition to assisted living; improved autonomy and the inability to regain autonomy. The continued loss of autonomy was observed to occur in those participants who transitioned independently during a pandemic and without help from their children. However, when presented with the virtual walkthrough, the independently transitioned group of participants agreed that this intervention would have helped them regain their autonomy through easing their concern about the transition, improved navigation in their new assisted living apartment, and improved control. These three factors were also found in the dependently transitioned participants through their children's intervention and other resources, including the physical tour and brochures.

Improved control appeared in the dependently transitioned older adults. This was also apparent in the responses for the benefits of the virtual walkthrough. Here, participants explained that if they were to transition independently, the virtual walkthrough would allow them to take control of the transition in certain situations. Findings from Phase 1 and 2 indicated that improved navigation for both dependently and independently transitioned older adults would occur, even with children's assistance. The easing concern of the transition was found in both sets of data and

in both transition groups. The findings are in line with previous literature, which suggests that interventions that include presentation of surroundings can help older adults in decreasing environmental press, i.e., autonomy (La Gory & Fitpatrick, 1992).

CHAPTER V

CONCLUSION

This study contributes to literature in understanding the transition process for older adults into assisted living facilities, specifically in the understanding of autonomy, involvement of children, and the use of virtual walkthrough in the transition. Previous literature suggested that more interventions were needed to help improve autonomy (Wilcocks, 1987), specifically through visual and descriptive stimuli (Sanders et al., 2004). However, involvement of children was not considered or suggested as a form of intervention; children could provide those visual and descriptive services for the older adult during their transition. Previous literature also began to introduce immersive experience technology in the form of virtual reality to be an easy interactive tool (Lee & Park, 2020) that could help improve emotional wellbeing in older adults (Calogiuri et al., 2018). The findings of this study suggest that a virtual walkthrough may be beneficial in improving autonomy in older adults who transition independently into assisted living facilities. This study shows that autonomy is not the cause of disrupted transitions, instead, it is the catalyst for the initial transition. Participants made it clear that there is an elevated level of satisfaction in the transition when their children were involved, even if that meant they did not have as much control over certain decisions. It was also made clear that transition decisions were made mutually throughout the transition; however, the children took the lead on everything else. The findings suggest that if the older adults were faced with a scenario where they did not receive

help from their children, nor had any other interventions at their disposal (for example, during the CoViD-19 pandemic), the virtual walkthrough immersive experience technology intervention could be used as an intervention.

This study also offers insight into the impact that a virtual walkthrough may have on older adults, before, during, and after their transition. This type of intervention can allow users to take control of their transition, improve navigation in the new assisted living apartment, and ease the overall concern of the transition in scenarios where other resources are not available to them. The most common resources include the involvement of their children and physical tours/walkthrough of assisted living facilities. This study suggests that older adults who accept their transition might not perceive their loss of autonomy due to children's involvement as a negative factor. Specifically, the older adults preferred their children's help rather than accept a scenario where they would have had to do it on their own. Older adults who transition independently have a negative perception about the experience and find it difficult to retain their autonomy following the transition.

Limitations

CoViD-19 severely impacted this study. Initially, the study was intended to be conducted in person to ensure study compliance and observation of the participants. However, due to the restrictions brought on by CoViD-19, the research was forced to move into an online platform. This meant conducting both the focus groups online with no in-person lab study. Conducting the focus groups online, via Zoom, featured limitations including limited ability to hear participants' responses clearly and to view facial expressions. The communication issues included participants not being able to hear the questions, and the researcher not being able to hear the participants' responses clearly. Specifically, in the Phase 2 focus group, the Zoom camera was not on the participants; inability to see the participant's facial expressions made it difficult to clearly understand their responses. While this was more the case with the Phase 2 focus group, the Phase 1 focus group had its own issues of not holding/placing the camera in a proper position, where

their faces could be clearly seen. Therefore, the technology was a limitation for communication with older adults for focus group research.

Another limitation was the lack of general understanding of the purpose of the study, limited immersive experience, the lack of control for how the virtual walkthrough was viewed, how the survey was to be completed, and how the focus group was to be conducted. Since the researcher was not able to explain to the participants the general purpose of the study in person due to CoViD-19 restrictions, all the information was sent to the activities directors as the conduit of that information to the participants. This led to the lack of control for the accurate and clear communication of the study purpose for the participants and their general lack of understanding of the study purpose and technology use. There was also not an ability to control what type of platform/device the participants used to view the virtual walkthrough. After the first focus group, it became clear that participants were using different devices to experience the virtual walkthrough, with some having issues with the navigation depending on devices used. The assisted living participants did have more difficulty understanding the general guidelines of the questions than had been previously expected. A final limitation was that this study did include a limited population with little diversity.

Direction for Future Research

Autonomy, cognition, and overall perception of independence should be closely considered in future studies. The reason for this suggestion is because previous literature suggests that autonomy is lost and cognition declines during and after the transition (Wilson, 2016), however, in this study it was observed to occur before the transition, acting as the catalyst for the transition. Previous literature also indicated that assisted living facilities promote independent living, suggesting that the residents in assisted living have a higher level of cognitive health (Stone & Reinhard, 2007). Researchers should understand and prepare for these limitations before further studies with this population of older adults. Future studies should strive to observe a

diverse older adult population to address the varied needs in different characteristics including age, gender, income, to name a few.

Due to the number of children involved in assisted living transitions, future studies should focus on receiving feedback from the children of the transitioned older adults. Children of older adults have an influence on assisted living transitions from the starting point of the recognition of the lack of autonomy to the transition, which includes planning arrangements. It was also suggested that the children view the virtual walkthrough because it might be beneficial in choosing the apartment and understanding the layout for ease of placement of furnishings. The virtual walkthrough also needs to be improved to serve as a more beneficial intervention tool, as suggested by the older adults. The virtual walkthrough should include information features that explain the apartment layout, emergency features, and other accommodations to make it more interactive, similar to the information that a physical tour would provide.

Therefore, according to the findings of this study, an intervention of a virtual walkthrough during a transition into an assisted living facility for older adults can serve as beneficial only in a limited scenario, where all other resources are not available or limited. This includes children's involvement and the lack of physical tours, or scenarios including transitioning during a pandemic, which restricts access to all support systems. This type of technology needs to be very interactive to portray as many of the physical environmental factors as possible for this population to fully comprehend its function and benefit. The virtual walkthrough should also be improved to be more user-friendly for use with this population with the support of a user-centered design framework. This will ensure that the end-user's needs and concerns are considered and addressed throughout the user-centered design process (Johnson et al., 2005).

Conclusion

The user-centered design model helped guide the work and procedures of this study to gain understanding of user needs and the requirements that would benefit the user (Jokela et al., 2003). By using the user-centered design framework to guide this study, the research was able to stay focused on the improvement of the virtual walkthrough intervention based on the user and the user needs. Overall, the findings of this study did not align with what was originally expected, as the focus of the findings ended up offering more insight on autonomy and transition, rather than the benefits of the use of technology as an intervention. The adult children seemed to increase the dependently transitioned older adults' overall satisfaction with the transition, as the children took on the stressors of the transition themselves. However, while one could argue that by being so involved in the transition, that the children were amplifying the decline of their parents' actual autonomy through a release of control. It appears that these participants were able to regain their sense of control once they had moved and were set up in the new assisted living apartment. The outcomes of this study suggest that the older adults who transitioned with the help of their children had access to more transitional tools, which allowed them to regain their autonomy after the transition more quickly.

To answer the research question "How can immersive experience technology help older adults in their transition into assisted living?", the results suggest that a virtual walkthrough may help older adults improve their autonomy before, during, and after their transition into assisted living, but primarily with a specific population without family support. The virtual walkthrough intervention can be seen as a tool to ease concerns before, during, and after the transition, while improving navigation in the new assisted living apartment, thus allowing for improved control. Participants who transitioned independently suggested that the virtual walkthrough would have been beneficial during and after their transition, with the added measuring tool to allow for navigation and control in moving the appropriate belongings and knowing where to place them. Therefore, it is suggested that through the application of this intervention, environmental press

can be lowered in older adults in that specific population. By improving autonomy through easing

concern and providing the ability to better navigate, older adults may be able to regain control in

their new assisted living environment, similar to previous literature that suggests that there may

be a lowering of environmental press in older adults through a preliminary introduction to the

environment (Park & Lee, 2017).

Despite the previously described limitations, the findings from this study are beneficial

for future researchers to understand that loss of autonomy often occurs prior to the transition to

assisted living and that the type of transitions occurring (dependent/independent) will impact the

residents' ability to regain autonomy once the transition is complete. Immersive experience

technology may not be suggested as the principal intervention for all individuals moving to

assisted living facilities, but it will serve as a beneficial intervention for independently

transitioning older adults. When introduced prior to the move, the virtual walkthrough may ease

the concerns in what to bring, and where to place it, thus improving navigation in the new

assisted living apartment, and improving the older adult's overall control so that they are able to

regain autonomy in their new assisted living apartment.

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APPENDICES

APPENDIX A

Phase 1 and 2 Focus Group Recruitment Email

Sending email: kate.korneva@okstate.edu
Name
Address
Dear ____,
As a graduate student at Oklahoma State University, I am conducting a research project to study the benefits of the type of interventions shown to older adults before transitions into assisted living. I am requesting your participation, which will involve your permission to conduct an online focus group with your residence. I am requesting a total of eight participants. The online focus group session will contain questions about the type of interventions presented before transitions, impact of intervention on transitions, perception of a virtual walk-through intervention, etc. I have attached a copy of the types of focus group question for your review. The identity of the study facilities, their location and all names will be kept completely confidential throughout the research process. Your participation in this study is voluntary. You are free to choose not to participate or withdraw from the study at any time.
Upon your approval, I would like to set up a time to conduct the online focus group. There are no foreseeable risks or discomforts to the residents. Although there may be no direct benefit to you at this time, the possible benefit of your participation is that the findings of this study may help in future education of care staff about culture change initiatives. The overarching aim of the study is to better understand the benefits of virtual walkthrough interventions on older adults transitioning into assisted living.
If you choose to participate in this research project, please send an email of permission to kate.korneva@okstate.edu containing the following information:
• Facility letterhead
• Title of project: Immersive Experience Interventions for Older Adults Transitioning into
        Assisted Living
• A general description outlining your understanding of the project
• Your permission to do an online focus group with the residence of your assisted living facility
If you have any questions regarding your rights as a participant in this research and/or concerns about the study, or if you feel under any pressure to enroll or to continue to participate in this study, you may contact the Oklahoma State University Institutional Review Board (which is a group of people who review the research studies to protect participants' rights) at (405) 744-1676
If you have any questions concerning this research study at any time, please do not hesitate to contact me.
Please the attached flyer for further information and participation for the residence.
Sincerely,
Kate Korneva

University Research Compliance

PHASE 1 PARTICIPANT
INFORMATION FORM

Evaluation of IRB Procedures Regarding
Informed Consent

Title: Immersive Experience Interventions for Older Adults Transitioning into Assisted Living

Investigator: Kate Korneva

Purpose: The purpose of the research study is to understand older adult's perception of the use of virtual interventions in transitions to assisted living facilities.

What to Expect: This research study focus group will be conducted online. The online focus group will last 1 hour. This online focus group will be audio recorded for research analysis.

Compensation: You will receive no payment for participating in this study.

Risks: There are no risks associated with this project which are expected to be greater than those ordinarily encountered in daily life.

Your Rights and Confidentiality: Your participation in this research is voluntary. There is no penalty for refusal to participate, and you are free to withdraw your consent and participation in this project at any time.

The information you give in the study will be kept confidential. This means that the research team will know the participants real identity, but it will not be disclosed. This data will be stored in a password protected computer until May 1, 2021. The research team will ensure confidentiality to the degree permitted by technology. Your participation in this online survey involves risks similar to a person's everyday use of the internet. If you have concerns, you should consult the survey provider privacy policy at https://zoom.us/privacy/.

Contacts and Questions: If you have questions about the research study itself, please contact the Principal Investigator at kate.korneva@okstate.edu. If you have questions about your rights as a research volunteer, please contact the OSU IRB at (405) 744-3377 or irb@okstate.edu.

If you participate in this focus group, you agree to consenting.

Phase 1 Focus Group Questions

1. Please describe the background and circumstances which led to your decision to move to Assisted Living.
2. What type of information or intervention did you receive before your transition into Assisted Living?
3. How did the information or intervention help you during your transition?
4. Did the information or intervention create any barriers for you during your transition?
5. Would you have liked to have been more involved in the transition? If so, how?
6. Please describe your response to the virtual walkthrough that I shared as an intervention for AL transitions.
7. In general, what types of needs would the virtual walkthrough address if presented prior to an initial transition into AL?
8. Would the virtual walkthrough have been beneficial to you prior to your initial transition? If so, why?
9. Would the virtual walkthrough have created barriers to your during your initial transition? If so, why?
10. In what ways can the virtual walkthrough be improved for future applications?

Phase 2 Focus Group Questions

1. Please describe the background and circumstances which led to your decision to move to Assisted Living.
2. What type of information or intervention did you receive before your transition into Assisted Living?
3. How did the information or intervention help you during your transition?
4. Did the information or intervention create any barriers for you during your transition?
5. Who helped you? How did it feel for you having your children help with the transition?
6. How much input did you have in the move?
7. Was it important to know measurements of walls to help decide which furniture to bring? When you were thinking about moving your furniture in, did you consider wall measurements? If so, would a measuring tool help in a VR walk-through? Why/why not?
8. Would you have liked to have been more involved in the transition? If so, how?
9. Please describe your response to the virtual walkthrough that I shared as an intervention for AL transitions.
10. In general, what types of needs would the virtual walkthrough address if presented prior to an initial transition into AL?
11. Would the virtual walkthrough have been beneficial to you prior to your initial transition? If so, why?
12. Would the virtual walkthrough have created barriers to your during your initial transition? If so, why?
13. In what ways can the virtual walkthrough be improved for future applications?

APPENDIX B

Phase 3 Survey Recruitment Email

Sending email: kate.korneva@okstate.edu
<u>Don Blose</u>
<u>Spanish Cover Retirement Village</u>
11 Palm Ave
Yukon OK, 73099

Dear Mr.Blose,

  As a graduate student at Oklahoma State University, I am conducting a research project to study the benefits of the type of interventions shown to older adults before transitions into assisted living. I am requesting your participation, which will involve your permission to conduct an online survey questionnaire with your residence. I am requesting a total of 22 participants. The online survey questionnaire will contain questions about the type of interventions presented before transitions, impact of intervention on transitions, perception of a virtual walkthrough intervention, etc. I have attached a copy of the types of questions for your review. The identity of the study facilities, their location and all names will be kept completely confidential throughout the research process. Your participation in this study is voluntary. You are free to choose not to participate or withdraw from the study at any time.

  Upon your approval, I will ask you to forward the attached online survey questionnaire to your residence. There are no foreseeable risks or discomforts to the residents. Although there may be no direct benefit to you at this time, the possible benefit of your participation is that the findings of this study may help in future education of care staff about culture change initiatives. The overarching aim of the study is to better understand the benefits of virtual walk-through interventions on older adults transitioning into assisted living.

  If you choose to participate in this research project, please send an email of permission to kate.korneva@okstate.edu containing the following information:

• Facility letterhead
• Title of project: Immersive Experience Interventions for Older Adults Transitioning into
  Assisted Living
• A general description outlining your understanding of the project

  Your permission to do an online focus group with the residence of your assisted living facility. If you have any questions regarding your rights as a participant in this research and/or concerns about the study, or if you feel under any pressure to enroll or to continue to participate in this study, you may contact the Oklahoma State University Institutional Review Board (which is a group of people who review the research studies to protect participants' rights) at (405) 744-1676 If you have any questions concerning this research study at any time, please do not hesitate to contact me.

Please the attached flyer for further information and participation for the residence.
Sincerely,
Kate Korneva

Welcome to the survey! This questionnaire is designed to address the use of interventions in transitions to assisted living facilities conducted by Kate Korneva, under the direction of Dr. Emily Roberts, Design, Housing, & Merchandising, Oklahoma State University. Your participation will help the research team understand your needs within assisted living during your transition.

What to Expect: This research study survey is administered online., Please answer all the questions to the best of your ability, they survey should take you about 30 minutes to complete. You can also save your answers and return to the survey to finish it at another time.

Risks: There are no risks associated with this project which are expected to be greater than those ordinarily encountered in daily life.

Benefits: There are no direct benefits to you. However, you may gain an appreciation and understanding to how research is conducted and will contribute to empirical knowledge about transitions into assisted living.

Compensation: You will receive no payment for participating in this study.
Your Rights and Confidentiality: Your participation in this research is voluntary. There is no penalty for refusal to participate, and you are free to withdraw your consent and participation in this project at any time.

The information you give in the study will be anonymous. This means that the research team will not know the participants real identity. This data will be stored in a password protected computer until May 1, 2021. The research team will ensure anonymity to the degree permitted by technology. Your participation in this online survey involves risks similar to a person's everyday use of the internet. If you have concerns, you should consult the survey provider privacy policy at https://www.qualtrics.com/privacy-statement/.

Contacts and Questions: If you have questions about the research study itself, please contact the Principal Investigator at kate.korneva@okstate.edu. If you have questions about your rights as a research volunteer, please contact the OSU IRB at (405) 744-3377 or irb@okstate.edu.

If you chose to participate: By clicking the arrow below, you are indicating that you freely and voluntarily agree to participate in this study and you also acknowledge that you are at least 18 years of age.

BEFORE STARTING THE SURVEY, PLEASE VIEW THIS MOCK UP APARTMENT WALK THROUGH:

https://players.cupix.com/p/WDLoM9Jw

Age

[   ]

Gender

○ Male

○ Female

○ Non-binary / third gender

○ Prefer not to say

Marital Status

◯ Married

◯ Widowed

◯ Separated

◯ Divorced

◯ Never married/Single

Ethnicity

◯ Asian

◯ Black/African American

◯ Caucasian

◯ Hispanic/Latinx

◯ Native American

◯ Pacific Islander

◯ Other _____

◯ Prefer not to say

What type of housing did you live in at the time you decided to move to your current assisted living facility?

◯ Apartment

◯ Condominium

◯ Duplex/Townhouse

◯ Single Family Home

◯ Other _____

◯ Prefer not to say

How long did you live in that previous home?

○ Under 1 year

○ 1-2 years

○ 3-4 years

○ 5-6 years

○ Longer than 6 years

○ Prefer not to say

How long have you lived in your assisted living facility?

○ Under 1 year

○ 1-2 years

○ 3-4 years

○ 5-6 years

○ Longer than 6 years

○ Prefer not to say

How long did you consider moving before your transition into the assisted living facility?

○ Under 1 year

○ 1-2 years

○ 3-4 years

○ 5-6 years

○ Longer than 6 years

○ Prefer not to say

Did you have concerns when transitioning into the assisted living facility?

○ Not at all

○ Little concern

○ Neutral

○ Some concern

○ Lots of concerns

How emotionally prepared were you prior to your transition into the assisted living facility?

○ Not prepared

○ Somewhat prepared

○ Neutral

○ Mostly prepared

○ Very prepared

Thinking about both the good and bad things that make up your quality of life, how would you rate the quality of your life as a whole, after transitioning into assisted living?

○ Very bad

○ Bad

○ Neutral

○ Good

○ Very good

I feel like I have control over my life after the transition into assisted living.

○ Strongly disagree

○ Slightly disagree

○ Neutral

○ Somewhat agree

○ Strongly Agree

I feel like I am more independent after the transition into assisted living.

○ Strongly disagree

○ Slightly disagree

○ Neutral

○ Somewhat agree

○ Strongly agree

I have more time for leisure activities after the transition into assisted living.

○ Strongly disagree

○ Slightly disagree

○ Neutral

○ Somewhat agree

○ Strongly agree

What type of intervention were you introduced to before your transition into assisted living?

○ Flyer

○ Floorplan

○ Virtual tour

○ Other [   ]

○ None - if this answer is chosen, please skip to question 21

○ Prefer not to say

How beneficial was the intervention in easing concerns in your transition into assisted living?

○ Not beneficial

○ Little benefit

○ Neutral

○ Somewhat beneficial

○ Very beneficial

How beneficial was the intervention in helping you navigate in your new home in assisted living?

○ Not beneficial

○ Little benefit

○ Neutral

○ Somewhat beneficial

○ Very beneficial

How beneficial was the intervention in placement of your items in your new home in assisted living?

○ Not beneficial

○ Little benefit

○ Neutral

○ Somewhat beneficial

○ Very beneficial

How accurately did the intervention portray your new home in assisted living?

○ Not accurately

○ Slightly accurately

○ Neutral

○ Somewhat accurately

○ Very accurately

The virtual walk-through would have been beneficial in easing concerns about my transition into assisted living?

○ Strongly disagree

○ Slightly disagree

○ Neutral

○ Somewhat agree

○ Strongly agree

The virtual walk-through would have been beneficial in helping me navigate in my new home in assisted living?

○ Strongly disagree

○ Slightly disagree

○ Neutral

○ Somewhat agree

○ Strongly agree

The virtual walk-through would have been beneficial in helping in placement of my items in my new home in assisted living?

○ Strongly disagree

○ Slightly disagree

○ Neutral

○ Somewhat agree

○ Strongly agree

My interaction with the virtual walk-through was clear and understandable.

○ Strongly disagree

○ Slightly disagree

○ Neutral

○ Somewhat agree

○ Strongly agree

I found the virtual walk-through easy to use.

○ Strongly disagree

○ Slightly disagree

○ Neutral

○ Somewhat agree

○ Strongly agree

I felt confident about using the virtual walk-through.

○ Strongly disagree

○ Slightly disagree

○ Neutral

○ Somewhat agree

○ Strongly agree

What did you find to be the most important feature in this virtual walk-through? Please rank the following, 1 being least important and 6 being most important.

- ○ Measurement features
- ○ Directional arrows
- ○ Names of rooms
- ○ Ability to look around in one spot
- ○ Seeing furniture within the space
- ○ Other: [   ]

What can be improved within this virtual walk-through?

[   ]

Phase 3 Demographics Table

Demographics	Frequency n	Percentage %
Age		
65-74	2	14.3
75-84	5	35.7
85 and up	7	50.0
Gender		
Female	9	64.3
Male	5	35.7
Marital Status		
Married	7	50.0
Widowed	7	50.0
Separated	0	0.0
Divorced	0	0.0
Never married/Single	0	0.0
Ethnicity		
Asian	0	0.0
Black/African American	0	0.0
Caucasian	13	92.9
Hispanic/Latinx	0	0.0
Native American	0	0.0
Pacific Islander	0	0.0
Other	1	7.1
Years Lived In AL		
Under 1 year	6	42.9
1-2 years	2	14.3
3-4 years	4	28.6
5-6 years	1	7.1
Longer than 6 years	1	7.1

VITA

Ekaterina V. Korneva

Candidate for the Degree of

Master of Science

Thesis: THE ROLE OF IMMERSIVE EXPERIENCE TECHNOLOGY FOR
AUTONOMY IN OLDER ADULTS TRANSITIONED INTO ASSISTED LIVING: A
USER-CENTERED DESIGN APPROACH

Major Field: Design, Housing & Merchandising

Biographical:

        Education:

        Completed the requirements for the Master of Science in Design, Housing &
        Merchandising at Oklahoma State University, Stillwater, Oklahoma in July,
        2021.

        Completed the requirements for the Bachelor of Science in Human Sciences at
        Oklahoma State University, Stillwater, Oklahoma in 2020.

        Experience:

        Graduate Research and Teaching Assistant, Department of Design, Housing,
        and Merchandising, Oklahoma State University, August 2020 – Present.
        Responsibilities as a research assistant included helping create a website for
        the upcoming Interior Design program review by Council for Interior Design
        Accreditation (CIDA). This task included gathering all previous course and
        student work from the past five years of the program for each required course
        of the program and organizing it on the website so that the CIDA team
        could do their review of the program with easy interactivity and navigation on a
        virtual platform. Responsibilities as a teaching assistant included
        lecturing/teaching lab section of 1003 Design Theory, a course within the
        Interior Design program, as well as grading projects created in the lab.