Introducing Positive Distraction in a Clinic Waiting Room

A Thesis

Presented to the Faculty of the Graduate School of Cornell University

In Partial Fulfillment of the Requirements for the Degree of Master of Arts

by

Qiwen Luo

May 2017

ABSTRACT

This paper examines the impact of various types of positive distractions on perceived wait time, Discrepancy between Perceived and Actual wait time (DBPA) (whether actual and perceived wait time is the same, or over/under), perceived quality of care, and patient anxiety level. A quasi-experiment was conducted to test the hypotheses. In the experiment, three conditions were set up in a waiting room of a clinic, comprised of two positive distractions and a control. The first condition introduced a video of an aquarium into the room. The second introduced an interactive aquarium game that a waiting patient can interact with via a tablet. A third condition, in which TV news played on a TV in the background (as is the norm in the waiting room), was used as the control. Surveys were distributed to collect patient response on perceived wait time, perceived quality of care, and anxiety level. Receptionists and nurses coordinated to collect patients' actual wait times. Behavioral observation was conducted to provide more objective data (e.g. patients' actual activities while waiting). There were 408 patients who finished the survey, with 72 hours of behavioral observation conducted in total. The results partly support the hypotheses. DBPA was influenced by the interventions, and patient stress level was influenced by the perception of wait time. Perceived quality of care was correlated with a patient's anxiety level. Based on the results, I suggest that DBPA might be a stronger indicator of a patient stress level than actual or perceived wait time, and that DBPA could be influenced by positive distraction.

Key words: positive distraction, wait time, anxiety level, out-patient waiting experience, perceived quality of care, waiting rooms

Biographical sketch

Qiwen Luo (Amber) was born in Guangdong, China. She matriculated at the University of Edinburgh in the UK beginning in 2011, and earned a bachelor's degree in interior architectural design. She was inspired by a book about the theory of environmental psychology, and applied those theories and findings in research in her final year of design. After that, she found she had a great passion for environmental psychology and the impact this approach has on the design process.

Thus, she started her master's degree in design and environmental analysis at Cornell University, where she learned a more scientific, human-center design approach. She was interested in conducting research and generating design guidelines based on literature in healthcare design and spatial design for children. She has worked on design consulting projects at school in various settings: education, workplace, healthcare and real estate, and engaged in architecture programming, consulting, post-occupancy evaluation. During 2016 summer, she served as a design strategist and interior design intern at Ballinger in Philadelphia, which is an architectural company specializing in healthcare design. Her internship involved her in various types of projects. Amber worked on planning and strategies, and collaborated with people from different disciplines.

This inter-disciplinary experience, and scientific and systematic research approach provided a unique perspective for her approach to problems and seeking out creative solutions. After graduating from Cornell, she intends to pursue a career in design consulting, which will continue to translate research findings into practical design guidelines and continue to practice evidence-based design.

ACKNOWLEDGEMENTS

I would like to thank the Guthrie clinic, Ithaca, NY, and all the staff that collaborated with researchers to collect data. I am very appreciative of the support of Guthrie administrator Ken Harris; my advisor and the chair of my thesis committee: Professor Mardelle M. Shepley; the minor member of my thesis committee, Professor Gary W. Evans; and my editor, Augustus Rose. Thanks also to the Department of Design and Environmental Analysis Graduate program, at Cornell University, which sponsored the experiment.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

Attention Restoration Theory (ART)

Perceived Wait Time (PWT)

Actual Wait Time (AWT)

Discrepancy between perceived and actual wait time (DBPA)

PREFACE

The thesis addresses the outpatient waiting experience and the effects of introducing of positive distractions on perceived wait time. It has been written to fulfill the graduation requirements of the Design and Environmental Analysis program at Cornell University. I was engaged in researching and writing this thesis from January 2016 to May 2017.

My research question was developed together with my advisor Mardelle M. Shepley, Professor Gary W. Evans and, the Guthrie Clinic administrator, Ken Harris. The research demanded continuous collaboration among the staff working in the clinic, the administrator, the organization, and myself. Fortunately, everything worked out well.

I would like to thank Mardelle M. Shepley for her excellent guidance and support, Gary W. Evans for his insights and contributions, Ken Harris for his help, collaboration, and great passion while working on this project, and my editor Augustus Rose for his hard work making this thesis more fluid. I also want to thank all of the participants who volunteered to take the survey and provide valuable responses and feedback on the intervention, the physical environment, and elements that influenced their waiting experience. I am grateful to the Department of Design and Environmental Analysis, which funded the entire project and provided the necessary resources to support my research. Finally, I would like to thank my family and friends, who always motivate me and support my ideas.

I hope you enjoy reading my thesis.

Qiwen Luo (Amber)

Ithaca, May 05, 2017

CHAPTER 1: INTRODUCTION and LITERATURE REVIEW

1.1 Introduction

This thesis aims to provide information about the design of clinic waiting rooms by focusing on the role of positive distraction. It provides an overall view of the theory behind positive distraction and the different kinds of stimuli that contribute to positive distraction. Wait time is the main independent variable in this study; its impact on perceived quality of care, anxiety level, and overall waiting experience was tested.

Waiting is common in healthcare settings, especially in outpatient services. However, waiting is likely to be considered as an unpleasant experience that people try to avoid (Durrande-Moreau, 1999; Gasparini, 1995). Wait time, in particular, has a significant impact on patient satisfaction (Bleustein et al., 2014). Unfortunately, there are few studies that have been conducted to investigate this problem and provide possible solutions. Positive distraction may help patients pass the time, since it is able to draw patient attention from the current stimulus to other more pleasant stimuli (Schneider & Hood, 2007; Shepley, 2006). In exploring this topic, this paper begins by reviewing Attention Restoration Theory (which is the foundation of positive distraction), variables that contribute to positive distraction, waiting experience in healthcare settings, and methods for exploring the impact of positive distraction.

1.2 Attention Restoration Theory (ART)

Attention Restoration Theory (ART) addresses the role that specific experience can play in aiding recovery from fatigue caused by directed attention (Herzog et al., 1997; Kaplan, 1995; Ulrich et al., 1991). Tennessen & Cimprich (1995) suggest that the capacity for attention is essential for the effective performance of daily activities that require processing selective

information, decision-making, achieving goals, etc. In addition, in the modern world people need to direct or select their attention to purposeful and important activities and tasks by avoiding and resisting other distracting and interesting stimuli in order to maintain clarity of focus and effective functioning (Jiang & Chun, 2001; Kaplan, 1995; Tennessen & Cimprich, 1995). Directed attention is defined as the capacity to block competing and distracting stimuli while focusing on more important and purposeful tasks, which requires mental effort (Herzog et al., 1997; Kaplan, 1995; Posner & Snyder, 1975). Apart from directing attention to the important tasks, other more relaxing and pleasant stimuli can draw a person's attention in a way that can achieve a restorative effect. This is the definition of positive distraction, an environmental intervention that can be implemented in clinic waiting rooms. The positive stimuli in waiting rooms is engineered to draw a patient's attention to something more pleasant and relaxing than contemplating potential health issues. The following research suggests possible strategies could be applied to generate restorative effects.

Exposure to nature has long been thought to be one of the more effective ways to restore the capacity for directed attention. Tennessen and Cimprich (1995) tested this by studying the impact of nature views from student dormitories on students' performance of directed attention. The experiment was done in the participants' rooms, three dormitories with similar sized windows giving four types of views (all natural, mostly natural, mostly built, and all built). The students' direct attention was measured by their performance on several tests, including Digit Span Forward, Symbol Digit Modalities Test, and Necker Cube Pattern Control. The results show that those students who had more extensive nature views from their dormitory windows performed better than those who did not have a nature view. Nature views did not, however, no correlation was between performance and mood state.

Other researchers have found that natural settings have a more positive effect on restoration than urban settings (Hartig, Evans, Jamner, Davis, & Gärling, 2003; Kearney & Winterbottom, 2006; Ulrich et al., 1991, 2008). Hartig et al. (2003) tested the restorative effect of natural settings using pre- and post-methodology. One hundred and twelve young adults were randomly assigned to complete attention-demanding tasks. Half of these involved driving while half involved another attention-demanding task. After that, all of the participants were randomly divided into two groups. One of the groups sat in a room with a tree view, and then had a nature walk. Another group sat in a viewless room, and then walked around in an urban environment. Ambulatory blood pressure, emotions, and attention were measured before the attention-demanding tasks, and then after the participants had sat and rested in a room and had a walk. Blood pressure decreased dramatically after people had a rest with a tree view. In addition, people performed better on the attention test and reported a better mood after walking around in nature. This study supports that the theory that natural settings help to restore people's attention.

Apart from natural settings, Kaplan, Bardwell, and Slakter (1993) suggest that museums might serve as restorative environments. The collections displayed in a museum were predicted to help with recovery of directed attention. This study surveyed 124 visitors on the restorative aspects of their visit and gathered information from focus groups. The results show that while visitors had a fairly restorative experience overall, those more comfortable and familiar with museums benefited most from these settings. One of the survey's questions asked about whether the participants felt escape from their daily concerns. This question received a relatively positive response, which might indicate that interesting and aesthetically-pleasing settings might help to draw people's attentions from their daily routines and thus help to restore the fatigue brought on

by directed attention. Hartig, Mang, and Evans (1991) suggest that "restorative settings should promote some sense of being away, extent, and compatibility."

1.3 Positive distraction

Positive distraction in the context of healthcare facilities refers to "the ability to allow the individual to shift focus from negative stimulus within the health environment to the more restorative aspects of the non-medical world"(Shepley, 2006). Distraction also has been described as an "emotion-focused coping strategy because it diverts the focus of attention away from unpleasant stimuli by manipulating the environment" (Schneider & Hood, 2007). The interventions most commonly known to induce positive distraction are: nature (Kearney & Winterbottom, 2006; Shepley, 2006; Ulrich et al., 1991), art (Hathorn & Nanda, 2008; Nanda et al., 2012; Shepley, 2006), music (Cooper & Foster, 2008; Hsu, Chen & Hsiep, 2016; Iyendo, 2016; Lee et al., 2004), & virtual reality (VR)(Baños et al., 2013; Hua, Qiu, Yao, Zhang, & Chen, 2015; Schneider & Hood, 2007; Schneider & Workman, 2000; Wiederhold, Gao, Sulea, & Wiederhold, 2014).

1.3.1 Nature

Because access to nature has been shown to provide restorative effects to patients, introducing access to nature (e.g. interior vegetation, window views onto natural settings, and healing gardens) is recommended in the design of healthcare environments (Ulrich, 1984; Ulrich et al., 1991; Whitehouse et al., 2001). Whitehouse et al. (2001) conducted a post-occupancy evaluation (POE) in a children's hospital garden to evaluate whether the natural setting had an impact on stress reduction, restoration, and increasing consumer satisfaction. Whitehouse and colleagues (2001) found that the healing garden increased satisfaction, and was perceived as a

place of restoration and healing. In another study, researchers Introduced natural sights (e.g. a photograph of an open natural landscape) and sounds during flexible bronchoscopy (FB) and found significant reductions in pain for older patients and patients with better health (Diette, Lechtzin, Haponik, Devrotes, & Rubin, 2003). Furthermore, patients who were randomly assigned to rooms with window views of nature had a better recovery rate than those with a view of a brick wall (Ulrich, 1984).

In a fourth study, one that is specifically relevant to the research described in this paper, a controlled experiment was conducted in the surgery rooms of a dental surgery office. One room had a fish tank while the other did not (Katcher, Segal, & Beck, 1984). The results showed that when the room had an aquarium, patients not only had lower anxiety levels, but they also were more willing to collaborate with their doctors. In summary, studies show that as a type of positive distraction, natural surroundings positively influence people's anxiety levels, recovery rates, and reduction of pain.

1.3.2 Visual Art

Visual art is another type of positive distraction that has a positive impact on patient outcomes. According to Hathorn and Nanda (2008) "Visual art includes traditional 2D and 3D works, as well as digital art and virtual reality (VR)." Visual art might incorporate still and motion works. There are numerous benefits of introducing visual art into healthcare settings, better pain control and anxiety reduction being the most obvious. Patients who viewed a natural scenic video with music reported a significant reduction in present pain intensity, pain rating index, and anxiety level (Miller, Hickman, & Lemasters, 1992). A natural scene mural with music also helped patients to reduce pain during flexible bronchoscopy (FB) (Diette et al., 2003). Visual art has an impact on patient behavior in the emergency department waiting room

According to Nanda et al. (2012), patients in the ED waiting room exposed to a video loop of natural pictures and still natural art experienced a significant reduction in restlessness, and a marked decrease in number of queries made at the front desk. The results also indicated a significant increase in social interaction and a reduction in noise level.

Regarding the type of visual art, both adults and children in healthcare settings positively rate natural themed art works (Eisen, Ulrich, Shepley, Varni, & Sherman, 2008; Nanda, Hathorn, & Newmann, 2007). Hathorn & Nanda (2008) conducted a literature review of the healing effect of visual art on patient outcomes, current art programs in U.S. hospitals, and a guideline for art selection and art placement in healthcare settings. This guideline was conducted to provide feasible design recommendations for healthcare settings, since visual art representing nature was supported by numerous studies showing it to be beneficial to patient outcomes. Therefore, visual art, especially art simulating nature, can be important to healthcare environments as positive distraction.

1.3.3 Virtual reality

As one type of positive distraction, Virtual Reality (VR) is a relatively new technique that is being used during unpleasant medical procedures (Wiederhold, Gao, Sulea, & Wiederhold, 2014). Because VR allows individuals to feel, hear, and interact with stimuli in order to divert attention away from the immediate situation by placing them into "another place," the employment of VR distractions has found its way into the design of healthcare facilities. Schneider and Hood (2007) introduced VR as a positive distraction during chemotherapy. In their study, patients reported that using VR made the chemotherapy treatment seem shorter and that they felt better during the treatment. In a related study, after receiving VR intervention for a

week patients with metastatic cancer reported more positive emotions than negative (Baños et al., 2013).

Moreover, VR intervention could also help to reduce the distress of patients with chronic pain. Distress pain level, anxiety level, and high heart rate. This result was tested in an experiment conducted by Wiederhold et al. (2014) in clinic patients with chronic pain. Some were enrolled in the intervention condition and the rest in the control condition. Participants completed a self-reported questionnaire about the VR experience, recording their pain intensity, level of simulator sickness (such as general discomfort, fatigue, headache, eyestrain and nausea), and heart rate. The control group reported greater pain intensity and heart rate, indicating that VR had a positive impact on these indicators.

For most studies, VR has been used to simulate a view or a journey through nature, through such things as videotapes of natural landscapes (Miller et al., 1992), and interactive VR audiovisual nature distractions involving a forest walk and deep sea diving (Schneider & Hood, 2007; Schneider, Prince-Paul, Allen, Silverman, & Talaba, 2004). One reason VR is becoming so popular is that it has the ability to draw people's attention from the negative stimulus and create a real sense of being away from the immediate environment. Furthermore, VR may utilize our limited capacity for attention, to cope with negative events, such as stress, anxiety, and depression (Hua, Qiu, Yao, Zhang, & Chen, 2015). In summary, similar to static visual art, VR representing natural scenery can help to reduce patient anxiety level and pain. Consistent with the findings on the restorative effects of nature, representations of nature through still art as well as interactive, immersive scenes also have a significant effect on patient health outcomes. All of them are used as positive distractions, since they are designed to deflect a patient's attention from their current situation to another event.

1.3.4 Music

Music, as another kind of positive distraction, has been introduced to healthcare settings and has been shown to have positive effects on patient outcomes, such as emotions, stress, anxiety, and pain (Iyendo, 2016; Tang & Vezeau, 2010). Music is considered to be a form of therapy (Aydin & Sahiner, 2017; Cooper & Foster, 2008; Hanser & Mandel, 2005). Data suggests that it has a positive effect on the pain and anxiety levels of burn patients as they have their dressings changed (Hsu, Chen, & Hsiep, 2016), and it has been shown to improve the mood of patients with traumatic brain injuries. Hospital staff, as well, have responded positively to music intervention. Nurses who worked in intensive care units (ICU) reported that ambient music would help them moderate their emotional responses during after-death care (Holm, Fålun, Gjengedal, & Norekvål, 2012). Nursing students reported feeling more relaxed during their first blood draw skill practice when the music intervention was present (Ince & Çevik, 2017).

Apart from introducing music to inpatient rooms and during treatment, the waiting room is another place that music intervention could be beneficial. In one study, music was introduced in a radiotherapy waiting room (Cooper & Foster, 2008). During a week-long experiment, four types of music were played in the waiting room. One day was easy listening, on another day jazz, then pop, and then classical music. A fifth day was assigned as the control condition, during which no music was introduced. Participants completed a survey to indicate their favorite music type from the four categories played that day, and their stress level before arriving and after sitting in the waiting room. The results showed that more than half of patients reporting feeling increased calmness after listening to the music. Interestingly, according to the results, if the music played on that particular day was disliked by patients, their discomfort level increased (the

survey showed most people prefer easy listening). Therefore, music intervention shows a benefit only to those individuals who enjoy that particular type of music, and has a negative effect on those who don't.

1.4 Waiting

Waiting is an unavoidable experience when patients visit hospitals and clinics. Some may perceive it as the least pleasant part of the healthcare experience. Long waiting times have a negative impact on patient satisfaction (Bleustein et al., 2014). Furthermore, longer wait times may lead to increased levels of anxiety (Thu, 2015). But significantly, perceived waiting time is a stronger predictive of patient satisfaction than actual waiting time (Thompson, Yarnold, Williams, & Adams, 1996). Although reducing waiting time before treatment is important, because it is nearly impossible to achieve a zero wait time within the current medical system, improving the waiting *experience* is more likely to have an impact on patient stress levels.

The waiting experience does not just apply to patients, as many patients are accompanied by family members, who must wait even longer than the patients, often with little to no information on how long the wait time will be, or on the details of the patient's medical procedure. Dexter & Epstein (2001) revealed that providing updated information about a patient's situation to his or her family helps to reduce family members' stress levels while waiting outside surgical suits. Moreover, in-person progress reports will largely reduce family members' anxiety levels, particularly when surgery is expected to be delayed. Neufeld and Mokhtarian (2012) measured the general opinions of waiting (like or dislike) but did not analyze the relative circumstances that may influence attitudes during wait times. This study used an existing data set from Northern California with 2,800 participants that included people's attitudes

towards waiting. The result shows that people with higher-incomes and children tended to hold less favorable opinions of waiting. Respondents who were more tolerant of waiting usually brought tools to support themselves while waiting, such as books, magazines, tablets, smartphones and music players.

In fact, if waiting is seen as unavoidable, most people bring materials to distract themselves during the wait, which means that they will likely have their own distractive tools while they wait, such as reading materials, smart phone, tablets, etc. (Mishra, Mokhtarian, & Widaman, 2015). This is referred to as self-distraction (Durrande-Moreau & Usunier, 1999). Apart from self-distraction, most service providers (such as airports, healthcare providers, waiting rooms, etc.) provide some distractions to reduce the burden of waiting, such as television, newspaper, magazines, toys for children, and free Wi-Fi (Mishra et al., 2015).

Longer wait time negatively impacts a patient's level of anxiety. Thu (2015) recruited 200 patients and calculated their wait time by collecting arrival and departure times. The participants were required to complete a State-Trait Anxiety Inventory (STAI) before and after their waiting experience. The results show that the length of wait correlates positively with level of anxiety.

However, reducing perceived waiting time and patient stress level may be an effective way to improve perceived quality of care. Thompson, Yarnold, Williams, & Adams (1996) suggest that perceived wait time (not actual wait time) is the determining factor in patient satisfaction. A study was conducted to test the influence of specific stimuli (such as TV), and physical attributes of waiting room on the appraisal of the wait, satisfaction with the service and perceived waiting time. The experiment was conducted in three hospital waiting rooms involving 337 participants. Subjects were randomly assigned to different waiting rooms with or without TV

and asked to complete a survey after consultation. Researchers observed every tenth visitor. The survey included perceived time spent in the waiting room, overall satisfaction with the service, perceived duration of the wait, affective responses (e.g., irritation), perceived attractiveness of the waiting environment, maximum acceptable waiting time, and time spending on watching TV. Participants estimated the time spent in the waiting room. The appraisal of the wait was assessed on a five-point Likert scale from very short (1) to very long (5). The affective variables included five items: irritation, fairness, annoyance, boredom, and stress experienced. The perceived attractiveness of the waiting environment consisted of four attributes (also assessed on a 5-point Likert scale): atmosphere, cleanliness, spaciousness and climate. Objective waiting time was measured by the difference between the check-in time and the time that the participant went into the room. The results show an average waiting time of 28 minutes, with 28% of participants waiting more than half an hour. Participants were quite good at estimating the waiting time, the correlation between actual and perceived waiting time being 0.73. The main acceptable waiting time was 23 minutes. While the finding did not support that the hypothesis that TV could help to reduce perceived waiting time, the waiting environment did influence patients' response to their wait.

In a related study, Pati and Nanda (2011) introduced different types of VR to two pediatric waiting rooms. All the conditions were created on a TV in the waiting room, with the TV playing different scenes in different conditions, including still nature photographs, ambient art, and a natural aquarium. Researchers conducted behavioral observations to test whether the positive distraction had an impact on patients. The foci of attention, physical and social behavior, and activities of waiting were observed and recorded. The result suggested that the introduction of VR was likely to calm children down, resulting in a significant increase in more passive

behavior and less anxious behavior, and an increased attention to the TV (when this distraction was available), suggesting that positive distraction can influence the stress and anxiety related to or generated by waiting. While this study introduced three different contributions to positive distraction the researchers did not provide detailed data comparing the impact of different conditions on patient behavior.

1.5 Methodologies for Addressing Positive Distraction in Waiting Rooms

Two types of methods are particularly appropriate for studying positive distraction in a waiting room: surveys and behavioral observation.

1.5.1 Surveys

Survey methodology is a general, low-cost approach to collecting patients' subjective opinions of interventions and other variables. It works especially well in field experiments within healthcare settings, as it reduces contact between researchers and patients, thereby reducing intrusion. Cooper and Foster (2008) used a survey to collect patient stress levels and opinions of music intervention in a radiotherapy waiting room. Arneill and Devlin (2002) distributed surveys with images to collect people's opinions of various styles of waiting rooms within clinics, along with the perceived quality of care associated with the physical environment.

A well-developed and tested survey can be tested for validity and reliability. Danielson et al. (2008) developed the Quality of Care – Staff Form (QOC – S), and Quality of Care – Patient Form (QOC – P), survey instruments designed to assess three aspects of quality of care: physical environment of inpatient unit, staff sensitivity to patient trauma history, and quality of engagement. In a sample of 68 staff and 81 patients, the items within the survey show internal

consistence (Cronbach's alpha = .89). One part of the instrument that assesses the physical environment of inpatient units was adapted in the current study to assess the physical environment of waiting rooms, since this part of the instrument assessed various elements of the physical environment, including furniture, lighting, noise level, cleanness of the space, etc.

Lien, Wu, Chen, and Wang (2014) developed a healthcare quality questionnaire to assess interaction quality, physical environment quality, outcome quality, trust in the hospital, image congruence, switching costs, trust in the allied hospitals, and willingness to recommend an allied hospital. The items of the survey were adopted and modified from various studies and tested in a sample of 483 inpatients. Constructed reliability (CR) of trust in the hospital was 0.812. Average variance extracted (AVE), a measure of convergent validity of trust in the hospital, was 0.521. Only trust in the hospital's CR and AVE are indicated in this paper, because trust is the only part of the instrument that will be included in the survey instrument for this study. The current study is trying to examine the relation between wait time and trust in the clinic, and how positive distraction affects the level of that trust.

1.5.2 Behavioral Observation

The multi-method approach of this research (including qualitative and quantitative data, self-reporting, and behavioral observation) improves the study by avoiding mono-method bias, and providing a more comprehensive picture of the problem. Behavioral observation benefits social scientific research by assessing the relation between actual activity and other attributed variables. It can be applied to field studies, field experiments and laboratory experiments (Kerlinger & Lee, 1999). One of the primary strengths is that behavioral observation does not rely on self-reporting. Additionally, it enables the gathering of data without intruding on patients.

Pati and Nanda (2011) used a behavioral observation instrument to assess children's activities and behavior in five positive distraction conditions that were introduced in waiting rooms of pediatric clinic. All data were collected using a standardized data sheet. Five categories of behavior were included for observation: attention, physical behavior, activity, location, and social behavior. This instrument was adopted and modified from several existing children's observation instruments (e.g., Handen, McAuliffe, Janosky, Feldman, & Breaux, 1998; Roberts, 1990; Roberts, Ray, & Roberts, 1984) and used a 20-minute sample time to collect data for each child's reaction, behavior in each condition.

Hadjistavropoulos & Craig, (2002) suggest that behavioral observation should be applied to measure patient pain. A large number of nonverbal actions can only be captured by behavioral observation. This method is especially good for subjects who cannot represent themselves clearly and/or with cognitive impairments, such as young children, mentally ill patients, and people without verbal skills.

1.6 Current study

Whereas most prior studies only examine the impact of one distraction on patient outcomes, the current study extended prior studies by comparing various types of positive distractions. The impact of TV news was compared to a simulated natural environment (a video of an aquarium) and an interactive environment. The impact of the latter two forms of positive distraction were specifically contrasted, as they represent the difference between a passive stimulus and an interactive stimulus. The interactive distraction has never been implemented in outpatient waiting rooms, and has only been used during patient treatment and in inpatient units. Because the interactive stimulus should be easily accessed by more than one person at a time, an

interactive tablet was used instead of a VR headset. The interactive tablet is a new intervention as a positive distraction that has never been reported as being used before.

This research explores whether the positive distractions implemented in this study enhance patient waiting experience, and attempts to identify the most effective positive distraction to be used in future waiting room design. The research objective originates from positive distraction theory, which helps shift a person's attention from negative stimuli to more positive and restorative stimuli (Shepley, 2006), thereby helping patients divert attention from the unpleasant fact of waiting for medical treatment, to an experience that can occupy their attention in a pleasant way.

In my literature review I uncovered no prior studies that compare the impact of passive versus interactive distraction on patient waiting experience. While research has been conducted on the impact that one particular type of distraction, such as passive distraction (TV, still art works, view of nature), or interactive distraction, the comparison undertaken here explores which has a greater impact on the waiting experience in clinics.

Hypotheses:

- Hypothesis 1. The actual wait time will influence perceived wait time, perceived quality of care, anxiety level and overall waiting experience.
- Hypothesis 2. Positive distractions will have a beneficial effect on perceived wait time, perceived quality of care, anxiety level and overall waiting experience.
- Hypothesis 3. Perceived wait time will mediate the relation between positive distractions and perceived quality of care, anxiety level and overall waiting experience.

- Hypothesis 4. Positive distraction will moderate the relation between actual wait time and perceived wait time, perceived quality of care, anxiety level and overall waiting experience.

Please see Figure 1 that displays the relation between independent and dependent variables.

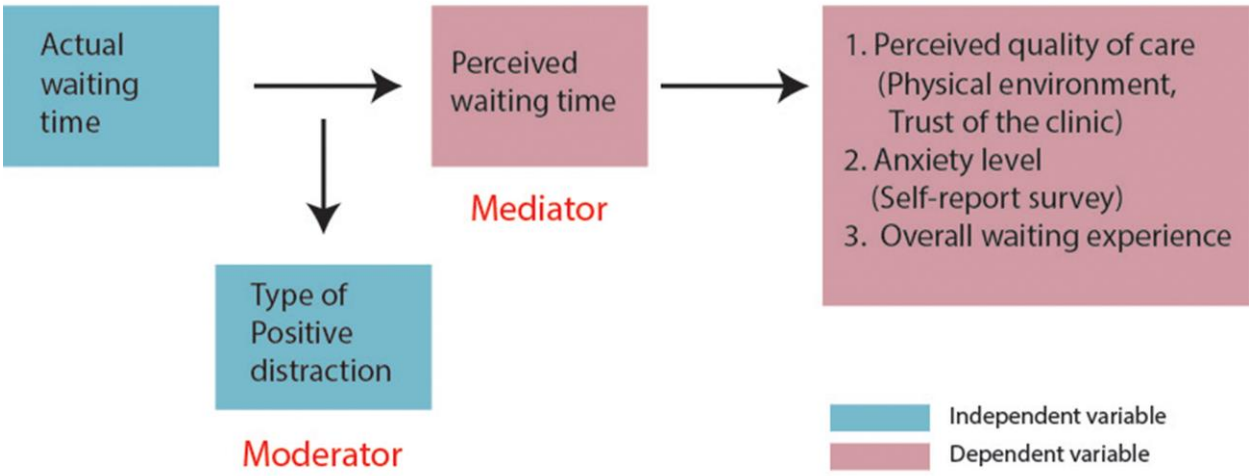

Figure 1: Hypothesis chart

These hypotheses were formulated based on literature on ART, positive distraction, healthcare setting research, and research about waiting, as well as my personal understanding and experience in healthcare environments. Firstly, wait time is related to patient satisfaction. Bleustein et al. (2014) revealed that long wait times decreased patient satisfaction. Moreover, Thompson et al. (1996) suggested that perceived wait time is a stronger predictor of patient satisfaction than actual wait time, and that actual wait time is strongly correlated with perceived wait time. Thu (2015) also revealed that longer wait time leads to higher anxiety levels. But positive distraction helps people pass time, and VR distraction has been shown to make chemotherapy treatment seem shorter and the treatment less unpleasant (Schneider & Hood, 2007).

Therefore, I introduced positive distraction as a moderator to influence perceived wait time in order to influence perceived quality of care.

A new variable was created based on the existing independent variables. This variable, Discrepancy between Perceived and Actual wait time (DBPA), is a variable created to determine whether actual wait time matches perceived wait time. It is a categorical variable, comprised of three categories: perceived wait time is more than actual wait time, perceived wait time is less than actual wait time, and perceived wait time is the same as actual wait time. (See Table 1.) Unlike the perceived wait time in the study of Thompson et al. (1996), the new variable is more objective and reflects patient expectation by addressing discrepancy between perceived and actual wait time, instead of just directly deriving findings from self-reported measures.

Perceived wait time in the study by Thompson et al. (1996) is an independent variable and comes from the same self-report index as the dependent variable; perceived wait time was a self-reported response, correlated with another self-reported variable: patient satisfaction. Therefore, discrepancy between perceived and actual wait time was created to address this issue.

Table 1: New independent variable.

Discrepancy between perceived and actual wait time (DBPA)
Perceived wait time > Actual wait time: P>A = 2
Perceived wait time < Actual wait time: P<A = 1
Perceived wait time = Actual wait time: Match = 0

Therefore, two additional hypotheses, relating to this new independent variable were added as shown in Figure 2.

- Hypothesis 5. Patient's perception of wait time will influence perceived quality of care, anxiety level, overall waiting experience, and the response to the question: "Does it feel like you waited for a long time or short time?"
- Hypothesis 6. Interventions will influence DBPA

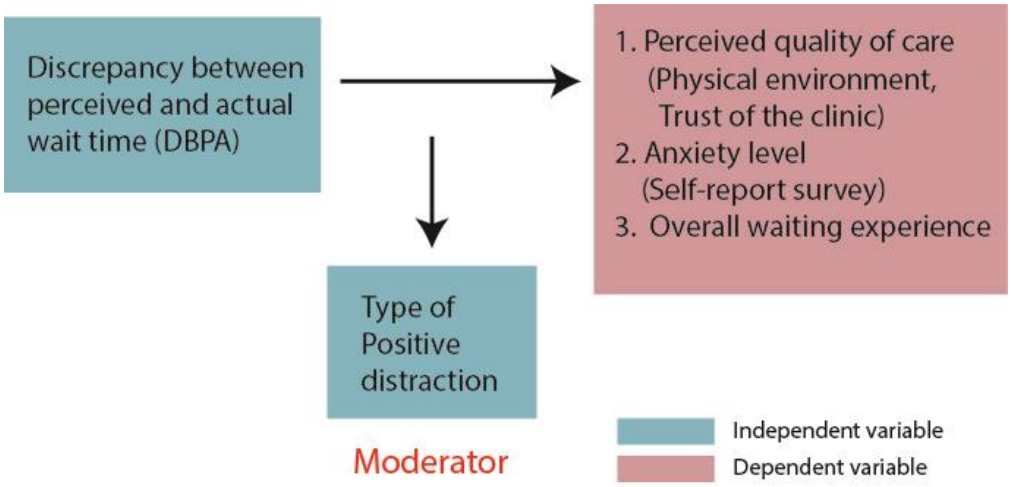

Figure 2: Developed hypothesis chart

A quasi-experimental between subjects study was used to examine the hypotheses.

CHAPTER 2: METHODOLOGY

2.1 Research Design and method:

2.1.1 Participants

The researcher drew the participant samples from patients who visited Guthrie clinic in Ithaca, New York between October 10 to November 18, 2016. Adult patients were recruited by the clinic receptionists by verbally asking about their willingness to participate, and then releasing a consent form with information about the study and a survey. A poster was also

placed in the waiting room to provide more information about the study and to recruit participants. A total of 586 participants were recruited, and 408 participants completed the survey. The age range of the participants was 18 to over 70 years old. Five percent of the participants were 18-20 years old, 5% were 21-30, 7% were 31-40, 16.8% were 41-50, 21% were 51-60, 28.3% were 61-70, and 21% were older than 70. Regarding gender, 34.7% were male, 65.3% were female. Almost 92% of the participants were white; 80.1% of participants visited alone; 44.9% of participants were in Condition 1, 32.8% in Condition 2, and 22.3% in Condition 3; and 94.4% of participated visited the clinic before.

2.1.2 Setting

The experiment was set up in the larger waiting rooms in Guthrie Clinic, Ithaca, New York which accommodates 23 patients in a time, averaging about 200 patients a day. The waiting room is in the center of the building, with no natural light or exterior window views. The waiting room has a flat-screen television in the front, with 17 chairs arranged in rows facing the television. There is a staff desk next to this waiting area for registration and appointments. There are a few art works on the walls and a few plants in the front of the waiting room. The color, furniture and style of the waiting room are very neutral and institutional. (Please see Figures 3 and 4.)

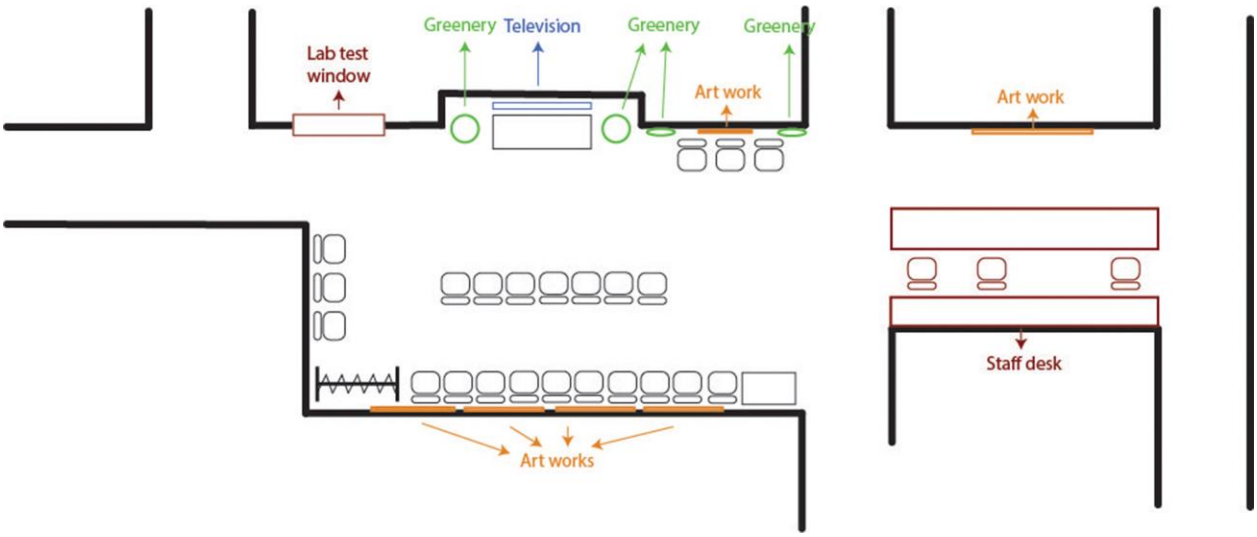

Figure 3: Floor plan of the waiting room in Guthrie clinic

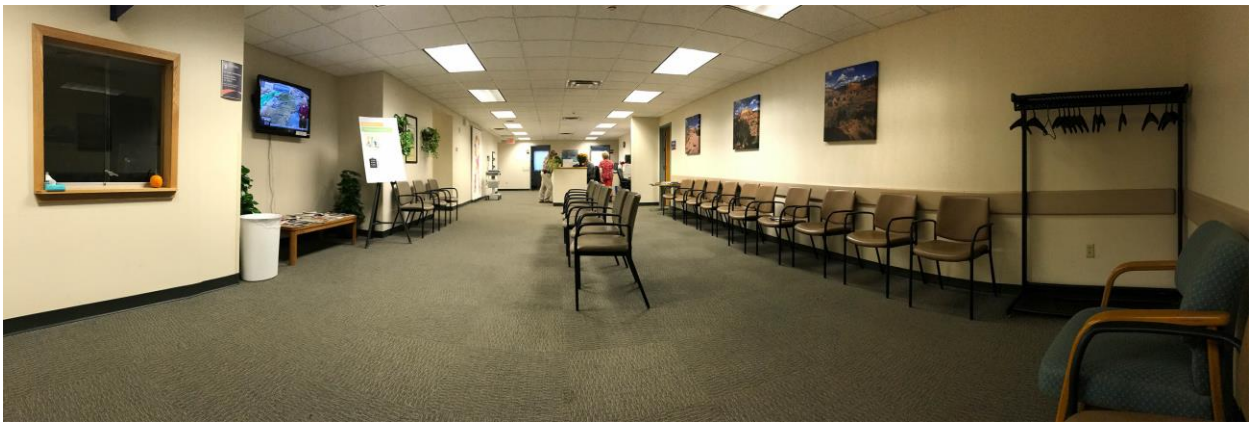

Figure 4: Overview of the waiting room

2.1.3 Positive Distraction Interventions

The distraction interventions were run through the existing television in the waiting room. There were three conditions within this experiment, with each condition running for two weeks. Condition 1 was playing the TV news as usual, with the channel set to TWC news, a New York news station that broadcasts 24-hours a day, seven-days a week. Condition 1 was set up in

the first and fourth weeks of the experiment, with the TV set to TWC for the whole time during those two experimental weeks. (See Figure 5).

Figure 5: The setting of condition 1.

Condition 2 was a video of a digital aquarium with bubble sound effects. This video was created by a digital aquarium application, Fish Farm 2 version 2.6, developed by BitBros Inc in Apple Store and Google Play. This app has two different modes: a display mode, and an interactive mode. When there is no interaction, it displays an aquarium with fishes randomly swimming around. In this condition, the app was installed in an iPad and connected to the TV to display the digital aquarium. The iPad, as an interactive panel, was hidden so that participant would not accidently activate another mode (please see the setting in Figure 6). Condition 2 was set up in the second and fifth week.

Figure 6: The setting of condition 2

Condition 3 displayed an aquarium with the bubble sound effects, but in the interactive game mode, which allows users to feed the fish, sell and buy new fish, breed new fish, sell and buy new decorations, etc. The iPad served as the control panel and was placed in front of the television to allow participants to interact with the game, and every setting remained the same in order to eliminate potential confounding variables. Two posters were put next to it with instructions on how to play the game. (See Figure 7). The following elements and factors were controlled to be the same as Condition 2: type and volume of sound effects, background of the aquarium and type of fish. In all of the conditions (1,2, and 3), the volume of television and the intervention were the same (Figure 8).

Figure 7: The setting of condition 3

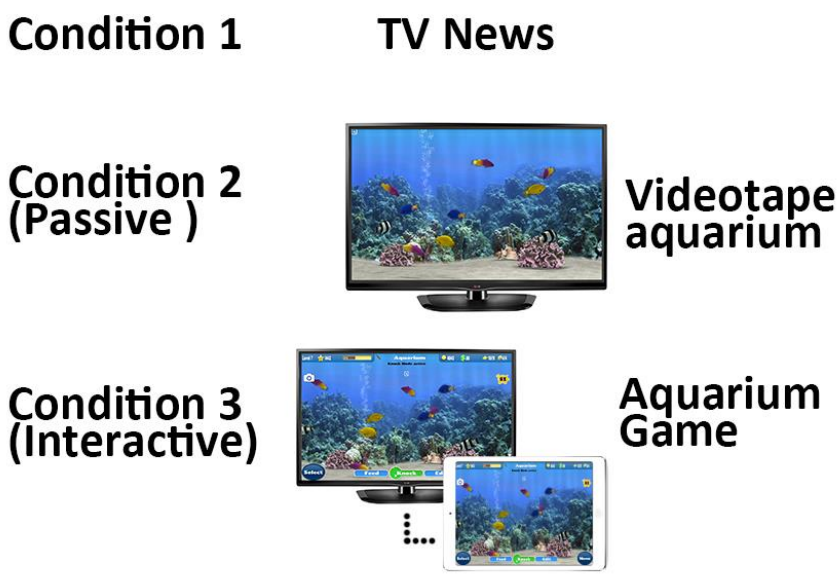

Figure 8: Conditions set up.

2.2 Instruments

2.2.1 Survey

The survey is a 36-item questionnaire designed to assess eight variables: patient actual wait time, patient perceived wait time, perceived quality of care (mainly assessing the physical environment of the waiting room), trust in the clinic, anxiety level, activities while waiting, overall waiting experience, reason for visit, and demographic information (age, gender, ethnicity). An open-ended question about participants' further opinions regarding the space was also included. Patient's actual wait time was recorded and collected by the clinic. The receptionist recorded patient arrival time, and the nurse recorded the patient departure time, which is the time that patients leave the waiting area and enter the consulting room. Patient perceived wait time was assessed by two questions: "How long do you think you were waiting (A. under 5 minutes, B. 5 – 10 minutes, C. 11 – 15 minutes and so on)?" and "Did you feel you waited for (0 – a short time, or 10 – a long time)?"

Perceived quality of care was developed and modified from the Quality of Care Measures (QOC-P) survey developed by Danielson et al. (2008) previously mentioned in the literature review. Ten items about assessment of the interior physical environment were derived from the QOC-P and adjusted to reflect the physical environment of a waiting room. Although this research addressed a primary care clinic, patient level of trust was evaluated using one of the sections of the Healthcare Quality Questionnaire by Lien, Wu, Chen, & Wang (2014b) – Trust of the Hospital. For both perceived quality of care and trust, participants completed the measure by rating their agreement with a statement regarding the waiting room and their waiting experience using a 5-point Likert scale, ranging from strongly agree (1) to strongly disagree (5). The low score indicates a more positive opinion regarding the space and the experience.

Anxiety level was derived and modified from the Generalized Anxiety Disorder 7-item (GAD-7) scale (Spitzer, Kroenke, Williams, & Löwe, 2006). Participants indicated their current

anxiety level by rating a statement using a 4-level scale, ranging from not at all (1), a little bit (2), frequently (3), and all the time (4). Patient's overall waiting experience was assessed by the following question: "Please indicate how you feel about the waiting experience today (0 - relaxing, 10 - anxious/worrying)." The full-version of survey is provided in Appendix A. The Cronbach's α of the adopted survey used in the current study is .899, and the Cronbach's α of the existing instruments is: Quality of Care – Patient Form (QOC – P) =.89.

Although the instrument was developed from two existing scales: Quality of Care Measures (QOC-P) (Danielson et al., 2008), and Healthcare Quality Questionnaire (Lien et al., 2014), the factor analysis of perceived quality of care supports the validity of the scale (see Table 2). Cronbach's alpha coefficient for inter-item reliability of the scales were 0.899. Factor one (Physical environment) is correlated with factor two (trust in the clinic) ($r = 0.559$, $p < 0.0001$). Factor one (Physical environment) is correlated with anxiety level ($r = 0.172$, $p = 0.0009$). Factor two (trust in the clinic) is correlated with anxiety level ($r = 0.177$, $p = 0.0006$). Overall waiting experience is correlated with Factor one (Physical environment) ($r = 0.437$, $p < 0.0001$), Factor two (trust in the clinic) ($r = 0.314$, $p < 0.0001$) and anxiety level ($r = 0.262$, $p < 0.0001$).

Table 2: Factor loading of perceived quality of care

Factors	Factor loading
Factor 1: Physical environment (Mean = 1.94, sd = 0.58)	
1. The environment is soothing.	0.769
2. The waiting room looks welcoming and inviting.	0.746
3. The waiting room smells pleasant to me.	0.720
4. The lighting in the waiting room is pleasant.	0.688
5. The furniture in the waiting room is comfortable.	0.652
6. The waiting room is neat and clean.	0.651
7. The overall environment of the clinic makes me feel safe.	0.633
8. The sound level in the waiting room is comfortable.	0.620
9. The staff are calm and relaxed.	0.593
10. Staff are friendly and welcoming.	0.542
Factor 2: Trust in the clinic (Mean = 1.73, sd = 0.66)	
1. Overall, I fully trust this office.	0.901
2. This office provides the best medical care for me.	0.875
3. I believe the physicians at this clinic offer the best treatment for me.	0.860
4. This office is reliable.	0.842
	Cronbach's α = .899

2.2.2 Behavioral observation

Participant's activities and behavior were observed and recorded using a standardized data sheet. This instrument was developed by adopting and modifying an existing waiting room behavioral observation instrument (Pati & Nanda, 2011). Some items were removed and adjusted to fit our sample population (adult), since the existing instrument was designed for observing children's behavior. The following categories were included: attention, activities, social interaction, wait time, gender, visit alone or with someone, and location of the seat that they chose. Details of the instrument are provided in Appendix B.

Because of limited resources, only one researcher conducted all observations, therefore only a half-hour pilot test was conducted to assess inter-rater reliability. The inter-rater reliability ranged 0.85 -1, mean 0.95 (KAPPA); ranged 0.57 - 1, mean 0.82 (Intraclass Correlation

Coefficient). The researcher observed one participant in the waiting room at a time, on each Monday and Wednesday from 1:30 pm to 5:30 pm, and each Friday from 8:00 am to 12:00 pm during the weeks of the experiment. Researchers recorded patient behavior by recording the frequency and/or duration of items by using the standardized data sheet. Seventy-two-hours of behavioral observation were conducted in this study, however there is no reliable research on regarding the recommended number of hours for an appropriate study. Observation time varies across different studies. For instance, Whitehouse et al. (2001) conducted a two week behavioral observation in order to tested the effect of a new healing garden on patient satisfaction in a children's hospital. Sherman, Varni, Ulrich, & Malcarne (2005) gathered 20 hours of behavioral observation for each of three sites for a total of 60 hours to evaluate the healing gardens surrounding a pediatric cancer center.

2.3 Procedure

The Cornell Institutional Review Board (IRB) approved this study protocol. Data were collected for six weeks in the clinic. Each condition was set up before the clinic opened on the Monday morning prior to the start of the experiment. Every receptionist followed a verbal script asking each patient who would be sitting in the experimental waiting room about their willingness to participate in the study. The script of this inquiry was written by the researcher and released to receptionists before the experiment started. After receiving a patient's agreement, the receptionist recorded the patient's arrival time, then removed it from the experimental package and kept this page in the reception area. The page was collected and returned to the administration office at the end of the day. After that, the receptionist released the experimental package to the patients. This package included a consent form, a poster that explained the study, and a survey.

This was a voluntary study. Participants could decide to complete the survey any time while they were sitting in the waiting room, or drop off the study when leaving. Participants experienced one of three conditions that had been set up for the particular week. After they were called by the nurse, they were led to a consulting room or an exam room. The nurses would then write the time that the patients left the waiting room (departure time). The nurses asked the patients to remain to complete the last four questions on the survey before leaving the waiting room. The final part of survey asked about patient activities while they were waiting, patient perceived wait time, and overall waiting experience. After participants finished their survey, the nurses collected the survey and returned it to the administration office. The researcher picked up the completed surveys and the pages with arrival time from the administration office. Researchers paired up the pages of arrival time with the surveys by using the unique number on each survey to collate arrival time and departure time.

Behavior observation was conducted during the experimental weeks. A poster was displayed in front of the waiting room that explained the study and informed the patients that they might be observed. The observer entered the waiting room and behaved like a patient, sitting in seat A (see Figure 3) to reduce awareness regarding their role as a researcher. The researcher observed every second patient who entered the waiting room. Observations were recorded from the time the patient arrived in the waiting room until they left for the exam room. Only one patient was observed a time. The observer had a 15-minute break in every hour. The noise level of the room was also recorded each half hour by using a digital sound level meter (produced by Radio Shack, Model: 33-2055, reading range from 60 -120 dB) during the behavioral observation period. Noise level was recorded as a control variable.

2.4 Data Analysis

All statistical analyses were performed using JMP Pro 13.0.0 software (SAS Institute Inc.). A value of $p < 0.05$ was considered as statistically significant. For different hypotheses and variables, different statistical tests were used. Table 3 shows the hypotheses and data analysis.

In order to determine patient DBPA, actual wait time was transferred into a categorical variable by applying the same categories as perceived wait time. Actual wait time was measured by minutes as a continuous variable, but perceived wait time, as a categorical variable, was measured by multiple options with 5-minutes intervals. Comparing the actual wait time with perceived wait time, data was generated into three new categories beyond this new variable: P > A (Perceived wait time > Actual wait time), Match (Perceived wait time = Actual wait time), P < A (Perceived wait time < Actual wait time).

Table 3: Hypothesis and data analysis

`	Variables		Types of Statistical Test
	Independent	Dependent	
Hypothesis One: • The actual wait time will influence perceived wait time, perceived quality of care, anxiety level and overall waiting experience.	Actual wait time	• Perceived wait time • Perceived quality of care • Anxiety level • Overall waiting experience	Spearman Correlation test
Hypothesis Two: • Positive distractions will have an effect on perceived wait time, perceived quality of care, anxiety level and overall waiting experience.	Positive distractions	• Perceived wait time • Perceived quality of care • Anxiety level • Overall waiting experience	Wilcoxon/ Kruskal-Wallis Test

`	Variables		Types of Statistical Test
Hypothesis Three: • Perceived wait time will mediate the relation between positive distractions and perceived quality of care, anxiety level and overall waiting experience.	Perceived wait time Positive distraction	• Perceived quality of care • Anxiety level • Overall waiting experience.	Linear regression model
Hypothesis Four: • Positive distraction will moderate the relation between actual wait time and perceived wait time, perceived quality of care, anxiety level and overall waiting experience.	Positive distraction Actual wait time	• Perceived wait time • Perceived quality of care • Anxiety level • Overall waiting experience.	Multiple - linear regression with interaction
Hypothesis Five: • DBPA will influence perceived quality of care, anxiety level, overall waiting experience, and the response of does it feel like you wait for a long time or short time	DBPA	• Perceived quality of care • Anxiety level • Overall waiting experience • Does it feel like you wait for a long time or short time	One-way ANOVA
Hypothesis six: • Interventions will influence DBPA	Intervention	• DBPA	Chi-square

CHAPTER 3: RESULTS

3.1 Survey Results

For actual wait time, the median wait was 12 minutes, the lower quartile was 6 minutes, and the upper quartile 25 minutes. The minimum wait was 1 minutes, maximum 162 minutes. For the perceived wait time: under 5 minutes was 31.33%, 6-10 minutes was 32.7%, 11-15 minutes was 16.1%, 16-20 minutes was 7.63%, 21-25 minutes was 3.54%, 26 -30 minutes was 2.73 %, over 30 minutes was 6%.

DBPA, which assesses the difference between actual wait time (A) and perceived wait time (P) had 367 responses, of which 52.9% of participants thought that perceived wait time was shorter than actual wait time (P < A), 28.6 % of participants thought that perceived wait time was equal to actual wait time (Match), and 18.5% of participants thought the perceived wait time was more than the actual wait time (P>A). In general, people felt that they waited for relatively short time $M = 2$, $SD = 2.16$ (0= a short time, 10 = a long time).

The mean score of quality of physical environment was 1.93 ($SD = 0.57$), and the mean of trust in the clinic was 1.72 ($SD = 0.66$), and both are factors of scale relative to perceived quality of care (rated from 1-strongly agree to 5-stongly disagree). Regarding the activities that participants did while they were waiting: 23.8% read books/magazines, 27.7% used a smart phone/tablet/PC, 8.6% talked with friends/family, 17% watched TV, 5.7% talked with staff, 29.7% did other things (e.g. completing a survey, siting). In Condition 3, only 2.5% of participants interacted with the intervention. 4.9% of people wanted it to play with it but it was not available at the time, because someone else was using it. 38.3% of people didn't want to play with the device, and 54.3% of people did not know about the intervention at all. In general, participants had a relaxing waiting experience ($M = 1.83$, $SD = 2.09$) (0=relaxing, 10= anxious/worrying).

The hypotheses were tested, but only a few had significant effects. Regarding Hypothesis 1, actual wait time had a significant impact on perceived wait time ($p < 0.0001$, X^2=114.76) and overall waiting experience with $p = 0.0004$, $F = 12.98$, df1=1, df2=243 (see Figure 9). Actual wait time was positively correlated to perceived wait time. A longer actual wait time results in a longer perceived wait time, with greater anxiety levels reported in the overall wait experience. However, no significant relationships were found between actual wait time and perceived quality of care or anxiety level.

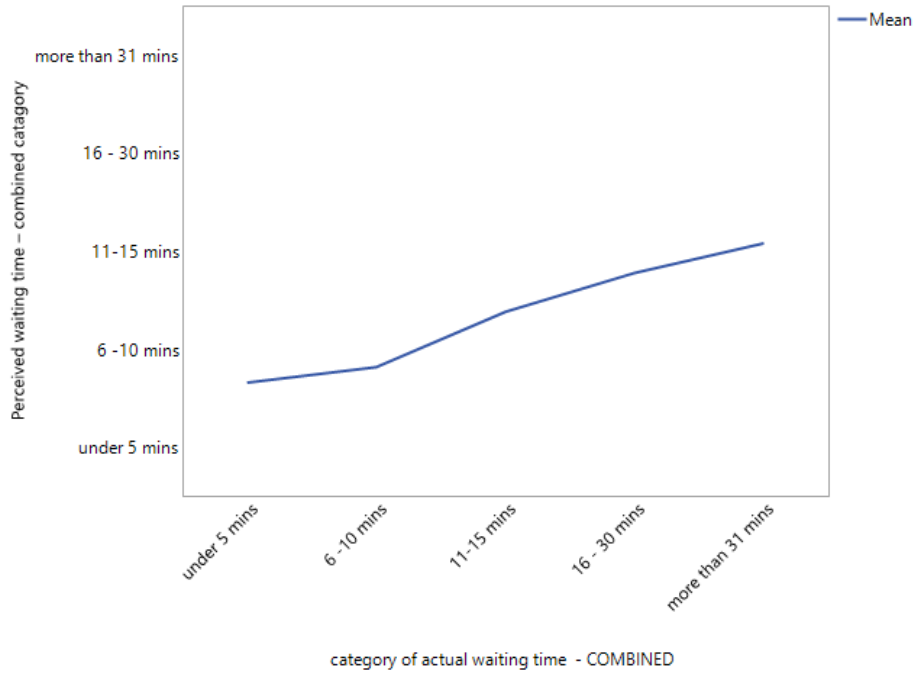

Figure 9: Relation between actual wait time (A) and perceived wait time (P)

For Hypothesis 2, no significant relation was found between conditions and perceived quality of care, anxiety level, and overall waiting experience. For Hypothesis 3, perceived wait time had a significant relationship to trust in the clinic (a part of perceived quality of care) (p = 0.048, $df = 4$, X^2= 9.58). A shorter wait time increases patient trust in the clinic. But no significant relationship was found between perceived wait time and conditions, anxiety level, or

overall waiting experience. Regarding Hypothesis 4, there was an interaction between conditions and actual wait time on physical environment (F = 3.046, df1=2, df2=282, p = 0.047). The impact of actual wait time on the feeling of the physical environment depends upon what condition patients' experienced. There was no interaction between conditions and actual wait time on trust in the clinic, overall waiting experience, and perceived wait time.

In hypothesis five, DBPA had a significant impact on anxiety level (p = 0.006) (see Figure 10). People whose perceived wait time was reported as longer than actual wait time felt more anxious than the those whose perceived wait time was less than actual wait time, as well as those whose perceived wait time was the same as actual wait time. In addition, a significant relationship was found between DBPA and the response to the question: "Does it feel like you've been waiting for a long time or a short time?" (X^2= 30.1, df = 2, p <0.001). Nonparametric comparisons for all pairs were tested. Significant differences were found between P>A and Match (z = 5.48, p < 0.001), between P>A and P<A (z = 3.60, p=0.001), and between Match and P<A (z = -2.88, p = 0.012). However, no significant relationship was found between DBPA and perceived quality of care, or overall waiting experience.

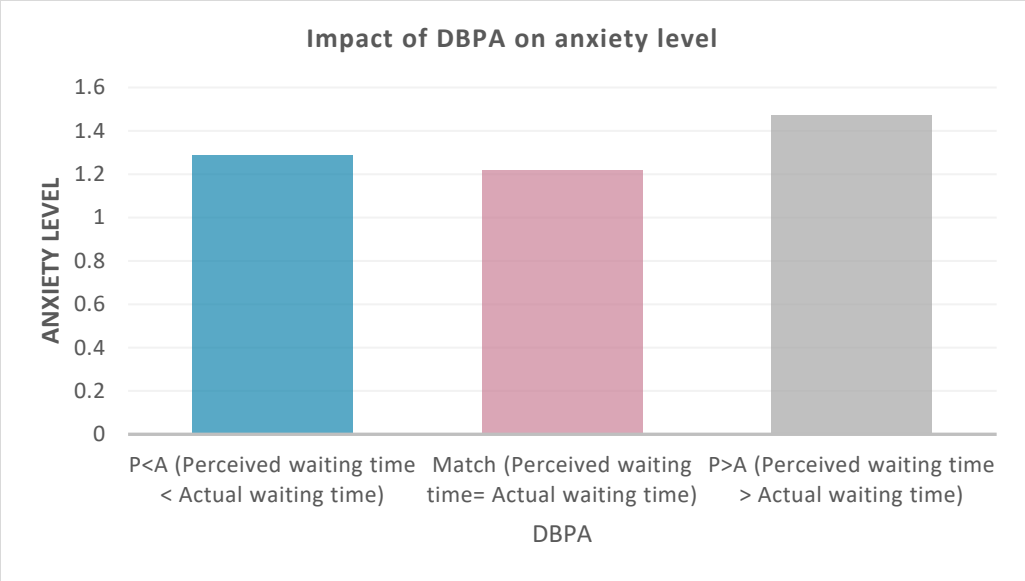

Figure 10: Impact of DBPA on anxiety level

Regarding Hypothesis 6, DBPA was influenced by the intervention, which are fish video and fish game (X^2 = 9.60, p = 0.048) (see Figure 11).

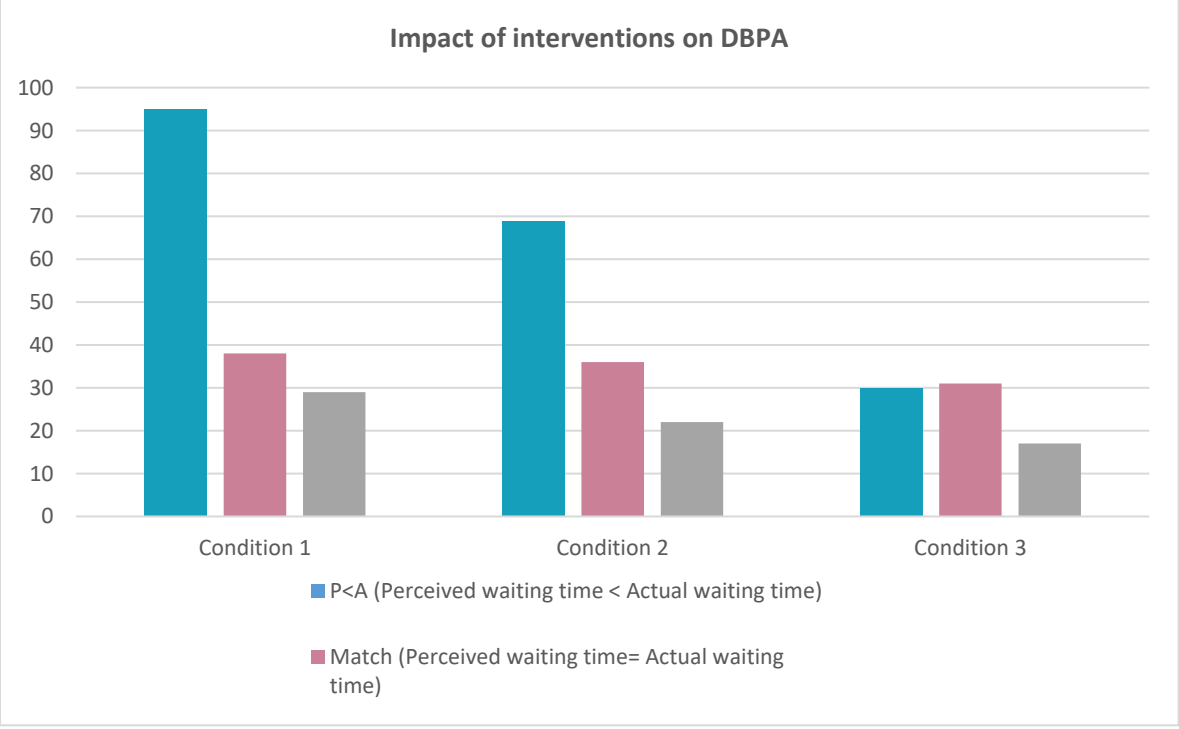

Figure 11: Impact of interventions on DBPA

There was an open-ended question (“Do you have any comments about the space?”) listed at the end of survey. One-hundred and thirty-four participants answered this question. There were 33 comments about the intervention and/or TV news. In groups with interventions (Conditions 2 and 3), nine people said they preferred the intervention over the normal TV news; however, ten people said they preferred TV news over intervention. In Condition 1, nine people reported that they had adverse feelings to the TV news; only two people reported the TV as nice. The major reasons that participants disliked the TV news was that the sound was distracting and noisy, and the news content was sad and made them more stressed. The major reason they disliked the intervention was the bubble sound of the intervention (in Conditions 2, and 3), which they found annoying. However, the noise level of all the conditions were similar, Condition 1 was recorded as having a mean sound lever of 56.67 dB, Condition 2 measured 57.26 dB, and Condition 3 was recorded at 56.98 dB.

Other topics mentioned frequently in the response to this question are summarized in Figure 12. Furniture, layout, colors, privacy and noise were mentioned ten or more times.

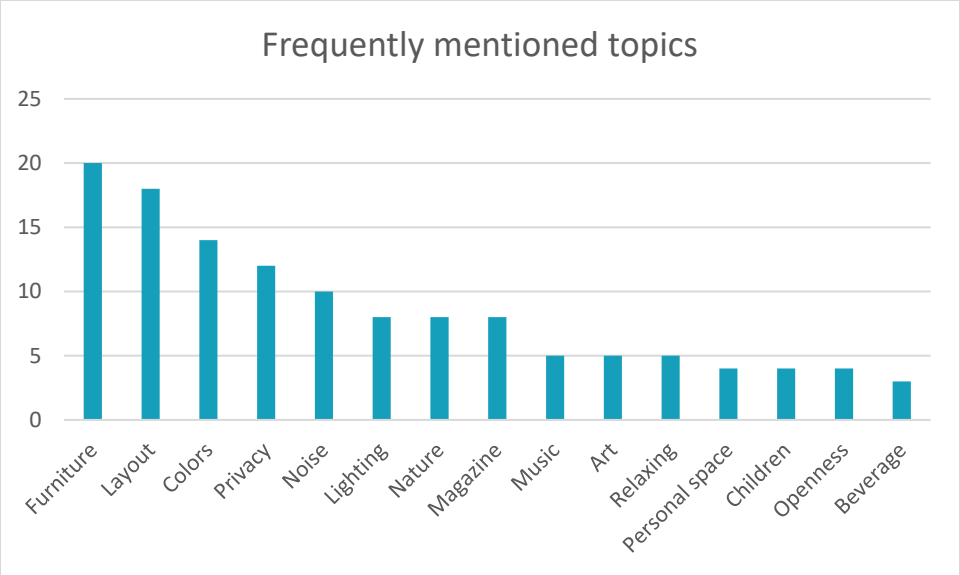

Figure 12: Frequently mentioned topics in the open-ended question

3.2 Result of behavioral observation

A total of 72 hours of behavioral observation was conducted. Two-hundred and eleven people were observed during the data-gathering period: 65.9% of them were female and 34.1% male. Fifty-five percent were accompanied by family or friends. The samples were relatively evenly distributed: 30% from Condition 1, 33.1% from Condition 2, and 36.9% from Condition 3. The median wait time was 9 minutes ranging from 1 to 193 minutes. Most people spent under 7.5 minutes watching the TV or the intervention, 0 – 10 minutes on their digital devices, 0- 5 minutes reading books and magazines, and 1 – 12.5 minutes on social interaction (see Figure 13).

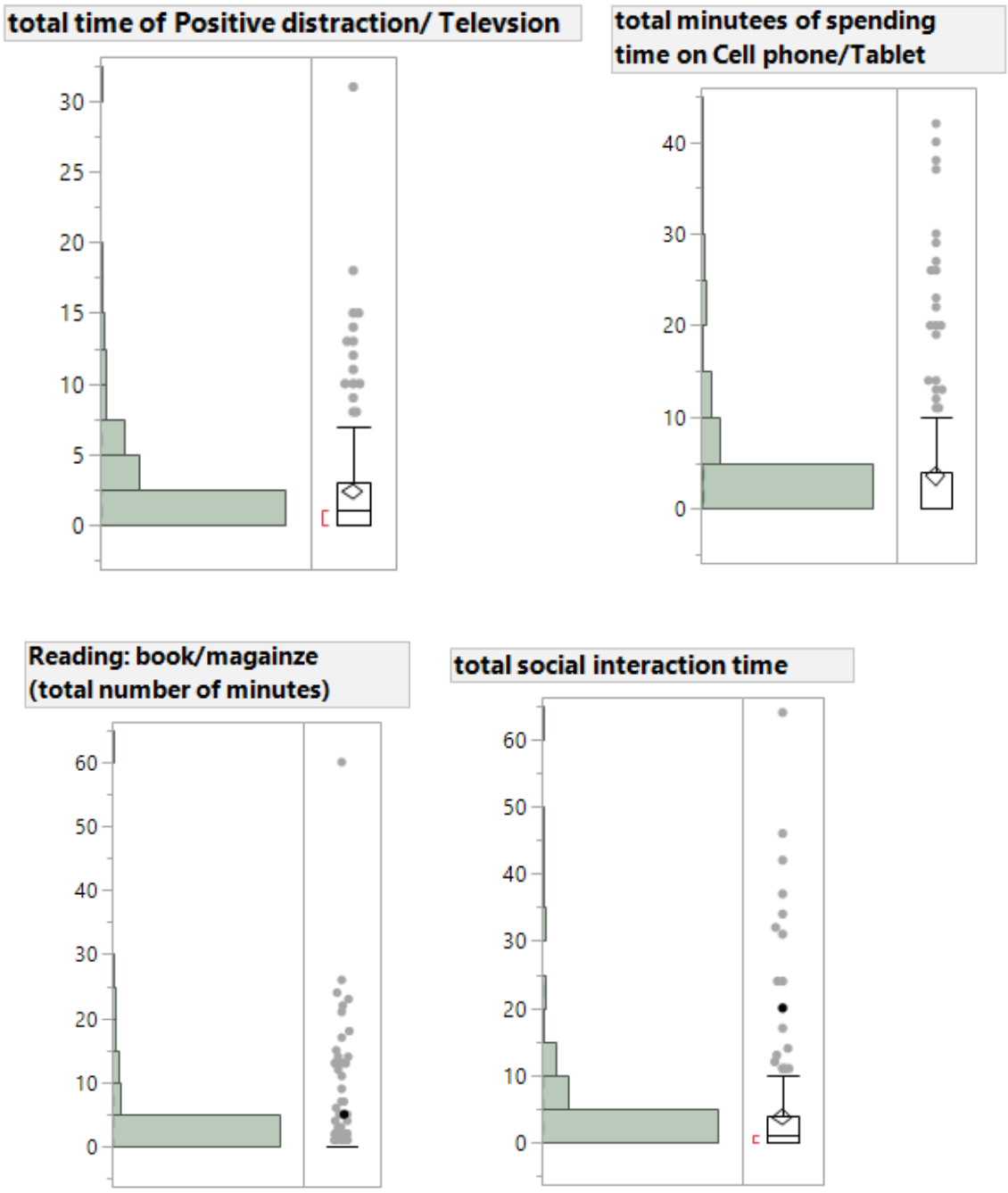

Figure 13: Time spent on various types of activities during waiting

There was a significant relationship between the interventions and time spent watching TV or the intervention ($X^2 = 8.97$, $df = 2$, $p = 0.011$). A nonparametric comparison between all pairs was conducted that showed a significant relationship between Condition 1 and Condition 2

(z = -2.85, p = 0.013). Apart from that, it seems that people were more willing to look at the plants in the clinic in Conditions 2 and 3, although the *p-value* is not significant (p= 0.05) (see Figure 14). There was no significant relationship between interventions and looking at art, reading a magazine, using a digital device, or social interaction. In Condition 3, 62.8 % of patients passively engaged with the intervention (watching the game without interacting with it), 33.3% of patients did not engage with intervention at all, and 3.8% of patients actively engaged with the game. During 97.4% of the observation time, the intervention was available to patients, however, only 5% of patients interacted with it.

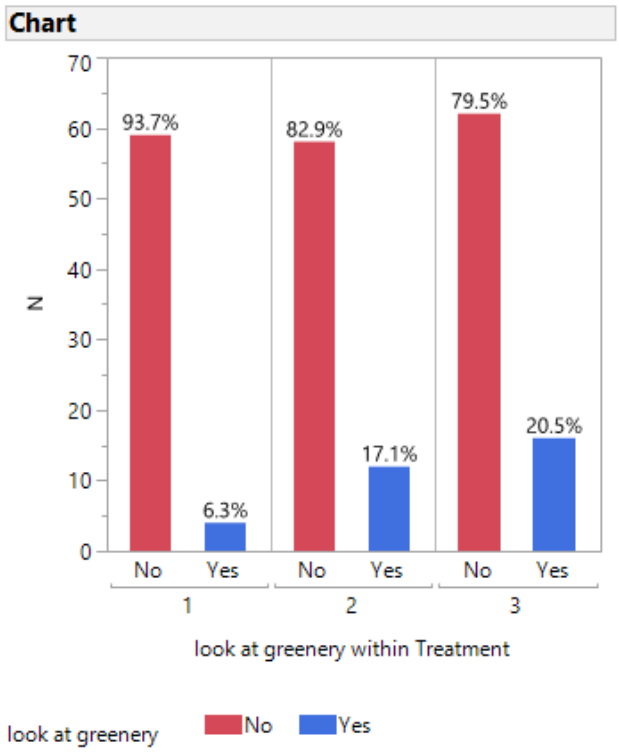

Figure 14: Impact of interventions on looking at plants in the waiting room

CHAPTER 4: DISCUSSION

4.1 Discussion of the results

The TV news and passive fish tank had an impact on DBAP, meaning a larger number of people who experienced Conditions 1 and 2 resulted in a perceived wait time that was less than the actual wait time. This result (see Figure 11) supports Hypothesis 6. But although the distraction interventions used in this study influenced DBAP, this did not manifest as expected. The passive stimulus conditions (television and fish tank) had a greater impact on patient underestimating of perceived wait time (P<A) than the interactive fish tank. However, only a small number of participants interacted with the intervention in the latter case. One explanation for this could be that the interactive stimulus was not appropriate for older adults. One participant said, "I would rather have a news station on the TV -- the game would be more appropriate for a pediatric waiting room." This research added to the results of Thompson et al. (1996), as I found that the intervention in this study influenced DBAP in addition to perceived wait time (how long the patient felt they had waited). There was no significant relation between the interventions and the actual wait time, which contributed to extended the existing literature.

The study did not support Hypothesis 2, as I found no significant relationship between positive distraction and perceived quality of care, anxiety level, or overall waiting experience. However, problems with procedures may have contributed to Type II Error False Negative. In this study, most of the participants started to fill in the survey after arriving in the waiting room, without being sufficiently exposed to the interventions. In other positive distraction studies, the survey/measure started before and/or after the participant had experienced the treatment and not during the treatment. For example, Schneider and Hood (2007) introduced the VR intervention during chemotherapy and Ince and Cevik (2017) introduced a music intervention to nursing students for their first blood draw experience, and both of the studies required participants to answer the survey after the they experienced the intervention.

DBAP had a significant impact on anxiety level. When people underestimated the wait time (P<A) or estimated it correctly (P=A), their stress level was lower than when they overestimated wait time (P>A). This result partly supports Hypothesis 5. This study provides a new perspective to thinking about wait time. Most prior studies focus on the relationship between perceived wait time and patient satisfaction, without considering patient stress or anxiety levels. For example, Holbrook et al. (2016) found that underestimating wait time in an MRI outpatient waiting rooms is correlated with higher patient satisfaction, but stress was not addressed. Thompson et al., (1996) drew the same conclusion in their study, and also did not address the role of stress. It would be meaningful to identify the relation between stress and DBPA, since DBPA is more conceptual and represents a discrepancy between actual and perceived wait time instead of just perceived time.

DBPA also had a significant relationship to the question “Does it feel like you’ve been waiting for a long time or a short time.” The question asks the participant to provide their direct opinion of the length of their wait. The significant relationship between these two items could support the validity of DBPA (a categorical variable created based on existing independent variables).

While actual wait time significantly influences perceived wait time, most participants in this study underestimated their wait time, which supports the results of Holbrook et al. (2016), but runs contrary to the results of Thompson et al. (1996), who suggested that patients were good at estimating wait time. Importantly, actual wait time is related to overall waiting experience, and perceived wait time is related to trust in the clinic. Therefore, the actual time they spend in the waiting room will influence their overall waiting experience. Furthermore, how they perceive their wait time will influence the level of trust and confidence they have in the clinic. Moreover,

there is a correlation between physical environment and trust in the clinic. The results of this study show a stronger correlation than the study conducted by Lien et al. (2014).

The average actual wait times collected from the survey and from the researcher's observations were very similar (survey: median: 12 mins, lower quartile: 6 mins, upper quartile: 25 minutes; behavioral observation: median: 9 mins, lower quartile: 4 mins, upper quartile: 21.25 minutes). However, there were ways in which survey responses and observations were dissimilar. In the survey, 23.8% indicated that they were reading while they were waiting, but observation data indicated that that most participants spent only about 5 minutes reading. Additionally, 27.7% of people said they were using a digital device (smart phone/tablet/PC), but observation data indicated that most people spent 5 -10 minutes on their digital device. Finally, about 17% people said they were watching TV, and observation noted most people spent under 5 minutes on it. While the behavioral observation sample size is much smaller than the survey, it could still provide insight into the fact that when people claim that they were doing something during waiting, the length of time spent on that particular activity may not as long as expected. Previous researchers have also found incongruence between observed and self-reported behavior (e.g., Donaldson & Grant-Vallone (2002); Verhofstadt, Buysse, & Ickes (2007)).This might also suggest that there is an impact on perceived time and activity depending on the intervention – one of the basic hypotheses of this study. This emphasizes the shortcomings of self-reported measurement as well as the benefit of using a multi-method approach in this study.

In the open-ended question at the end of the survey, in the fish tank condition, people held different ideas about the intervention; about half of them thought the setting was relaxing and soothing, but the rest preferred the TV channel over than digital fish tank. Two participants stated that they'd prefer to have a real fish tank instead of a digital one. The major complaint

about the fish tank was the continuous bubbling noise and the fact that it was digital. It was also perceived as incongruous with the environment. One respondent noted that “the aquarium sound effect in waiting room is a little weird coming from the TV screen.”

However, many people in Condition 1 claimed to dislike the TV news because it was stressful, sad, and noisy. A participant noted “Maybe a different TV station other than continuous news network [would be better].” Other statements included: “Eliminate the TV, sound is distracting” “the T.V. is distracting and annoying” “TURN OFF TV!” Some people provided advice about the content of the positive distraction: “I would rather watch travel channel, news and (hard to find good channel -PBS Maybe) cooking - no artificial stuff,” “Recommend something else than TWC NEWS be on the TV. I would suggest streaming videos of national parks of patients could "visit" the park and take in the natural beauty they after while waiting.”

There may be several reasons so many people disliked the TV news, including that it provided too much stimuli, that was an oral presentation, and it kept repeating information. In this case, TV news as a distraction may lead to information overload. Information overload relates to cognitive overload, sensory overload, communication overload, and knowledge overload, and occurs when the supply information is more than a human’s information processing capacity (Eppler & Mengis, 2004). Since humans have limited capacity to process information in a given time period (Halford, Wilson, & Phillips, 1998), an limited attention span (Tennessen & Cimprich, 1995), sick people may be less able to process information. The repetitive stimulation could be a case of information overload, especially for those patients in worse health condition. This also supports the concept behind Lawton’s Environmental Competence-Press Theory, that individuals whose competence is undermined may be

particularly vulnerable to stressful environments (Lawton & Nahemow, 1973). While the digital fish may not provide enough stimuli to some of the healthier patients, it was perceived as a relaxing element for some. The latter may be less healthy patients, with lower information processing capacities, so that they might respond better to something with less stimuli.

It is important to provide a balance to various visitors' needs, as too much stimuli can cause adverse feelings, while too little stimuli may lead to boredom. This is also consistent with Wohlwill's optimization principle (an extension of adaptation level theory), that a positive affect is generated if the stimuli is reaching the adaptation level; however, if the stimuli is increased or decreased beyond the adaptation, the positive affect will decrease and gradually become negative (Wohlwill, 1966). Apart from just the patients, the patient's family and friends sat in the waiting room for long periods of time. Their ability to process information was likely better than the patient's. Considering the fact that people in waiting rooms have various abilities to process information (perhaps related to their health condition), different levels of positive distraction should be provided to accommodate these different needs.

4.2 Limitations of the study

There are some limitations of this study. Due to the geographic location of the conducted experiment, about 50% of the recruited participants were over 60 years old, and about 21% were between 50 to 60. Because older adults may be less familiar and comfortable with technology and digital devices, this may lead to less interaction with interactive conditions (e.g. Condition 3, the aquarium game). Therefore, the results may not accurately reflect the effectiveness of the interactive intervention on wait time and other dependent variables for all populations. In addition, more than 90% of participants were white, therefore, there was a bias in the diversity of

the sample. The results of the experiment may not be generalizable to the broader population, making the external validity of this study weak.

Furthermore, due to the experimenter's endeavor to avoid overly disrupting the general visiting procedure, the survey was released to participants before the waiting experience began. Therefore, patients could start answering the survey without being exposed to the interventions for a sufficient time, although there were four questions that they were required to answer after leaving the waiting room. Ideally, a patient should answer the whole survey after finishing the waiting experience, but sitting in the waiting room was likely the only free time that they had to fill-in the survey without disrupting the rest of their visit. Moreover, completing the survey also served as a distraction.

Some of the completed surveys were not included in the data analysis, because the nurse neglected to write down the departure times. Because the study is attempting to examine the impact of wait time, the study could not include those data. This may have had some influence on the results, as 30.4% of surveys were eliminated due to incomplete data departure time data. As I did not gather data regarding nurse behavior it is unclear whether specific circumstances impacted their completing the survey. Furthermore, most of the participants had visited the clinic before and had the opportunity to compare the interventions (Conditions 2 and 3) to the control condition, although this was a between-subjects study and the participants were not supposed to know other conditions. Also, because of a limited budget, only one iPad could be set up in the front. Lack of access may have decreased people's opportunity to interact with the instrument. Additionally, people may feel uncomfortable when playing while being observed by others.

For the behavioral observation, the researcher gathered data at particular times and days, and other times and days could not be covered. This may contribute to selection bias, since the time sampling was not able to equally distribute across the entire period of the experiment.

Another limitation was that some participants were aware of the researcher, despite it being a naturalistic observation. The presence of the researcher may have influenced participants' behavior during the experiment, thereby impacting reliability.

4.3 Future studies

There are a few things could be done in future studies to expand this research. Firstly, researchers should test participants' anxiety levels before they start to wait in the clinic waiting room. Secondly, the opportunity should be provided to release the survey after they finish their waiting experience, but before they start diagnosis or treatment. Finally, multiple devices could be implemented so patients can easily access the interactive stimulus.

While introducing positive distraction (passively displaying art work, natural scenes) via TV has been examined in waiting rooms in children's hospitals before (Pati & Nanda, 2011), this study examined the effects of positive distraction by displaying a digital aquarium through a television monitor to older people. In future studies, an experiment could be designed to examine the impact of this kind of positive distraction on different age groups, such as adolescents (age 10 to 19), young adults (19 -25), and adults (25-50). Also, the content of display could be changed. Prior studies have run experiments showing a video slideshow of nature photographs, ambient art, and a natural aquarium (e.g., Pati & Nanda, 2011).

Another recommendation would be to play a continuous natural scene (such as walking through a forest or park), since some people commented in the survey that they wanted to see the

travel channel or shows that could help them relax and were not too monotonous. This study was limited to the effect of the continuous random motion of fishes swimming around a digital fish tank.

Because few participants actively interacted with the intervention, the interactive stimulus was not able to be adequately tested. Recently, Newark airport has implemented a tablet in some dining and waiting areas. It would be interesting to do a waiting experience experiment in that airport to see whether digital interactive devices have an impact on people's waiting experience, perceived wait time, and anxiety level.

Additionally, traditional interactive games (such as puzzles, board games, etc.) might be studied, because interactive distraction has been tested by implementing VR during undressing and treatment processes (i.e. chemotherapy); the results showing a positive impact on perceived treatment time, distress, and anxiety (Hua et al., 2015; Schneider & Hood, 2007; Schneider & Workman, 2000; Wiederhold et al., 2014). Because the intervention in the waiting room should benefit all patients in the room, it would be problematic to set up VR headsets in outpatient waiting rooms, because those gaming headsets can only be used by one person at a time. In addition, waiting and treatment are two different situations. Treatment is a more individual and private event that occurs in a more private space, while waiting occurs in open and public space. Gaming headsets may not be suitable to apply in the waiting room, however, other interactive elements, both traditional and digital, could be tested to find the best intervention in the waiting room.

Finally, the impact of DBAP on anxiety level could be in different healthcare settings (outpatient waiting room, MRI waiting room, radiological waiting room, ED waiting room, pediatric waiting room and etc.). Situation may significantly influence DBAP. Patients in ED

waiting rooms may perceive they are waiting longer than those in general outpatient waiting rooms. In addition, people who wait in different waiting rooms may have different levels of anxiety. Thus, future research is needed explore this relation more.

CHAPTER 5: CONCLUSION

5.1 Design guidelines

Based on the results of this study, the following design recommendations for clinic waiting rooms are suggested.

1. Positive distractions:
    a. Provide indoor plants that allow patient access to some natural elements. Justification from this research study: Greenery and indoor plants in the waiting room received very positive feedback from the patients participating in this study, and it was one of the frequently mentioned elements within the survey (see Figure 12).

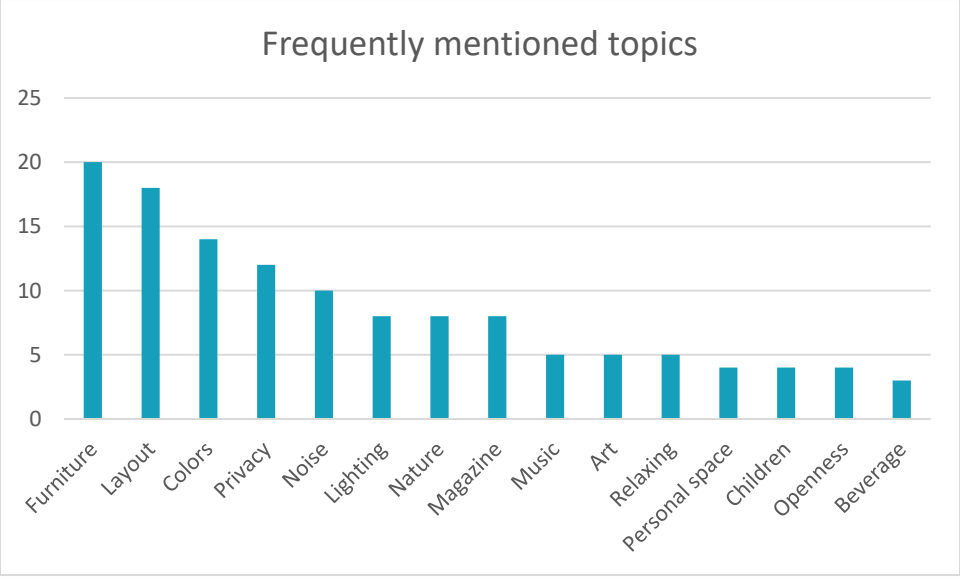

Figure 12: Frequently mentioned topics in the open-ended question

b. Instead of playing TV news, provide travel programs or video of walks through national parks and other places with calming natural scenery.

   Justification from this literature review: Thompson et al. (1996) suggested that watching TV may help to reduce perceived wait time. Pati & Nanda (2011) also suggested that playing natural scenery and images of art on TV could help to reduce children's anxiety. In the current study, about 80% of the comments reported that they disliked the TV news, finding it to be stressful, sad and noisy. Travel programs and nice walks through nature were frequently suggested by patients. This is consistent with the literature review chapter: elements that simulate nature (including VR, visual art, etc.) are more likely to help create a relaxing atmosphere.

c. Play gentle music and avoid orally-presented broadcasting on the TV.

   Justification from this study and the literature review: one reason participants disliked the TV was that the orally-presented information led to information overload. Information overload relates to cognitive overload, sensory overload, communication overload, and knowledge overload, and occurs when the supply information becomes greater than a human's information processing capacity (Eppler & Mengis, 2004). In this case, patients may have become more frustrated and stressed. Playing soft music was suggested by participants to improve the waiting experience.

2. Interior settings:

a. Provide more comfortable chairs, such as chairs with thicker cushions, or couches.

   Justification from this study: furniture (mainly providing more comfortable chairs), was the issue most raised by the participants (see Figure 12). This was their primary concern while they were waiting.

b. Avoid placing the reception/staff desk right next to seating area. If this cannot be avoided, install partitions to provide privacy to patients.

   Justification from this study: the second most frequently mentioned issue was the noise generated by staff desk next to the waiting area. Patients complained a lot about this layout, due to issues of both privacy and noise.

c. Apply colors with gentle tones on walls and floors to make the environment more attractive and less institutional.

   Justification from this study: color was the third most frequently mentioned design feature in this study (see Figure 12). Most of the patients reported that they preferred a warm and colorful space, and that the color of the current space was too institutional and dull.

Based on the behavioral observation as well as my experience, I suggested providing a variety of different positive distractions for patients (such as various reading materials, board games, Sudoku, and so on), so that patients could switch from one activity to another. This would provide patients with a greater sense of control over their activities. When stimuli exceed a patient's capacity for processing information, it may cause adverse feelings, however, too little stimuli may lead to boredom.

5.2 Closing

The outpatient waiting experience has been generally overlooked in research, especially the wait time, despite the fact that wait time has a significant impact on patient satisfaction (Holbrook et al., 2016; Thompson et al., 1996), and anxiety level. At present, there are numerous interventions that could reduce patient perception of wait time, without reducing actual wait time. Testing these interventions would benefit a hospital or clinic by increasing patient satisfaction without major organizational, labor, and management change. Further insight into the variables that influence the waiting experience would be meaningful. This study fills a current literature gap by testing and comparing passive and interactive distraction, through TV news and digital displays that simulate nature.

REFERENCE

Arneill, A. B., & Devlin, A. S. (2002). Perceived quality of care: the influence of the waiting room environment. *Journal of Environmental Psychology*, *22*(4), 345–360. https://doi.org/10.1006/jevp.2002.0274

Aydin, D., & Sahiner, N. C. (2017). Effects of music therapy and distraction cards on pain relief during phlebotomy in children. *Applied Nursing Research*, *33*, 164–168. https://doi.org/10.1016/j.apnr.2016.11.011

Baños, R. M., Espinoza, M., García-Palacios, A., Cervera, J. M., Esquerdo, G., Barrajón, E., & Botella, C. (2013). A positive psychological intervention using virtual reality for patients with advanced cancer in a hospital setting: a pilot study to assess feasibility. *Supportive Care in Cancer*, *21*(1), 263–270.

Bleustein, C., Rothschild, D. B., Valen, A., Valatis, E., Schweitzer, L., & Jones, R. (2014). Wait times, patient satisfaction scores, and the perception of care. *The American Journal of Managed Care*, *20*(5), 393–400.

Cooper, L., & Foster, I. (2008). The use of music to aid patients' relaxation in a radiotherapy waiting room. *Radiography*, *14*(3), 184–188.

Danielson, C. K., Borckardt, J. J., Grubaugh, A. L., Pelic, C. G., Hardesty, S. J., & Frueh, B. C. (2008a). Quantifying staff and patient perceptions of quality of care improvement in the psychiatric inpatient setting: Preliminary psychometrics of a new measure. *Psychological Services*, *5*(1), 1.

Danielson, C. K., Borckardt, J. J., Grubaugh, A. L., Pelic, C. G., Hardesty, S. J., & Frueh, B. C. (2008b). Quantifying staff and patient perceptions of quality of care improvement in the psychiatric inpatient setting: Preliminary psychometrics of a new measure. *Psychological Services*, *5*(1), 1.

Dexter, F., & Epstein, R. H. (2001). Reducing family members' anxiety while waiting on the day of surgery: systematic review of studies and implications of HIPAA health information privacy rules. *Journal of Clinical Anesthesia*, *13*(7), 478–481. https://doi.org/10.1016/S0952-8180(01)00322-1

Diette, G. B., Lechtzin, N., Haponik, E., Devrotes, A., & Rubin, H. R. (2003). Distraction Therapy With Nature Sights and Sounds Reduces Pain During Flexible Bronchoscopya: A Complementary Approach to Routine Analgesia. *Chest*, *123*(3), 941–948. https://doi.org/10.1378/chest.123.3.941

Donaldson, S. I., & Grant-Vallone, E. J. (2002). Understanding Self-Report Bias in Organizational Behavior Research. *Journal of Business and Psychology*, *17*(2), 245–260. https://doi.org/10.1023/A:1019637632584

Durrande-Moreau, A. (1999). Waiting for service: ten years of empirical research. *International Journal of Service Industry Management*, *10*(2), 171–194.

Durrande-Moreau, A., & Usunier, J.-C. (1999). Time Styles and the Waiting Experience An Exploratory Study. *Journal of Service Research*, *2*(2), 173–186.

Eisen, S. L., Ulrich, R. S., Shepley, M. M., Varni, J. W., & Sherman, S. (2008). The stress-reducing effects of art in pediatric health care: art preferences of healthy children and hospitalized children. *Journal of Child Health Care*, *12*(3), 173–190. https://doi.org/10.1177/1367493508092507

Eppler, M. J., & Mengis, J. (2004). The Concept of Information Overload: A Review of Literature from Organization Science, Accounting, Marketing, MIS, and Related Disciplines. *The Information Society*, *20*(5), 325–344. https://doi.org/10.1080/01972240490507974

Gasparini, G. (1995). On waiting. *Time & Society*, *4*(1), 29–45.

Hadjistavropoulos, T., & Craig, K. D. (2002). A theoretical framework for understanding self-report and observational measures of pain: a communications model. *Behaviour Research and Therapy*, *40*(5), 551–570.

Halford, G. S., Wilson, W. H., & Phillips, S. (1998). Processing capacity defined by relational complexity: Implications for comparative, developmental, and cognitive psychology. *Behavioral and Brain Sciences*, *21*(6), 803–831.

Handen, B. L., McAuliffe, S., Janosky, J., Feldman, H., & Breaux, A. M. (1998). A playroom observation procedure to assess children with mental retardation and ADHD. *Journal of Abnormal Child Psychology*, *26*(4), 269–277.

Hanser, S. B., & Mandel, S. E. (2005). The effects of music therapy in cardiac healthcare. *Cardiology in Review*, *13*(1), 18–23.

Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., & Gärling, T. (2003). Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology*, *23*(2), 109–123. https://doi.org/10.1016/S0272-4944(02)00109-3

Hathorn, K., & Nanda, U. (2008). *A guide to evidence-based art*. Concord. CA: Center for Health Design. Retrieved from http://artshealthnetwork.ca/ahnc/guide_to_evidenced_based_art_.pdf

Herzog, T. R., Black, A. M., Fountaine, K. A., & Knotts, D. J. (1997). REFLECTION AND ATTENTIONAL RECOVERY AS DISTINCTIVE BENEFITS OF RESTORATIVE ENVIRONMENTS. *Journal of Environmental Psychology*, *17*(2), 165–170. https://doi.org/10.1006/jevp.1997.0051

Holbrook, A., Glenn Jr., H., Mahmood, R., Cai, Q., Kang, J., & Duszak Jr., R. (2016). Shorter Perceived Outpatient MRI Wait Times Associated With Higher Patient Satisfaction. *Journal of the American College of Radiology*, *13*(5), 505–509. https://doi.org/10.1016/j.jacr.2015.11.008

Holm, M. S., Fålun, N., Gjengedal, E., & Norekvål, T. M. (2012). Music during after-death care: a focus group study. *Nursing in Critical Care*, *17*(6), 302–308. https://doi.org/10.1111/j.1478-5153.2012.00525.x

Hsu, K.-C., Chen, L. F., & Hsiep, P. H. (2016). Effect of music intervention on burn patients' pain and anxiety during dressing changes. *Burns*, *42*(8), 1789–1796. https://doi.org/10.1016/j.burns.2016.05.006

Hua, Y., Qiu, R., Yao, W., Zhang, Q., & Chen, X. (2015). The effect of virtual reality distraction on pain relief during dressing changes in children with chronic wounds on lower limbs. *Pain Management Nursing*, *16*(5), 685–691.

Ince, S., & Çevik, K. (2017). The effect of music listening on the anxiety of nursing students during their first blood draw experience. *Nurse Education Today*, *52*, 10–14. https://doi.org/10.1016/j.nedt.2017.02.009

Iyendo, T. O. (2016). Exploring the effect of sound and music on health in hospital settings: A narrative review. *International Journal of Nursing Studies*, *63*, 82–100. https://doi.org/10.1016/j.ijnurstu.2016.08.008

Jiang, Y., & Chun, M. M. (2001). Selective attention modulates implicit learning. *The Quarterly Journal of Experimental Psychology: Section A*, *54*(4), 1105–1124.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*(3), 169–182. https://doi.org/10.1016/0272-4944(95)90001-2

Kaplan, S., Bardwell, L. V., & Slakter, D. B. (1993). The Museum as a Restorative Environment. *Environment and Behavior*, *25*(6), 725–742. https://doi.org/10.1177/0013916593256004

Katcher, A., Segal, H., & Beck, A. (1984). Comparison of contemplation and hypnosis for the reduction of anxiety and discomfort during dental surgery. *American Journal of Clinical Hypnosis*, *27*(1), 14–21.

Kearney, A. R., & Winterbottom, D. (2006). Nearby nature and long-term care facility residents: Benefits and design recommendations. *Journal of Housing for the Elderly*, *19*(3–4), 7–28.

Kerlinger, F. N., & Lee, H. B. (1999). Foundations of behavioral research. Retrieved from http://www.citeulike.org/group/328/article/404473

Lawton, M. P., & Nahemow, L. (1973). Ecology and the aging process. Retrieved from http://psycnet.apa.org/psycinfo/2004-15428-020

Lee, D. W. H., Chan, A. C. W., Wong, S. K. H., Fung, T. M. K., Li, A. C. N., Chan, S. K. C., … Chung, S. C. S. (2004). Can visual distraction decrease the dose of patient-controlled sedation required during colonoscopy? A prospective randomized controlled trial. *Endoscopy*, *36*(03), 197–201.

Lien, C., Wu, J.-J., Chen, Y.-H., & Wang, C.-J. (2014a). Trust transfer and the effect of service quality on trust in the healthcare industry. *Managing Service Quality*, *24*(4), 399–416.

Lien, C., Wu, J.-J., Chen, Y.-H., & Wang, C.-J. (2014b). Trust transfer and the effect of service quality on trust in the healthcare industry. *Managing Service Quality*, *24*(4), 399–416.

Miller, A. C., Hickman, L. C., & Lemasters, G. K. (1992). A distraction technique for control of burn pain. *Journal of Burn Care & Research*, *13*(5), 576–580.

Mishra, G. S., Mokhtarian, P. L., & Widaman, K. F. (2015). An empirical investigation of attitudes toward waiting on the part of Northern California commuters. *Travel Behaviour and Society*, *2*(2), 78–87. https://doi.org/10.1016/j.tbs.2014.09.002

Nanda, U., Chanaud, C., Nelson, M., Zhu, X., Bajema, R., & Jansen, B. H. (2012). Impact of visual art on patient behavior in the emergency department waiting room. *The Journal of Emergency Medicine*, *43*(1), 172–181.

Nanda, U., Hathorn, K., & Newmann, T. (2007). The art-cart program at St. Luke's Episcopal hospital, Houston. *Healthcare Design*, *7*(7), 10–12.

Pati, D., & Nanda, U. (2011). Influence of positive distractions on children in two clinic waiting areas. *HERD: Health Environments Research & Design Journal*, *4*(3), 124–140.

Posner, M. I., & Snyder, C. R. R. (1975). Facilitation and inhibition in the processing of signals. *Attention and Performance V*, 669–682.

Roberts, M. A. (1990). A behavioral observation method for differentiating hyperactive and aggressive boys. *Journal of Abnormal Child Psychology*, *18*(2), 131–142.

Roberts, M. A., Ray, R. S., & Roberts, R. J. (1984). A playroom observational procedure for assessing hyperactive boys. *Journal of Pediatric Psychology*, *9*(2), 177–191.

Schneider, S. M., & Hood, L. E. (2007). Virtual reality: a distraction intervention for chemotherapy. In *Oncology nursing forum* (Vol. 34, p. 39). NIH Public Access. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/pmc2121303/

Schneider, S. M., & Workman, M. L. (2000). Virtual reality as a distraction intervention for older children receiving chemotherapy. *Pediatric Nursing*, *26*(6), 593.

Shepley, M. M. (2006). The role of positive distraction in neonatal intensive care unit settings. *Journal of Perinatology*, *26*, S34–S37.

Sherman, S. A., Varni, J. W., Ulrich, R. S., & Malcarne, V. L. (2005). Post-occupancy evaluation of healing gardens in a pediatric cancer center. *Landscape and Urban Planning*, *73*(2), 167–183.

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of Internal Medicine*, *166*(10), 1092–1097.

Tang, H.-Y. (Jean), & Vezeau, T. (2010). The Use of Music Intervention in Healthcare Research: A Narrative Review of the Literature. *Journal of Nursing Research*, *18*(3), 174–190. https://doi.org/10.1097/JNR.0b013e3181efe1b1

Tennessen, C. M., & Cimprich, B. (1995). Views to nature: Effects on attention. *Journal of Environmental Psychology*, *15*(1), 77–85. https://doi.org/10.1016/0272-4944(95)90016-0

Thompson, D. A., Yarnold, P. R., Williams, D. R., & Adams, S. L. (1996). Effects of Actual Waiting Time, Perceived Waiting Time, Information Delivery, and Expressive Quality on Patient Satisfaction in

the Emergency Department. *Annals of Emergency Medicine*, *28*(6), 657–665. https://doi.org/10.1016/S0196-0644(96)70090-2

Thu, H. S. (2015). Waiting Room Anxiety. *Journal of Radiology Nursing*, *2*(34), 114.

Ulrich, R. (1984). View through a window may influence recovery. *Science*, *224*(4647), 224–225.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, *11*(3), 201–230.

Ulrich, R. S., Zimring, C., Zhu, X., DuBose, J., Seo, H.-B., Choi, Y.-S., … Joseph, A. (2008). A review of the research literature on evidence-based healthcare design. *HERD: Health Environments Research & Design Journal*, *1*(3), 61–125.

Verhofstadt, L. L., Buysse, A., & Ickes, W. (2007). Social Support in Couples: An Examination of Gender Differences Using Self-report and Observational Methods. *Sex Roles; New York*, *57*(3–4), 267–282. https://doi.org/http://dx.doi.org/10.1007/s11199-007-9257-6

Whitehouse, S., Varni, J. W., Seid, M., Cooper-Marcus, C., Ensberg, M. J., Jacobs, J. R., & Mehlenbeck, R. S. (2001). Evaluating a children's hospital garden environment: Utilization and consumer satisfaction. *Journal of Environmental Psychology*, *21*(3), 301–314.

Wiederhold, B. K., Gao, K., Sulea, C., & Wiederhold, M. D. (2014). Virtual reality as a distraction technique in chronic pain patients. *Cyberpsychology, Behavior, and Social Networking*, *17*(6), 346–352.

Wohlwill, J. F. (1966). The physical environment: A problem for a psychology of stimulation. *Journal of Social Issues*, *22*(4), 29–38.

APPENDIX A: SURVEY

Demographic and basic info
1. What is your age?   **A. <17 B.18-20 C.21-30 D. 31-40 E.41-50 F.51-60 G.61-70 F. >70**
2. What is your gender?   **A. Male B. Female**
3. What is your ethnicity?
4. Why are you visiting the clinic today?   **A. Something specific (cold, fever, cough…) B. Return visit C. Routine Check D. Don't feel quite well (not too serious) E. Don't feel well (might be serious) F. Don't feel well (quite serious) G. Prefer not to disclose h) Other**
5. Are you visiting by yourself? A. Yes B. No, family member(s) or friend(s) accompany with me
6. When were you last seen in this office?
Perceived quality of care – physical environment
Please indicate to what extent you agree or disagree with the following statements, according to your experience in this waiting room. strongly agree -1 agree -2 neutral-3 disagree-4 strongly disagree-5
1. The sound level in the waiting room is comfortable.
2. The waiting room is neat and clean.
3. The furniture in the waiting room is comfortable.
4. Staff are friendly and welcoming.
5. The environment is soothing.
6. The staff are calm and relaxed.
7. The waiting room smells pleasant to me.
8. The lighting in the waiting room is pleasant.
9. The waiting room feels crowded.
10. The waiting room looks welcoming and inviting to patients
Perceived quality of care – Trust in the clinic
Please indicate to what extent you agree or disagree with the following statements, according to your experience in this waiting room. strongly agree -1, agree -2, neutral-3, disagree-4, strongly disagree-5
1. The overall environment of the clinic makes me feel safe
2. I believe the physicians at this clinic offer the best treatment for me
3. This office provides the best medical care for me
4. This office is reliable
Anxiety level
Please indicate how you feel about the *waiting experience* today?   **not at all-1, a little bit-2, frequently-3, and all the time-4.**
1. Nervous, anxious, or on edge at present
2. Not being able to stop or control worrying

3. Worrying too much about different things
4. Have trouble relaxing
5. Being so restless that it is hard to sit still
6. Becoming easily annoyed or irritable
7. Feeling afraid as if something awful might happen
Activity during waiting
1. What did you do while you were waiting? (Choose all that apply) **A. read books/magazines B. used smart phone/tablet/PC C. talked with friend/family D. watched TV F. talked with staff G. walked around H. Playing fish game I. other, please explain**
2. Did you play with the fish game? **A. Yes, I did. B. No, I did not, and I did not want to play it.** **C. No, I did not, but I would love to play it, if it is available. D. No, I did not, since I don't know about the game.**
Perceived wait time
1. How many minutes do you think you were in the waiting room? **A. Under 5 mins B. 6-10 mins C. 11-15 mins D. 16-20 mins E. 21-25 mins F. 26-30 mins G. 31-35 mins H. 36-40 mins I. 41-45 mins J. 46-50 mins K. 51-55 mins L. 56-60 mins M. More than one hour**
2. Does it feel like you waited…. 0 – a very short time 10 – a very long time
Overall waiting experience
1. Please indicate how you feel about the waiting experience today? 0 – relaxing 10 - Anxious/worrying

Existing instrument:

Quality of Care Measures (QOC-P)

Source:

Danielson, Carla Kmett, Borckardt, Jeffrey J., Grubaugh, Anouk L., Pelic, Christopher G., Hardesty, Susan J., and Frueh, B. Christopher (2008). Quantifying staff and patient perceptions of quality of care improvement in the psychiatric inpatient setting: Preliminary psychometrics of a new measure. Psychological Services, Vol 5(1), 1-10. doi: 10.1037/1541-1559.5.1.1

Items:

1. The sound level in the unit is pleasant.
2. The hospital is neat and clean.
3. The furniture in the unit is comfortable.
4. The staff are friendly and welcoming.
5. The hospital environment is healing.
6. There is a place I can go if I want peace and quiet.
7. The staff are available when I need them.
8. The staff are calm and relaxed.
9. The unit smells pleasant to me.
10. The staff review the benefit and risks associated with the treatments they recommend for me.
11. The unit feels crowded.
12. The staff seem over-controlling at times.
13. The staff in the unit seem to overreact to issues.
14. The lighting on the unit is pleasant.
15. The staff seem to understand me and my condition well.
16. There are activities on the unit that seem inviting to me or that welcome my involvement.
17. The staff in the unit praise me when I am doing well.
18. The staff ask me my opinions about the treatments they recommend.
19. My opinions about the treatments I am receiving are respected.
20. I feel like I could refuse a recommended treatment if I don't agree with it.
21. The staff have involved my family, friends, or caretakers in my treatment (if I wanted them to).
22. The temperature in the unit is comfortable.
23. I feel safe in the hospital.

Trust in the hospital

Source:

Lien, Che-hui, Wu, Jyh-Jeng, Chen, Ying-Hueih, and Wang, Chang-Jhan. (2014). Trust transfer and the effect of service quality on trust in the healthcare industry. Managing Service Quality, Vol 24(4), 399-416. doi:10.1108/MSQ-11-2013-0255

Items:

1. I believe the physicians of this hospital offer the best treatment for me
2. This hospital provides the best medical care for me
3. This hospital is reliable
4. Overall, I fully trust this hospital

APPENDIX B: BEHAVIORAL OBSERVATION

Observation Category	Observation Terms	Operational Definition
Attention	Attention (in general; specific items	**Eye fixation on any object/person. Objects can include books, digital devices, artwork, greenery, etc.**
	Positive distraction / Television (depend on the condition)	**Number of time and duration of watching the flat-screen TV in the waiting room on which the digital**
	Other artworks	**Whether participant look at any other artwork in the waiting room, e.g., paintings, photographic, at any**
	Greenery	**Whether participant look at any plants/vegetation in the waiting room**
	People	**Number of time looking at any person in the waiting room**
Activity	Playing with the intervention (Condition 3)	**Number of time and duration of playing with the aquarium game by interacting with the IPad (Condition 3)**
	Observing other person playing with the intervention (Condition 3)	**Number of time and duration of standing nearby the intervention, and watching the screen and another person without participate to the game**
	Using/playing with his/her cell phone or other digital device (tablet, laptop)	**Number of time and duration of using/playing with his/her phone or other digital device in the room**
	Reading	**Reading a paper book/ magazine or digital book (such as kindle)**
	Others	**Other activities apart from using phone/digital device and reading**

Amount of interaction between patient and their family/friend(s), staff, other patients	Amount of interactions between the patient and their family/friend(s), staff, other patients	**Number of times and duration that the following incidents have occurred. Talking to family/friend(s), staff, other patients, watching same thing together (watching TV together, watching phone together, reading together)**
Waiting time	Waiting time	**Duration that participant stay in the waiting room**

APPENDIX C: VARIABLES and ITEMS

Variables	Items
1. Intervention	Condition 1: control group Condition 2: fish video Condition 3: fish interactive game
2. actual waiting time	Departure time - Arriving time
3. perceive waiting time	how many minutes do you think you were in the waiting room
4. DBPA (new variable that not included in the survey)	Perceive waiting time > Actual waiting time: P>A Perceive waiting time < Actual waiting time: P<A, Perceive waiting time = Actual waiting time: Match
5. Perceived quality of care Factor 1- physical environment	1. The sound level in the waiting room is comfortable. 2. The waiting room is neat and clean. 3. The furniture in the waiting room is comfortable. 4. Staff are friendly and welcoming. 5. The environment is soothing. 6. The staff are calm and relaxed. 7. The waiting room smells pleasant to me. 8. The lighting in the waiting room is pleasant. 9. The waiting room looks welcoming and inviting to patients 10. The overall environment of the clinic makes me feel safe
Perceived quality of care Factor 2 – trust in the clinic	1. I believe the physicians at this clinic offer the best treatment for me 2. This office provides the best medical care for me 3. This office is reliable 4. Overall, I fully trust this office
6. Anxiety level	1. Nervous, anxious, or on edge at present 2. Not being able to stop or control worrying 3. Worrying too much about different things 4. Have trouble relaxing 5. Being so restless that it is hard to sit still 6. Becoming easily annoyed or irritable 7. Feeling afraid as if something awful might happen
7. Patient's activity while waiting	A- read books/ magazines B- used smart phone/tablet/PC C- talked with friend/family D-watched TV F-talked with staff G-walked around H-playing fish game
8. Does it feel like you wait for a long/short time	0 – short time, 10 – long time
9. how do you feel about your waiting experience (0 relax, 10 stress)	0 – relax, 10 - anxious