

DESIGN OF HEALTHCARE ENVIRONMENTS
TO IMPROVE MENTAL HEALTH
AND WELL-BEING OF FEMALE VETERANS

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TABLE OF CONTENTS

| Chapter | Page |
|---------------------------------------|------|
| I. INTRODUCTION | 4 |
| Introduction | 4 |
| The Background of the Study | 5 |
| II. LITERATURE REVIEW | 6 |
| Introduction | 6 |
| Importance of Veteran Healthcare | 6 |
| Veteran Mental Health Challenges | 7 |
| Military Trauma Among Female Veterans | 8 |
| Evidence Based Design in Healthcare | 9 |
| Importance of Co-Design | 10 |
| III. METHODOLOGY | 12 |
| Introduction | 12 |
| Participant Sample | 12 |
| Procedures | 13 |
| Instruments | 14 |
| Data Analysis | 15 |

LIST OF TABLES

| | |
|---------------|----|
| Table 1 | 15 |
| Table 2..... | 16 |

CHAPTER I

INTRODUCTION

1. INTRODUCTION

Female veterans are an essential and growing demographic within the United States military. According to the Department of Veterans Affairs, there are over two million female veterans in the United States making up 10% of the veteran population. Despite their contributions and sacrifices, female veterans often face unique challenges upon their return to civilian life, including a lack of appropriate and safe spaces and resources. Many female veterans have reported feeling uncomfortable or unsafe in certain environments, such as traditional veterans' organizations, due to a lack of accommodations for their specific needs and the predominantly masculine military culture that follows.

There has been very little research exploring self identity for women in the military however, female veterans have unique experiences and challenges that they only have a deep understanding of what works best for their needs. Female veterans can provide valuable insights into the design and development of spaces that meet their specific needs, including considerations such as privacy, comfort, accessibility, and safety. Thus, there is a critical need to not only co-design veterans clinics with appropriate lighting, color, and other interior environmental attributes, but also study the impact of such a design on mental health of female veterans. In the absence of such design, improving cognitive and physiological well being of female veterans will be an ongoing challenge in the United States.

By involving female veterans in the design process, we hope to better understand functional design elements which contribute to female veterans' perception that targeted spaces are both welcoming and inclusive. Female veterans can help identify areas where improvements can be made, such as better lighting, more private areas, or more flexible seating options. They can also help ensure that spaces are designed to accommodate the unique needs of female veterans, including those with disabilities or mental health conditions.

Co-design can help ensure that female veterans feel valued and supported in their transition back to civilian life, and that feel included in the spaces they use. Continuing to engage female veterans in the design and development of interior spaces may better support their needs.

2. BACKGROUND OF THE STUDY

Veterans are often diagnosed with mental health challenges, with the most common being post-traumatic stress disorder (PTSD) with female veterans often being misdiagnosed (Feczer & Bjorkland, 2009). Evidence-based design has shown that environmental attributes such as natural lighting, color, texture, patterns etc. within a space can play an important role in a) the willingness of female veterans to talk about their traumatic experiences, b) the treatment of PTSD in female veterans and c) the comfortability of female veterans within the healthcare environment (Feczer & Bjorkland, 2009). Though studies have explored health benefits of different environmental attributes of a space, none of the studies have reported specific needs and preferences of female veterans who have mental challenges along with emotions they experience when they spend time in healthcare environments.

CHAPTER II

LITERATURE REVIEW

1. INTRODUCTION

The following literature review describes some of the mental health challenges veterans are facing and healthcare environmental attributes such as natural lighting, color, texture, patterns etc. can play an important role on veterans' mental health and wellbeing with a primary focus on female veterans.

This research study aims to educate designers, healthcare workers, and stakeholders to understand the important difference of emotions and preferences for design of healthcare environments between male and female veterans and how a space's environmental attributes can have an impact on veterans' mental health and wellbeing.

2. IMPORTANCE OF VETERAN HEALTHCARE

Veteran healthcare facilities differ from private healthcare sectors and are important for veterans to have access to. Veteran Affairs (VA) healthcare facilities do offer some services that are not uniquely specific to VA facilities, however they are the only healthcare organization to combine their services all in the same facility and are veteran centric (Shulkin, 2016). VA facilities have clinical expertise in service-connected health conditions and disorders that private sectors may not provide. VA facilities also support not only the veteran, but also have services that support family members and caregivers (Shulkin, 2016). Knowledge and expertise of the issues and health challenges veterans face are crucially important and are not widely known

outside of VA healthcare systems. Less than 50% of private healthcare providers regularly scan for PTSD and depression and only 15% of community based mental health providers are proficient in treating military related issues (Tanielian et. al., 2014). It is also important to acknowledge that the overall health of veterans is significantly different than that of community civilians. The majority of VA users are collectively sicker and most likely to have 3 or more comorbid physical conditions than the general population (Jha, 2016).

There has been an increase in VA healthcare use amongst both men and women veterans, however there is still an underutilization of VA services for women veterans (Maisel et al., 2015). There are studies that have surveyed women veterans for why they do not use VA health care services. The top three results of a survey indicated that women veterans may not use VA health services due to poor linkage to VA services during and after military services, feeling unsafe in VA healthcare settings, and due to inequitable access to women-specific healthcare (Evans et. al., 2019). Women veterans reported that there is a disconnect after their military service and knowing their benefits after retirement. Many women veterans reported that they did not think they qualified for benefits because they believed benefits only applied to male veterans (Evans et al., 2019). Women veterans reported feeling unsafe in VA healthcare settings because of previous trauma, because VA healthcare settings are male dominated, or due to unfair and inappropriate treatment from staff members and other veterans, and not having appropriate resources for women-specific health care (Evans et al., 2019). There is a critical need to improve VA healthcare settings to be more women veteran inclusive, safe, and providing appropriate women-specific health care resources.

3. VETERAN MENTAL HEALTH CHALLENGES

Mental illnesses are one of the leading causes of disabilities worldwide (Platt et. al., 2017). As for veterans, they are vulnerable to a variety of mental health challenges with the most common being post-traumatic stress disorder (PTSD) (Institute of Medicine, 2012). About 30% of veterans that have reported are diagnosed with PTSD (Feczer & Bjorklund, 2009). Unfortunately, some veterans are reluctant to seek out psychiatric help due to stigmatization, unavailable resources, gender biases and more.

There is evidence that male veterans are 3-4 times more likely to receive a PTSD diagnosis than female veterans. Female veterans are more probable to have PTSD symptoms than male veterans (Pereira, 2002). Many female veterans are often not properly diagnosed or do not receive diagnoses because of different environmental factors and military culture within the VA setting. This can lead to female veterans to not report and seek help. With gender bias mistreatment and misdiagnoses among VA healthcare settings, female veterans are less likely to report current or future trauma related experiences. With female veterans less likely to report PTSD related symptoms, it undermines the severity of the problem of female veterans not receiving proper diagnosis and care.

4. MILITARY TRAUMA AMONG FEMALE VETERANS

Women veterans are a rapidly increasing patient population in VA environments. Within a 10-year time frame, the number of women veterans has increased by 46% (VA National Center for Veterans Analysis and Statistics, 2017). While the number of women veterans are increasing, they still remain a high minority in VA healthcare settings. A survey was given to a convenience sample of female veterans. Results showed that most women veterans do not feel comfortable in VA healthcare settings (Moreau et. al., 2018). It was found that women do not feel comfortable in VA healthcare settings due to the military culture that endures and the high prevalence of

military trauma among women veterans (Moreau et. al., 2018). Trauma can include harassment, sexual harassment, and sexual assault.

It has been found that one in four women have reported inappropriate comments and behavior directed towards them by male veterans in VA healthcare settings just within the past year (Klap et. al., 2019). One in three women veterans have reported of experiencing sexual harassment or sexual assault by male veterans (Williams & Bernstein, 2010). Sexual harassment and sexual assault that occur in military settings are known as military sexual trauma (MST). 71% of women veterans who served in the Vietnam War and all other wars afterwards reported seeking help for PTSD because they were sexually harassed and sexually assaulted while in the military (Williams & Bernstein). MST can have a huge negative impact on female veterans mental and physical well-being such as substance abuse, change in weight, eating disorders, relationships, and other medical issues.

These trauma related events that take place within and outside VA settings can have a huge effect on the conditions for female veterans attempting to seek treatment. While there is a VA Women's Health Services campaign in place to help change VA environments to be more inclusive and comfortable for female veterans, there is still a high rate of harassment and sexual assault ongoing in VA healthcare settings (Klap et. al., 2018). Evidence-based design has shown that environmental attributes such as natural lighting, color, texture, patterns etc. within a space can play an important role in a) the willingness of female veterans to talk about their traumatic experiences, and b) the treatment of PTSD in female veterans.

5. EVIDENCE BASED DESIGN IN HEALTHCARE

Evidence based design (EBD) has been developing over the last two decades to help find scientific evidence to improve the design of healthcare facilities (Ulrich et. al., 2010). EBD

guides and helps healthcare facilities understand the effects healthcare environments have on facility users such as reducing stress, improving safety, and promoting productivity in facility users (Platt et. al., 2017). When designing a healthcare facility, there are strict codes and regulations that must be followed that may take priority over patient emotions and preferences. However, recent studies have advised that creating patient centered environments may have positive effects on patients.

There is currently limited research in evidence-based design for those who suffer from PTSD. Current treatment options for PTSD can include medication and most commonly cognitive behavioral treatment (CBT) (Nuamah et. al., 2021). CBT focuses on identifying PTSD triggers, but these in-person treatment sessions do not focus on the patient's environmental surroundings outside of the session. The lack of analyzing PTSD patients' surroundings outside of treatment sessions limits the patient and nurses full understanding of possible PTSD triggers (Nuamah et. al., 2021). PTSD patients can benefit from designed environments that can ease triggers. Recent studies suggest that modifying current green spaces, adding windows, wayfinding, and eliminating environmental features that can trigger past trauma may improve patients' mental health (Golembiewski, 2013). However, there is still limited data on the influence of interior design and architectural attributes on PTSD and mental health patients (Nuamuah et. al., 2021).

6. IMPORTANCE OF CO-DESIGN

Co-design is a design approach that involves the end users in the decision making in the design process. In other words, co-design is seeing the end user as a collaborator in the design process. Healthcare facilities are a prime example of the need for and importance of co-design. Co-design in healthcare settings entails staff, patients, and stakeholders collaborating with

designers to improve the mental and physical well-being of facility users, productivity, safety, etc. Utilizing the co-design approach allows the discovery of different perspectives that can have an important role in improving the design of spaces. The importance in allowing end users involved in the design process is critical as these individuals are the ones who have a deep understanding of the challenges and need of improvement in their environment (Bird, et. al., 2021).

METHODOLOGY

1. INTRODUCTION

This study is aimed primarily to determine if the emotions experienced (stressed, satisfied, calm, nervous, etc.) by female veterans in healthcare environments is different from male veterans. The second aim of this study is to determine if there are differences in preference of environmental attributes such as natural light, color, pattern, texture, etc. between male and female veterans. This study is divided into two different phases. The first phase is a needs assessment survey and the second phase is designing a virtual space. The objective of this study is to assess if the integration of appropriate lighting, color, texture, pattern into co-designed spaces with female veterans based on literature and evidence-based design can help reduce cognitive load, stress, perceived discomfort, heart rate and blood pressure, while also improving concentration and mood in female veterans.

The central hypothesis is that interior spaces, incorporating lighting, color, texture, and pattern along with co-design, will improve cognitive and physiological measures when compared to interior spaces of traditional veteran's clinics. The rationale for this project is that interior spaces of veteran's clinics exhibiting lighting and color combinations that are co-designed with female veterans will result in improvements in cognitive and physiological performance in female veterans who use veteran's clinics. The researchers are well-positioned to lead this project based on their experience in diverse disciplines including interior design, lighting design and industrial engineering.

2. PARTICIPANT SAMPLE

The participant sample consisted of veterans all from the United States. Participants were selected on a voluntary basis through email, purposive, and snowball sampling. The criteria of participants for the study must be 18 years and older in age, which reflects the legal age citizens of the United States can enlist in the military. Participants also included all gender veterans. Participants who have any cognitive challenges or experience dizziness and nausea when using the virtual reality headset are given the option to discontinue the study at any time. This study will include 60 participants and participants received no monetary compensation.

3. PROCEDURES

The data was collected in the Mixed Reality Lab at Oklahoma State University. The study was conducted into two phases: a) survey, and b) focus group. Phase one is participants taking a needs assessment survey with Likert scale questions. The Likert scale questions ask the participants to rank their emotions experienced when in a veterans healthcare environment they often visit and preferences of different environmental attributes they like or dislike in their veterans healthcare environment. The emotions asked to rank are feelings of calmness, security, tension, easiness, satisfaction, fright, comfort, nervousness, indecisiveness, and relaxation. Participants who participated in the focus group were asked demographic questions and then asked to answer open ended questions about the current veterans healthcare environments they often visit.

Phase two is the redesign phase. Based on the data gathered from phase one, the researcher will create four virtual reality environments (environment a, environment b, environment c, and environment d) using Revit and Enscape. The responses from the survey and focus group were used to create co-designed VA clinics using virtual reality. The responses help the researcher select which stimulus to implement in the space. The two stimuli will be lighting

and color with warm and cool tones for each. Environment A will be an environment with warm lighting and warm color; environment B will have warm lighting and cool color; environment C will have cool lighting and cool color; and environment D will have cool lighting and warm color. Participants will use the Oculus Quest 2 virtual reality headset to experience these two environments. There will be 20 participants in each environment, 10 male and 10 female with a total of 80 participants. While participants were in the environments, they used the think aloud protocol, where they were asked to verbalize anything that comes to mind (Jääskeläinen, 2010). If participants were silent for more than 20 seconds, they were prompted by the researcher. When experiencing the environment, measurements for heart rate and pupil dilation were recorded. In addition, after experiencing each environment participants immediately took a survey that assessed feelings and emotions experienced (calm, secure, tense, at ease, satisfaction, fright, comfort, nervous, indecisiveness, and relaxed).

4. INSTRUMENTS

The participants' emotions expressed (calm, secure, tense, at ease, satisfaction, fright, comfort, nervous, indecisiveness, and relaxed) in the virtual environments were measured through a Likert Scale as well as an adapted version of the State Trait Anxiety Inventory (STAI). Participants physiological measurements such as heart rate were taken with Biopac Systems equipment. A baseline heart rate measurement was taken at resting heart rate for three minutes before they experienced any of the virtual environments. To get a baseline measurement for resting heart rate, participants sat with their eyes closed for three minutes before entering either of the virtual reality environments. Pupil dilation was measured to gather information for the user's mental demand and capacity when in space. This was measured through the VR headset.

Table 1

Modified State Trait Anxiety Inventory Questionnaire: Survey Questions for Emotions Expressed by Female and Male Veterans when using Veterans Healthcare Environments

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|--------------------|-------------------|----------|---------|-------|----------------|
| I feel calm | | | | | |
| I feel secure | | | | | |
| I feel tense | | | | | |
| I feel stressed | | | | | |
| I feel at ease | | | | | |
| I feel upset | | | | | |
| I feel satisfied | | | | | |
| I feel frightened | | | | | |
| I feel comfortable | | | | | |
| I feel nervous | | | | | |
| I feel indecisive | | | | | |
| I am relaxed | | | | | |

Table 2

Survey Questions for Importance of Attributes by Female and Male Veterans when using Veterans Healthcare Environments

| | Not at all Important | Slightly Important | Moderately Important | Important | Very Important |
|----------------------|----------------------|--------------------|----------------------|-----------|----------------|
| Color | | | | | |
| Natural Light | | | | | |
| Artificial Light | | | | | |
| Texture | | | | | |
| Pattern | | | | | |
| Available Space | | | | | |
| Form/Shape of Room | | | | | |
| Layout | | | | | |
| Materials & Finishes | | | | | |
| Furniture | | | | | |
| Decoration | | | | | |
| Acoustics | | | | | |

5. DATA ANALYSIS

For data analysis, a t-test was used for the quantitative analysis and a content analysis was used for the qualitative analysis for phase one. Phase two, heart rate, pupil dilation, task completion time and results from the survey were recorded and analyzed using the software Microsoft Excel and IBM SPSS. A 2*2*2 repeated measures ANOVA was conducted. The significance level was set at 0.05. Descriptive statistics were also reported.

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