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As the official journal of the AIA Academy of Architecture for Health (AAH), this publication explores subjects of interest to AAH members and others involved in the fields of health care architecture, planning, design, and construction. The goal is to promote awareness, educational exchange, and advancement of the overall project delivery process, building products, and medical progress that affects all involved in those fields.

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AAH currently consists of approximately 6,000 members. Its mission is to improve both the quality of health care design and the design of healthy communities by developing, documenting, and disseminating knowledge; educating design practitioners and other related constituencies; advancing the practice of architecture; and affiliating and advocating with others that share these priorities.

Please visit our website at [www.aia.org/aah](http://www.aia.org/aah) for more about our activities. Please direct any inquiries to [aah@aia.org](mailto:aah@aia.org).

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# Designing for Invisible Injuries: An Exploration of Healing Environments for Posttraumatic Stress

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## ABSTRACT

Nearly 8% of Americans will experience the condition of post-traumatic stress disorder (PTSD). While post-traumatic stress results from a variety of causes, including abuse, assault, or natural disaster, it is most commonly associated with warfare. An estimated 30% of those who spend time in war zones will suffer from PTSD (U.S. Department of Veterans Affairs, 2015). Symptoms such as flashbacks, hypervigilance and substance abuse often lead to difficulties maintaining relationships, employment and health. In extreme cases, PTSD can be a primary cause of suicide (Eaton, 2012).

The US Department of Veterans Affairs reports that PTSD leads healthcare concerns among veterans, a population that shares specialized backgrounds and health risks (Morris, 2015). This paper examines the potential of design and the healing environment to positively contribute to the experiences of veterans working to recover from combat PTSD.

Examining challenges in the physical, social, and ambient environment through veterans' perspectives, a design studio at Washington University in St. Louis developed a series of proposals that combined outpatient therapy with a residential-based resource center. The design exploration reveals elements in the built and natural environment that uniquely resonate with veterans' experiences and play a significant role in the approach to creating spaces for behavioral health treatment.

## Introduction

Written record of humans suffering from the mental, emotional and psychological toll of war dates back hundreds of years, from Homer's heroic quest in *The Iliad* to Shakespeare's tortured King Henry IV. Historically, this condition has been identified as shell shock, combat fatigue, and war neurosis. Today it is known as post-traumatic stress disorder, or PTSD.

Statistics indicate that one in three US veterans presents with symptoms of PTSD but fewer than 40% seek help (Veterans and PTSD, 2015). Suicide rates among veterans are twice as high as rates among civilians, with an estimated 22 veterans committing suicide every day (Kemp and Bossarte, 2012). Currently, the US Department of Veterans Affairs spends more than \$3 billion per year toward care, yet high rates of drop-out from behavioral health treatment programs persist (Morris, 2015).

The current PTSD treatment approach consists of a combination of biomedical therapies and psychotherapy to treat immediate symptoms and the subsequent underlying cause. Common psychotherapy treatment for PTSD consists of prolonged exposure therapy (PE) and cognitive processing therapy (CPT) (Understanding PTSD and PTSD Treatment, 2016). Both approaches are based on the premise that talking through trauma yields healing. This approach often runs counter to the training and culture ingrained in the military. Marine veteran David Morris writes in his book, *The Evil Hours*, "I began to think of the treatment not as therapy so much as punishment. Penance" (Morris, 2015).

In 2007, a program called "Ocean Therapy" was piloted at Camp Pendleton where veterans struggling with PTSD were taught how to surf. Veterans and counselors met in group therapy sessions after surfing, and participants began showing decreased symptoms in just five weeks. Since then, more than a thousand Marines have been through Ocean Therapy and have continued to positively improve. Researchers are currently studying reasons for success. These researchers believe that endorphins produced while surfing counteract the depletion of norepinephrine and serotonin—often symptoms of PTSD. Visual and auditory connections to water contribute to this phenomenon by reducing stress and allowing positive memories to begin to overwrite negative memories. This process begins to alleviate illnesses like insomnia and depression, which often accompany PTSD (Wallace, 2014).

Building on the success of Ocean Therapy and the call to reexamine the treatment of PTSD, Washington University in St. Louis conducted an architectural design studio where graduate students investigated the psychological and social aspects of combat PTSD. The studio teamed with veterans, spouses, therapists, and healthcare designers. Students were asked to suspend pre-conceptions of PTSD to understand the condition through first-hand narratives and research.

The studio considered how military experience uniquely shaped perception. For example, veterans are trained to survey their surroundings in highly specific ways. The ability to successfully operate in combat zones depends

on a sophisticated aptitude for analyzing and navigating through a potentially hostile environment. This deeply ingrained hypervigilance becomes a symptom of PTSD when it begins to interfere with a return to civilian life by continuously sending fight-or-flight signals to the brain.

Because psychologists largely agree that the physical environment can positively impact the behavior of patients suffering from mental health disorders, studio participants posed the following questions:

- How does advanced visual training inform the approach designers should consider when creating therapeutic spaces for veterans?
- Which aspects of the environment most effectively contribute to behavioral health treatment?
- In what ways can the transition from military life to civilian life be considered in the design process and approach to behavioral health environments for veterans?

Students built on research and analysis to develop proposals for a veterans Center for Ocean Therapy, which combined a suite of inpatient and outpatient resources with transitional housing. Engaging veterans in design reviews provided the studio with a window to understanding the design problem and the environmental variables that uniquely resonate with healing.

This paper describes the research, analysis, catalogue of issues, and concepts explored to further the discussion and understand how design can positively shape healing environments and outcomes for veterans struggling with behavioral health conditions such as combat PTSD.

## Research

The studio began with individual and collective research as students engaged in readings, films, and discussions with veterans. Emily Johnson, research assistant for the Center for Health Research & Design, gave a lecture about the history of asylums and the ‘moral model’ of treatment for mental health. Architect Matthew Finn lectured on the research project he conducted through the Perkins + Will Innovation Incubator on Post Traumatic Understanding (Finn, 2013). Students also watched the accounts of WWII veterans suffering from ‘nervous conditions’ in the John Huston documentary “Let There Be Light.”

As a result of exploring combat PTSD—including its stigmas, stereotypes, and the myriad therapies in practice today—students created a research graphic to convey the complex conditions veterans may encounter when seeking behavioral health treatment.

A study by Maeve Elder (figure 1) stems from first-hand accounts the student collected and depicts simultaneous

realities a veteran may face through experiencing flashbacks. The exploration is a collage of a scene from a convenience store and a street in Iraq, likening a visual analysis of everyday products on a convenience store shelf with an analysis of elements from a war-torn residential street. Through her research, this student was struck by how commonly flashbacks blur realities from military and civilian life, conflating ‘everyday’ and ‘real.’ The image reflects this condition of dual realities and provides insight into how military training and advanced perception skills may alter the experience of navigating through civilian spaces.

Muhong Zhang’s exploration (figure 2) likewise derives from first-hand narratives of veterans, tracing the transition of soldiers from civilian life to basic training to deployment and then back to civilian life. The student was interested in the physical transformation of this journey, beginning with the scale of the body and the social and cultural constructs that define each stage of experience.

Dara Smyth alternatively focused on social stigma and the fluctuating relationship between veterans and society (figure 3). The research was inspired by accounts of veterans who served in different wars. Depicting both a Vietnam War veteran and an Operation Enduring Freedom veteran, the study illustrates the historically bifurcated relationship between society and veterans, with the veteran depicted as both outcast and hero. Images of the two veterans are mounted as reliefs on Plexiglas, presenting veterans both as individuals and as symbols associated with the social stigma of war. This drawing prompted awareness around the social isolation veterans often encounter upon returning from deployment, as well as the reward they may experience when connecting with other veterans who served in different eras.

## Environmental analysis

Following this initial stage of research, the studio traveled to Southern California where students met with Dr. Carly Rogers, founder of Ocean Therapy. Students investigated sites identified for the Veteran’s Center project along Santa Monica Beach and had the opportunity to take a lesson in surfing, which gave them the ability to experience the ocean first-hand. Synthesizing experiences of the site, climate, and ocean with the opportunity to speak with Dr. Rogers and veterans, students created an analysis exploring environmental variables that could uniquely contribute to a therapeutic healing environment.

Analysis of the built environment through veterans’ perspectives informed design thinking significantly. Speaking with the studio, one veteran shared his first memory of the built environment after returning from Iraq. He recalled stepping out of a car in downtown



FIGURE 1



Image credit: Maeve Elder

FIGURE 3



Image credit: Dara Smyth

FIGURE 2

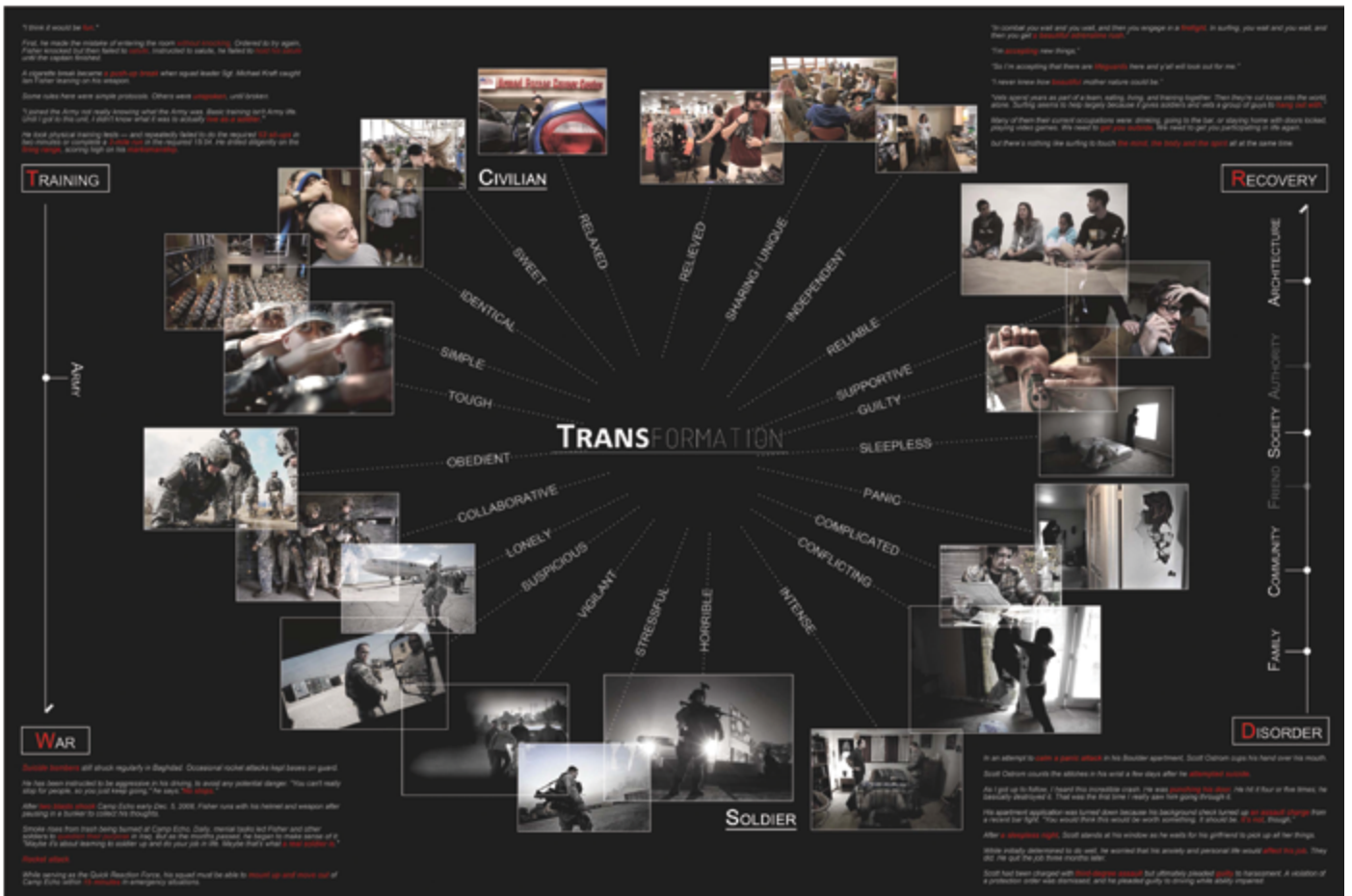


Image credit: Muhong Zhang

Los Angeles where he was overwhelmed and terrified by the sheer number of windows surrounding him. Throughout his deployment as a Marine, he was trained to survey new environments by visually scanning and ‘clearing’ them—checking windows, for instance, for threats such as snipers. With hundreds of windows presented from all directions in downtown Los Angeles, it was an impossible instinct to fulfill, causing heightened adrenaline and anxiety (Hayden, 2016).

Accounts like this and others prompted students to analyze the built environment as a veteran might, as shown through Stacy Witschen’s analysis in figure 4. The graphic presents a kind of mental map that distinguishes various features of the urban, residential, and natural environment. Paths of pedestrian travel around the site differ greatly as does the character of urban and residential spaces surrounding the site. This two- and three-dimensional mental map overlays a record of open versus constricted spaces with photographs, recollection of memories from military experience, facts known about the history of the site, and colors that simply represent an emotional reaction to the built environment.

Katheryn Haas explored the potential to shape daylight as a means of supporting circadian rhythms and sleep patterns (figure 5). She identified the connection between various activities and optimal times of day because night terrors and insomnia are commonly experienced symptoms of PTSD. Therefore, designing a breakfast room and group counseling spaces with strong eastern light might support waking, gathering, and focused discussion in the first part of the day, whereas a courtyard designed with shade might invite rest and relaxation after lunch.

Acoustics were another environmental variable explored. The study ‘Site as Sonograph’ by Maeve Elder (figure 6) reflects a series of audio recordings the student took on site. Bordered by a historic building, low rise residential, a city park, and the beach, the site is largely defined by a 20-foot grade shift, transitioning from a neighborhood to the beach. A wide range of sounds were recorded—from birds chirping and palms rustling in the direction of the park, to vehicular traffic and voices in the direction of the city. On certain parts of the site, one can hear the sound of waves crashing on the beach. This led to an interest in understanding the qualities of sound on the site because noise is a common trigger for flashbacks. Mapping sound as a form of topography allowed the possibility of shaping sound as a key environmental variable. This became particularly critical in supporting the creation of indoor and outdoor spaces later in the studio.

FIGURE 4



Image credit: Stacy Witschen

FIGURE 5

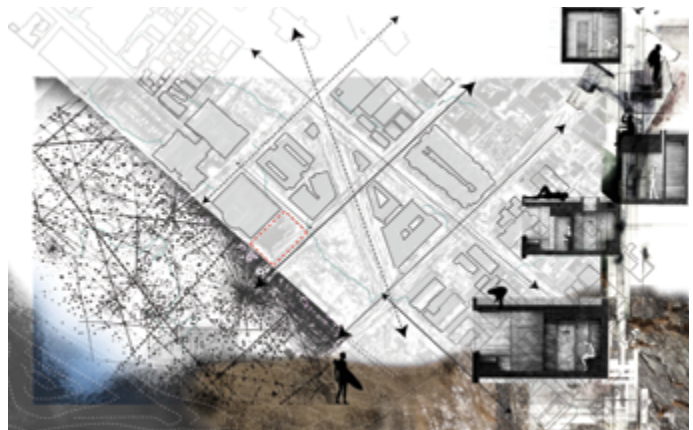


Image credit: Katheryn Haas

FIGURE 6

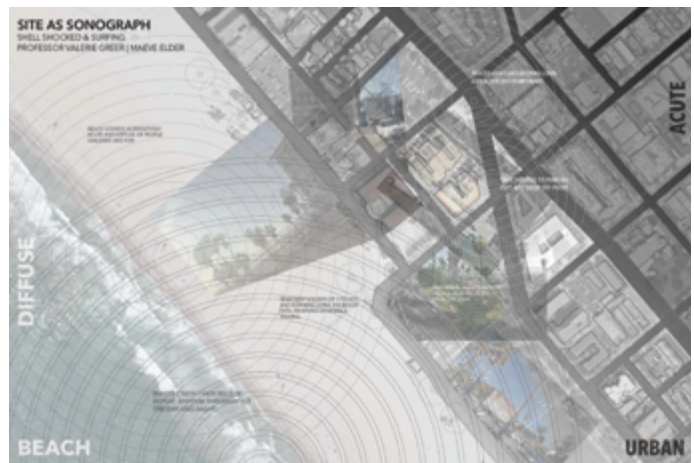


Image credit: Maeve Elder



## Design concepts

Following research and analysis, students designed a Veteran's Center for Ocean Therapy, a residential based treatment center with transitional housing for 40 veterans. The Center accommodates outpatient services such as access to ocean therapy, group and individual counseling, exercise facilities, physical therapy, and a career center for both resident and local veteran use. Shared amenities include dining, recreation, a workshop, and a family area for resident and local veterans, along with a plaza or landscape to benefit the larger community.

Students applied the body of research and analysis to generate concepts for healing environments.

Four major themes drove projects, providing insight and thinking into the future design of behavioral health environments for veterans: Thresholds and transition, comradery and community, mind and body, and awareness and engagement.

### 1. Thresholds & transition

Drawing upon the research and a guest lecture by Perkins + Will architect Matthew Finn, students gained an appreciation for many veterans' sensitivity to thresholds. Doors, stairs, and corridors present danger when navigating through combat conditions, and that vulnerability often lingers in the way veterans react to thresholds in the built environment. A local veteran described the concept of establishing a 'dominant position' when moving through zones of compression. He shared that, after moving through a door and into a room, his instinct is to stand with his back to a corner to survey all doorways.

Corey Stinson explored thresholds and transition in the project *Peripheral Limit: Reframing Mental and Psychological Thresholds* (figure 7). This led him to explore the potential of creating spaces that are positively associated with transition. Instead of creating thresholds through halls and doors, the student investigated ways in which light and shadow or hard and soft materials can help create thresholds. This approach aims to dismantle hard boundaries while creating an atmosphere that unites indoor and outdoor spaces and offers a simultaneous experience of protection and connection throughout the environment.

Working on a different site, Alexandra Ward investigated thresholds through a series of diaphanous layers that create a gradient between public and private spaces. Shown in figure 8, Ward conceived of the program as a series of indoor and outdoor rooms united through a wood frame structure, with a minimal use of corridors. Within this system, conventional walls protected private spaces while semi-private and communal spaces were defined by vertical slats. Articulating the assembly of this system served two purposes. The first was to celebrate the construction of the building, providing visual stimulation and order. The second was to provide an operable layer of louvers, giving occupants kinetic control over the privacy of spaces.

FIGURE 7



Image credit: Corey Stinson

FIGURE 8

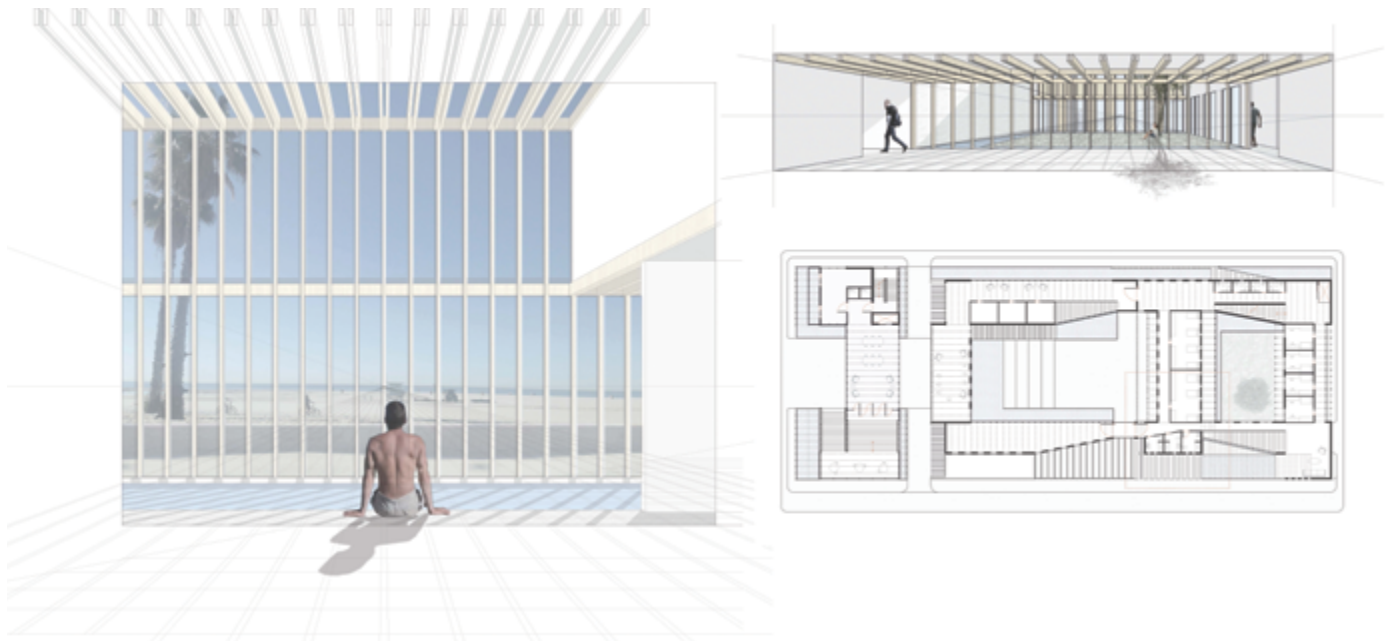


Image credit: Alexandra Ward

FIGURE 9



Image credit: Kuai Yu

Kuai Yu explored a sectional approach to thresholds in the project Transition (figure 9). As the concept diagram illustrates, Yu started with a stratified organization of communal, residential, and therapy spaces. She then introduced a series of shared outdoor areas and began blurring boundaries between spaces, working with half levels and ramps to create visual connections between people and activities.

These three strategies illustrate different approaches to creating a tactile connection between occupants and their surroundings to generate positive experiences associated with thresholds and transition in the healing environment.

## 2. Comradery & community

Another theme that the studio explored was the comradery and sense of community veterans often experience while serving in the military. A sense of isolation following a return to civilian life may stem from a loss of comradery and can be compounded by an inability of friends and family to relate to veterans' military experiences.

The idea of comradery drove the planning in the project Cultivated Vitality by Jay Schwartz, figure 10. Residential units are organized into a set of smaller neighborhoods, likened to squadrons. Units are designed to house 8 to 10 veterans, and each unit is directly connected to one of the outpatient resources such as the counseling suite or family area. The concept was to encourage bonding among members of each unit while also creating a sense of community around outpatient areas. This structure of neighborhoods creates a large central courtyard looking out onto the beach, a space for gathering at the heart of the center.

An alternate strategy to building comradery is seen through the project Communal Progression by Dylan Weber Callahan (figure 11). Here outpatient resources are integrated into the base of the building, with direct access from the beach and the street. Lifted above this community base are a series of residential blocks organized in a gradual arc. The concept was to create an intimate scale of bonding within residential areas while also creating a way for groups to be visually connected to each other at a larger scale. This strategy allowed the project to engage a historically significant neighboring building while creating a central outdoor plaza that connects veterans to each other and to the surrounding community.

Although the two project approaches differ, their common underlying design goals were to enhance comradery through the organization of the program.

FIGURE 10

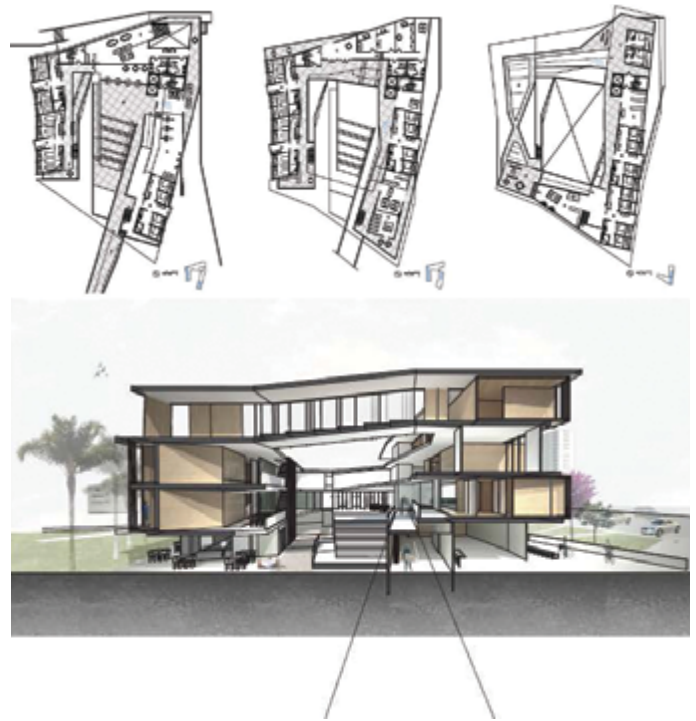


Image credit: Jay Schwartz

FIGURE 11



Image credit: Dylan Weber Callahan



### 3. Mind & body

Closely associated with comradery is the bonding established through physical exercise and exertion. Veterans frequently remarked, for instance, that the gym would be the most popular place in the Center. Ocean therapy builds on the physical and mental exertion required to surf, harvesting the power of the ocean and adrenaline from surfing to help veterans open up around the emotional and psychological challenges they may be facing. Labyrinths, at a slower pace, similarly engage mind and body and have been shown to be an effective therapeutic tool in working with PTSD (Anderson, 2011).

Muhong Zhang's project Invisible Link (figure 12), creates a strategy of journeying through the site as a way to engage body and mind. This student took a sectional approach, nesting the program into the slope of the site with a system of ramps and outdoor spaces, thereby transforming an experience of the Center into a journey through the site. Residential neighborhoods are centrally located with the gym and therapy spaces facing the beach to the west. To the east, the business center, dining, and recreation hall optimize a connection

to the neighborhood. Zhang designed different scales of social spaces throughout as well as a sloped landscape that traverses the site and connects local and resident veterans to each other and to the shared experience of travelling through the site.

Another investigation into the body and mind connection led Kathryn Haas to investigate how daylight can support circadian rhythm in Circadian Space (figure 13). Here, specific qualities of light animate a series of active and restful spaces. Haas designed sleeping spaces for diffuse, ambient light to enter in the morning and stronger sunlight to filter into a breakfast area, therapy suite, and workshop in the late morning. A quiet and cool space tucked away from the beach was designed for an early afternoon rest or a place to shower after surfing. Alternatively, a climbing wall that rises up from the beach level and was designed to be animated by late afternoon sun. This climbing wall penetrates vertically through several levels of the building, bringing veterans to a sunset platform and back to the private residential living levels. Thus, the design creates a shared journey throughout the day and celebrates exertion and rest.

FIGURE 12

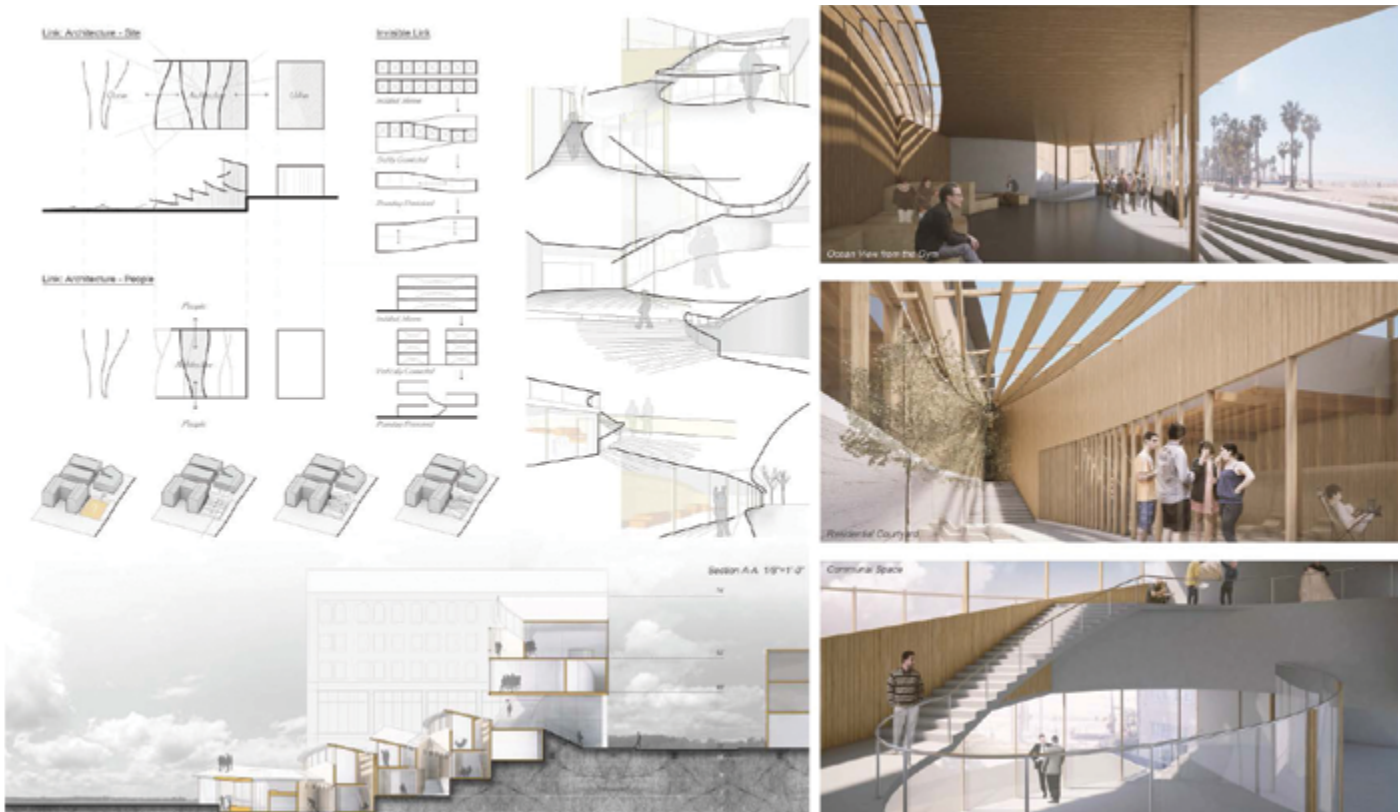


Image credit: Muhong Zhang



FIGURE 13



Image credit: Katheryn Haas

FIGURE 14



Image credit: Andrew Calbert

#### 4. Awareness & engagement

A final theme that emerged was the concept of post-traumatic growth, or positive psychological changes that may result from adversity (Morris, 2015). Through discussions with veterans, students learned that awareness and engagement is imperative to post traumatic growth, which reveals a dimension of ways in which veterans can positively emerge from the challenges of combat PTSD.

Andrew Calbert's project, *Grey Space: From Soldier to Civilian* (figure 14), expresses components of the program architecturally to visually distinguish different among activities and services found at the Center. The workout area cantilevers a level above the beachfront, for instance, while private living quarters are nested among roof gardens. Calbert based this campus concept of creating a choice of destinations on the idea that design should celebrate and promote awareness

of available resources. The project proposes a plaza to connect the neighborhood to the beach through a military service garden, providing a place for public gathering, reflection, and education.

Dara Smyth developed the ideas of celebrating service and engaging the community in her project, *Mediated Exposure* (figure 15). Through discussions with veterans who shared personal experiences of post-traumatic growth, the studio learned about the importance of service and finding ways to contribute positively to the community upon return to civilian life. The studio also learned how creativity often accompanies post-traumatic growth. This inspired Smyth to conceive of the woodshop and kitchen as points of gathering between veterans and the community—proposing that veterans could teach local teenagers how to build surf boards in the shop, for instance, and run a teaching kitchen that serves a

neighborhood café. The woodshop and the café are connected through a tribute garden, a contemplative public landscape that promotes reflection, awareness, and understanding of veterans' experiences both throughout deployment and upon return to civilian life.

Connecting Fragments, a project by Stacy Witschen (figure 16), organizes a layer of ground floor programmatic functions that interface with the neighborhood and community—including the library, welcome center, workshop, and family space—followed by a second layer of functions that interface with the beach and are more private for veterans' use. These two layers connect through courtyards and open spaces that weave veterans and the community together, allowing for an everyday awareness of the work, activities, and community hosted in the Veterans Center.

The potential to actively engage the community in the work of behavioral health treatment centers connects to the potential for post-traumatic growth by building awareness and appreciation of the many ways in which veterans contribute positively to civilian life.

FIGURE 16



Image credit: Dara Smyth

FIGURE 15



Image credit: Dara Smyth

## Conclusions

Imaginative empathy is one of the most powerful tools available to architects and designers. This empathy is critically needed in the design of behavioral health treatment centers. Although PTSD impacts young and old, men and women, the challenges that veterans face when struggling with combat PTSD are uniquely shaped by military experience. An understanding of veteran perspectives, experiences, and challenges should inform the design of healing and recovery environments.

This paper aims to identify issues and elements in the built and natural environment that may be applied to making a positive impact for veterans and others suffering from PTSD. The following implications and potential applications can be summarized as follows.

- Research identifies certain design elements that can both trigger and alleviate anxiety for individuals coping with PTSD.
- Responses to physical and ambient environmental factors are often uniquely shaped to veterans' experiences and training in the military.
- Engaging thresholds and transitions in a particularly sensitive manner may be particularly important to shaping veterans' experience of the built environment.
- Shaping space to reinforce a sense of comradery and community may support the creation of positive social connections associated with therapeutic healing environments.
- Organizing programmatic elements in a way that engages mind and body may enhance the process of physical and psychological healing.
- Creating opportunities for veterans to engage with community and service while in a therapeutic healing environment may support the opportunity for post traumatic growth.
- The projects proposed a host of new innovative programmatic solutions for veterans and individuals experiencing PTSD, such as ocean therapy, as an addition or alternative to the standard treatment facilities often associated with mental health facilities and the US Department of Veteran Affairs.

Though the studio emphasized the impact of healing environments in the context of a facility for veterans suffering from PTSD, concepts and themes discovered can have a greater impact on the approach to the design of healing environments for behavioral and mental health.

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