LA'I COMMUNITIES

PATTERN BRIEF

La'i Community Standards

Living Spaces
For Optimal
Mental Health

www.laicommunities.com

Primary Contributors

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WHO WE ARE

With a combined experience in behavioral health and real estate a development, La'i Communities passion is creating healing spaces.

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Dedication/Purpose

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How To Use This Guide

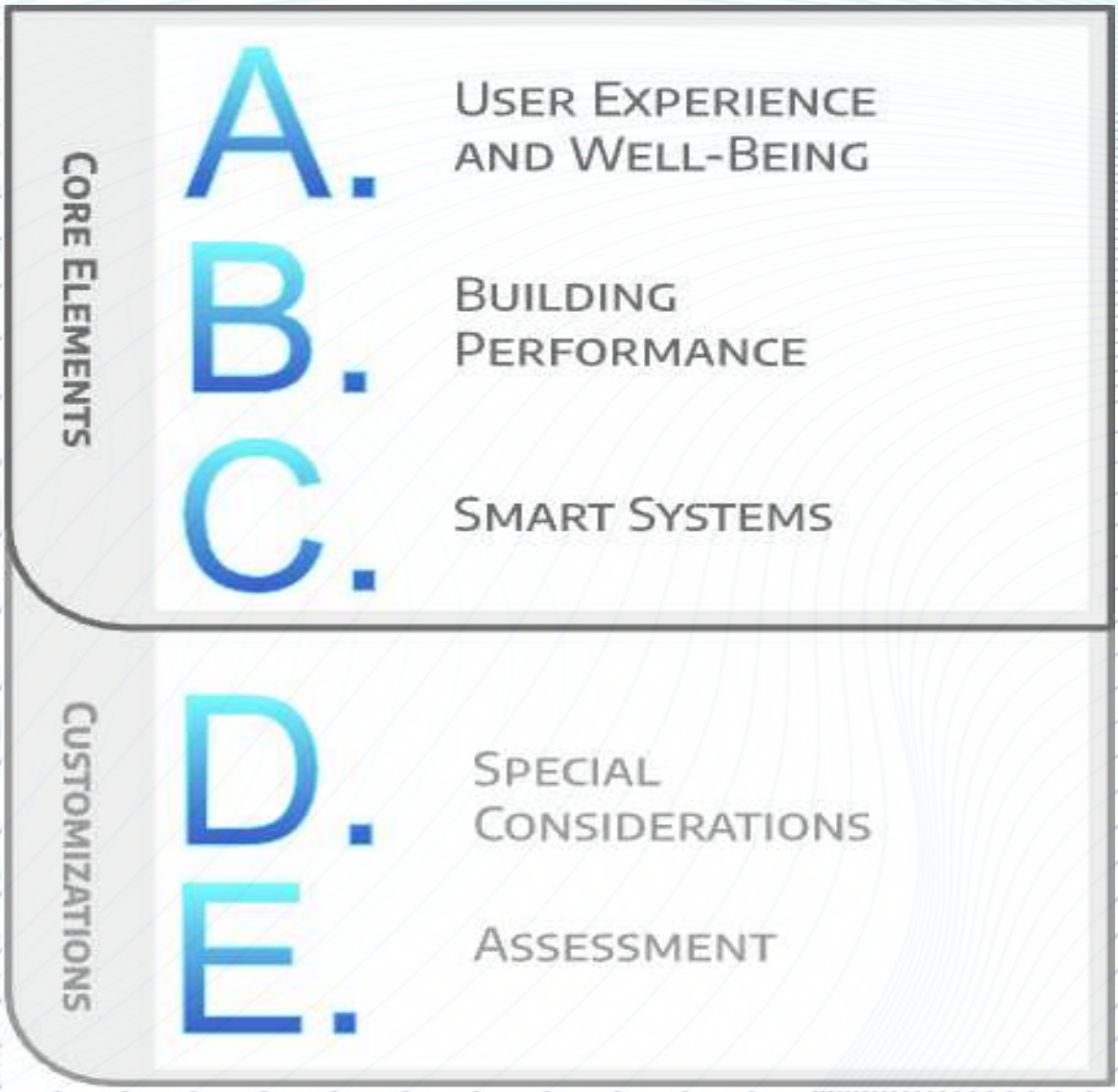
What is a brief?

The following is a synopsis of the larger La'i Communities Community Standards. As an overview, it does not contain all of the full criteria for the community standards.

1. Understand the context and content of La'i Communities Standards
2. Determine the baseline requirements for a project
3. Identify differentiators between La'i Standards and other programs.

Organization of the Pattern Language

Sections A, B, and C apply to all residential environments. For Specialty Mental Health Facilities, Sections D and E provide guidance with special considerations and assessment tools.



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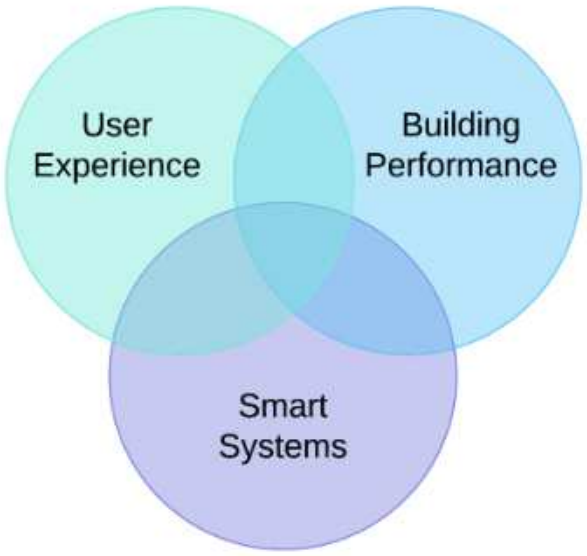
Built Environment and Mental Health - Core Components

The built environment has an impact on mental health. Here we outline our pattern language for spaces aimed at optimal mental health. The use of these patterns is not limited to the design of specialty-purpose mental health facilities; instead, they provide a recipe for any thoughtfully planned home environment.

User Experience and Wellbeing

Space and spatial context have both conscious and unconscious effects on the human mind, affecting health, wellbeing, and overall quality of life (Visser et al., 2020). Design for mental health draws heavily from nature, whose settings reduce perceived stress and stress hormones along with improving cognitive functioning (Stigsdotter et al., 2010; MacKerron & Mourato, 2013; Beyer et al., 2014; Bratman et al., 2015). Community is also an important concept in optimizing the built environment. Communal spaces can have significant psychological benefits,



The Core Concepts of Designing for Mental Health

including reducing feelings of isolation, enhancing social support, and improving overall mental well-being (Evans, 2019).

At the same time, privacy is a critical component when designing for optimal mental health. Designing for privacy includes effective soundproofing to prevent external noises from disturbing individuals in these paces, protecting s confidentiality in therapeutic spaces, and providing a spaces that give a sense of peace and security (Hosford, 2016).

Surface patterns and colors can also influence mood and comfort (Wilkins, 1995, 2018). Color is also involved in ease of use and wayfinding, which is especially important for those with cognitive disorders (Smith et al., 2012; Gitlin et al., 2014; Angus et al., 2021).

Building Performance

Features of the built environment that relate to mental health include light, sound, environmental comfort, and low toxicity of air, materials, and water. The choice of lighting impacts mood, sleep-wake cycle, and mental performance (Evans 2003; Gaggioni et al., 2014; Facer-Childs, et al., 2019; Bertani, et al., 2021).

Thermal comfort is important for mental health; temperatures that are too high or too low for comfort can have a negative impact on an individual's mood, making them feel more agitated or depressed (Nicol, Humphreys, & Roaf, 2012). Thermal comfort and ventilation has been associated with better mental health outcomes (Poortinga et al., 2017; Bernal, 2020; Engineer et al., 2021).
Air quality may have a positive (Allen et al., 2016) or negative (Wargocki & Wyon, 2007; Jones, 2011) effect on cognitive functioning along with a number of additional health effects. Energy efficient design can also influence mental health in a positive way (Wargocki, Wyon, Baik, Clausen, & Fanger, 1999). Poor air quality has been linked to various mental health issues, including cognitive decline and increased rates of depression (Allen et al., 2016).

Smart Systems

Smart Systems can help with monitoring of mental health; using non-intrusive sensors allows real-time insights into an individual's mental state without requiring active engagement (Kumar et al., 2013). Smart Systems can also provide mental health interventions, such as pleasant environmental sounds (Boyce, Hunter, & Howlett, 2003; Yang & Kang, 2005; Axelsson et al., 2010). Such interventions may also be triggered by algorithms that employ artificial intelligence (Delanerolle, 2021).

LA'I COMMUNITY STANDARDS

STRATEGY	PATTERN	Communal Spaces								Private Spaces			Treatment Spaces			
		Kitchen	Living Room	Bathrooms	Laundry Room	Front Yard	Back Yard	Office/Creative	Corridors	Bedroom	Bathroom	Storage	Individual	Group	Exam Room	Office/Workspace
User Experience and Well-Being																
	A1. Safety	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	A2. Privacy			■				■	■	■	■		■	■	■	■
	A3. Communal Space	■	■	■	■	■	■						■	■	■	■
	A4. Natural Connection	■	■			■	■	■	■	■			■	■	■	■
	A5. Texture and Color	■	■	■	■			■	■	■	■		■	■	■	■
	A6. Personal Dock									■						
	A7. Ease of Use	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	A8. Art, Rest and Wellness		■			■	■	■					■	■	■	■
Building Performance for User Wellness																
	B1. Lighting for Impact	■	■	■	■			■	■	■	■		■	■	■	■
	B2. Acoustic Environment	■	■	■	■			■	■	■	■		■	■	■	■
	B3. Thermal Comfort	■	■	■	■			■	■	■	■		■	■	■	■
	B4. Materials	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	B5. Air Quality	■	■	■	■			■	■	■	■	■	■	■	■	■
	B6. Water Quality	■		■	■	■	■				■				■	
	B7. Energy	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Smart Systems																
	C1. Non-intrusive Sensor Design	■	■							■	■					
	C2. Soundscape Design		■			■	■			■						
	C3. EMA and User Interface Design	■	■							■	■					
	C4. Artificial Intelligence Feedback Loop		■							■						
Special Considerations																
	D1. Residential Metnal Health Facilities	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	D2. Designing for Cognitive Dysfunction	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	D3. Designing for Mood Disorders	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Assessment																
	E1. Existing Condition Assessment															
	E2. Post-Occupancy Assessment															
	E3. Mental Health Needs Assessment															
	E4. Assessing Mental Health Impact															

A. User Experience and Well-being

Research findings consistently support the preference for natural settings over built environments, with reduction in perceived stress, stress hormones and improved cognitive function (Stigsdotter et al., 2010; MacKerron & Mourato, 2013; Beyer et al., 2014; Bratman et al., 2015).

A1.

Safety

Building in safety and trust within the home is essential to creating supportive and healthy living spaces. Physical safety is assured through thoughtful measures that safeguard health on a daily basis and in case of emergency.

A2.

Privacy

Privacy is a fundamental aspect of human well-being and is essential to optimizing spaces such as healthcare facilities, workplaces, educational settings, and public spaces.

A3.

Communal Space

Communal spaces play a crucial role in promoting mental health and well-being within residential settings. These spaces provide opportunities for social interaction, connection, and a sense of belonging, which are essential for maintaining positive mental health outcomes (Joye, 2007; Gehl, 2013; O'Brien & Godschalk, 2016; Evans, 2019).

A4.

Natural Connection

Features that reflect natural patterns and create perceived or literal views can significantly ameliorate stress and increased recovery times. (Maas et al., 2009; Stigsdotter et al., 2010, MacKerron & Mourato, 2013, Beyer et al., 2014; Bratman et al., 2015; Hedblom et al., 2019; Van Hedger et al., 2019).

A5.

Texture and Color

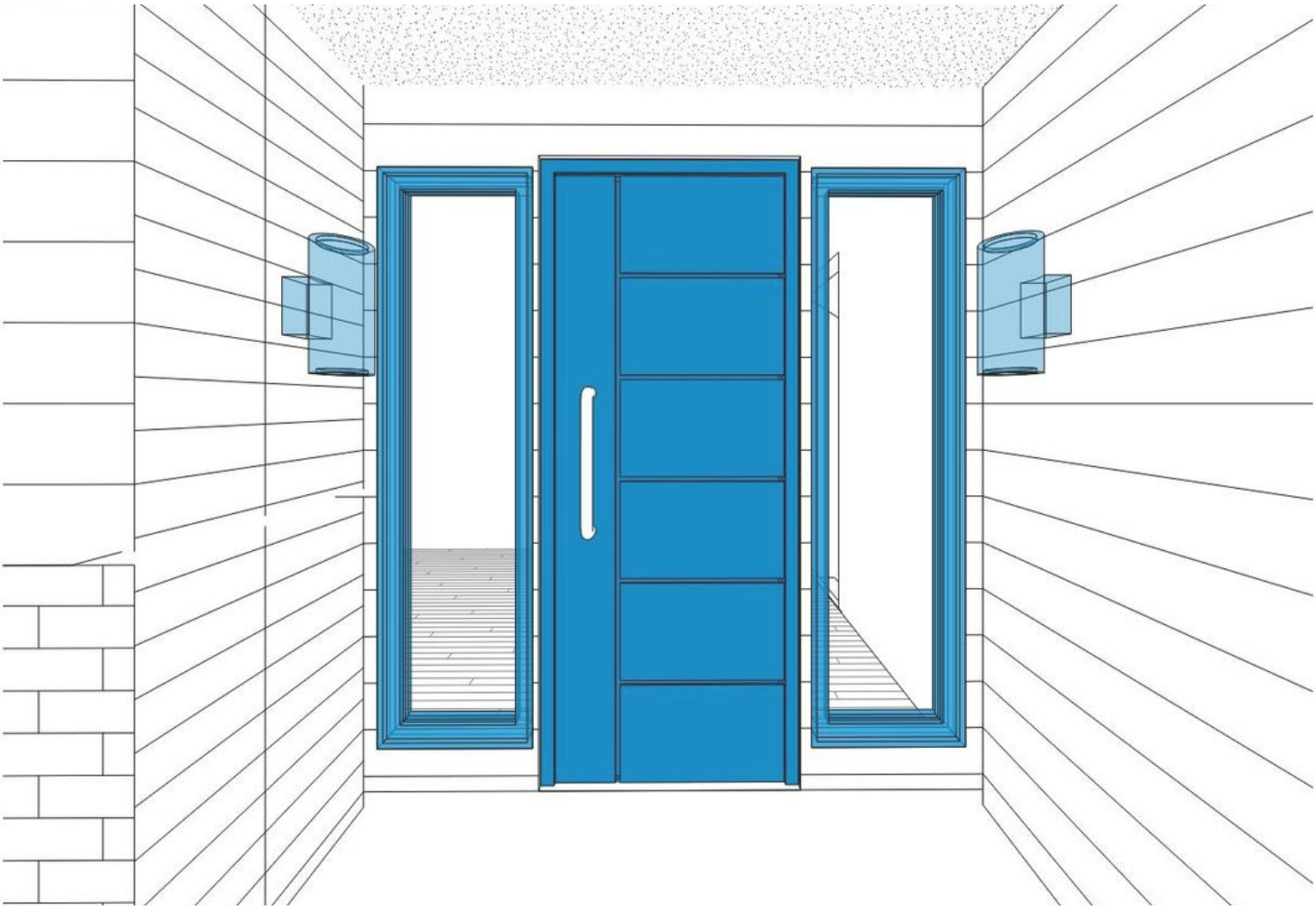
The influence of color on mood and mental well-being is a topic that has garnered considerable attention, but also controversy, in both psychological and architectural research. Regardless, different hues may evoke different emotional and psychological responses (Valdez & Mehrabian, 1994; Küller et al., 2006; Nasar & Devlin, 2011; Elliot & Maier, 2014; Fetterman & Robinson, 2015).

A6.

Ease of Use

Buildings following these development patterns will support high levels of diversity in terms of cognitive and physical abilities.(Marquardt G., 2001; Rabins et al., 2006; Callahan et al., 2012; Fellinger et. al, 2012; Alzheimer's Association, 2013; World Health Organization, 2013; Fortune et al., 2020)

A1. SAFETY



Building in safety and trust within the home is essential to creating supportive and healthy living spaces. Using the principles of trauma informed design, a sense of safety is ensured through spatial openness, unobstructed sightlines, and creating visual simplicity. Perceived safety is associated with better satisfaction and retention (Ettema & Schekkerman, 2016; Huefner et al., 2020). Physical safety is assured through thoughtful measures that safeguard health on a daily basis and in case of emergency.

1 Spatial Requirements

Create spaces that are well lit, acoustically separate, and predictable.

2 Windows

Windows provide light entering the living space, but also present special safety needs for different populations. Size and acoustic requirements can be found in the full pattern language.

3 Fire Safety

Along with acoustic controls, using fire resistant insulation between apartments/ private spaces increases safety and improves health.

4 Lockable Spaces

Giving users the ability to lock their personal space and secure their personal belongings (including important documents) is essential for a sense of security.

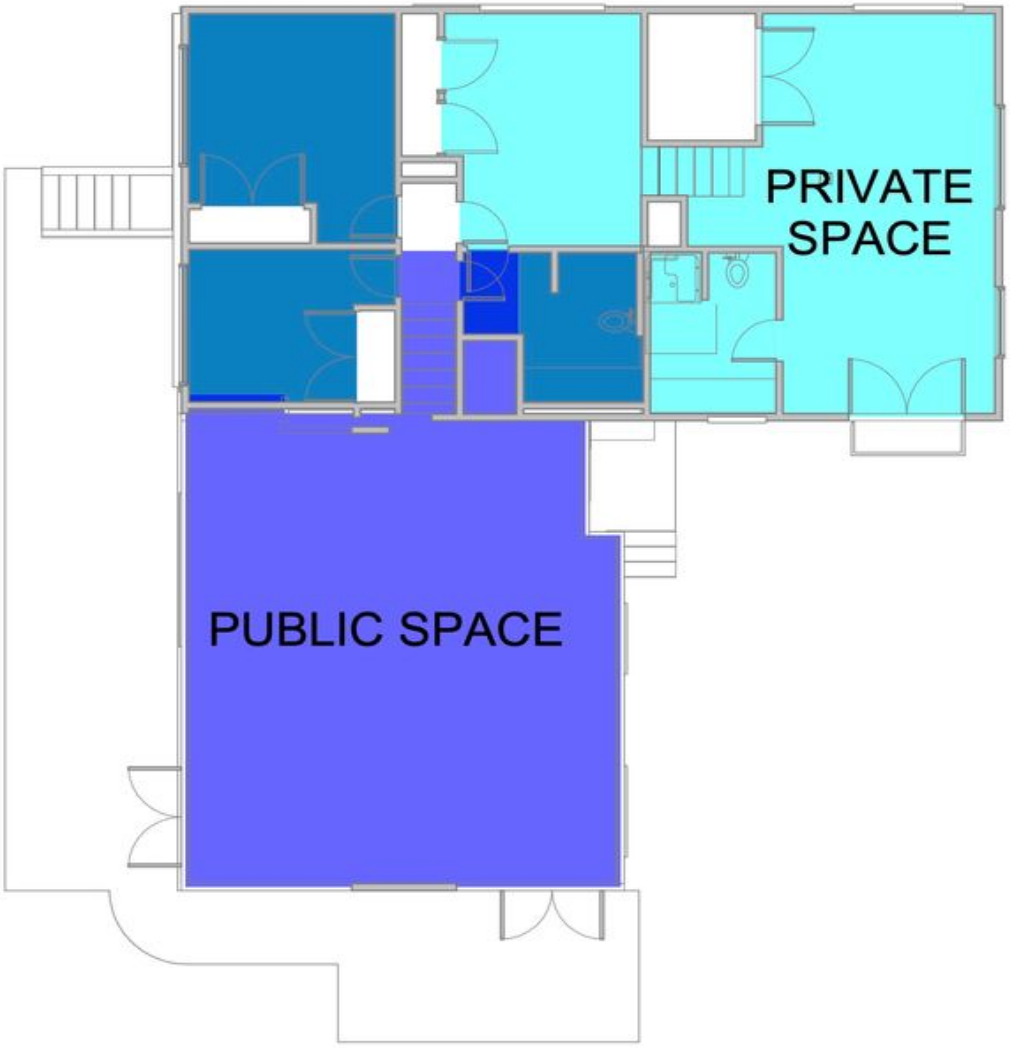
5 Disaster Resilience and Recovery

As communities grapple with the growing frequency and intensity of natural and human-made disasters, the need to integrate comprehensive disaster preparedness strategies into residential planning becomes an essential part of planning for safety and security.

6 Training and Safety Measures

Regular safety drills acquaint everyone with procedures, while continual staff training ensures familiarity with protocols.

A2. PRIVACY



Privacy is a fundamental aspect of human well-being and is essential to optimizing spaces such as healthcare facilities, workplaces, educational settings, and public spaces. This is especially important when non-related adults are living with one another (Torresin et al., 2022).

1. PHYSICAL SEPARATION

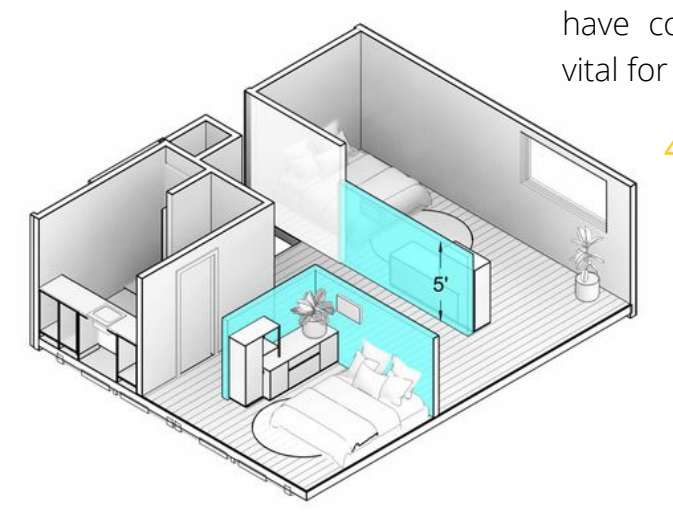
Designing spaces with physical barriers, such as walls, partitions, or dividers, can provide a sense of privacy by visually and acoustically separating individuals from their surroundings.

2. VISUAL PRIVACY

Visual privacy is achieved by using design strategies that prevent or minimize direct visual contact between individuals.

3. PERSONAL SPACE ALLOCATION

Designing spaces that allow individuals to have control over their personal space is vital for privacy.



4. SOUND CONTROL

Noise can significantly impact privacy. Employing sound-absorbing materials, acoustic treatments, or spatial planning techniques that minimize sound transmission can help create quieter environments and protect individuals' privacy.

5. LIGHTING DESIGN

Appropriate lighting design plays a crucial role in privacy. Balancing light levels and employing techniques like task lighting and zoning can help create areas of focus and promote privacy.

6. SOUNDSCAPES

Providing a soundscape audio device with nature-sounds or white noise can help increase privacy in conversations. (Soundscape Design).

7. CONFIDENTIALITY MEASURES

Implementing design features that support confidentiality is essential in environments where privacy is critical, such as healthcare settings.

A3. COMMUNAL SPACE

Communal spaces play a crucial role in promoting mental health and well-being within residential settings. These spaces provide opportunities for social interaction, connection, and a sense of belonging, which are essential for maintaining positive mental health outcomes (Joye, 2007; Gehl, 2013; O'Brien & Godschalk, 2016; Evans, 2019).

1. Assess User Needs:

Conduct surveys, interviews, or focus groups with residents to understand their preferences, needs, and expectations regarding communal spaces that promote healthy interactions.

2. Design and Layout Planning:

Arrange the communal spaces according to the intended purposes, ensuring safety accessibility, comfort, and aesthetic appeal.

Specific space types to consider include:

- **Common Kitchen**
- **Storage**
- **Eating Spaces**
- **Lounge Areas**
- **Library or Reading Space**
- **Music/Art Room or Piano in Lounge/ Conference Room**
- **Game Room**
- **Recreation Space**
- **Garden Space**

A4. NATURAL CONNECTION

Features that reflect natural patterns and create perceived or literal views can significantly ameliorate stress and increased recovery times. (Maas et al., 2009; Stigsdotter et al., 2010, MacKerron & Mourato, 2013, Beyer et al., 2014; Bratman et al., 2015; Hedblom et al., 2019; Van Hedger et al., 2019).

1. BIOPHILIA

Projects must incorporate elements nurturing the innate human-nature bond. Purposeful integration of nature through Environmental Features, Light and Space, and Natural Shapes and Forms

- Deliberate incorporation of nature's patterns through Natural Patterns and Processes and Evolved Human-Nature Relationships.

- Unique connectivity to the site, climate, and culture through Place-Based Relationships.

2. NATURE AND PLACE

Visual privacy is achieved by using design strategies that prevent or minimize direct visual contact between individuals.

3. VIEWS

Designing spaces that allow individuals to have control over their personal space is vital for privacy.

A5. TEXTURE AND COLOR

The influence of color on mood and mental well-being is a topic that has garnered considerable attention, but also controversy, in both psychological and architectural research. Regardless, different hues may evoke different emotional and psychological responses (Valdez & Mehrabian, 1994; Küller et al., 2006; Nasar & Devlin, 2011; Elliot & Maier, 2014; Fetterman & Robinson, 2015).

1. COORDINATE COLOR APPLICATIONS

with both 'Lighting for Impact" and 'Natural Connections' Patterns.

2. LIMIT DARK COLORS AND MONOTONE MATERIALS

Using the natural color system and engaging with consumer choice.

3. NATURAL TEXTURES

Select textures that use images of nature, connect to the native landscape around the building

4. REDUCE GLARE

Apply finishes to reduce glare and balance reflectance based on lighting plan and spatial needs.

5. UNIQUENESS IN PLACE, CLIMATE AND CULTURE

The project shall meaningfully incorporate public art while incorporating design facets exclusively for human delight and the celebration of culture, spirit, and place, harmonizing with its function and the native environment.

6. ARTFUL INTERIOR INTEGRATION

Incorporating artwork into interior spaces introduces visual intimacy.

7. ENHANCING ORIENTATION AND FAMILIARITY

Clear signage for orientation and color choice for reduced glare and clarity for navigation.

A6. EASE OF USE

Buildings following these development patterns will support high levels of diversity in terms of cognitive and physical abilities.(Marquardt G., 2001; Rabins et al., 2006; Callahan et al., 2012; Fellinger et. al, 2012; Alzheimer's Association, 2013; World Health Organization, 2013; Fortune et al., 2020)

1 Individual Usablity

Designs, regardless of occupancy type or age of building should meet the Principles of Universal design (United States Access Board), the Americans with Disabilities Act (ADA), and the Architectural Barriers Act (ABA) Accessibility Guidelines, or international equivalent.

2 Cleanable Surfaces

Resilient surfaces such as wainscot and stain resistant/ well aging materials are to be prioritized, maintaining cleanliness and safety for high-touch surfaces.

3 Wayfinding

Adding signs, color coding, appropriate lighting, views and art throughout a space enhances wayfinding by increasing spatial familiarity.

4 Variable Furniture

Provide a variety of size and types of furniture that can support multiple body types and any occupant disabilities.

5 Organizational Tools

Minimize clutter and create well organized environments, enhancing cleanliness and hygiene within the building.

6 Textural Sensitivity

Surfaces through the house should be pleasant to touch and pleasant to the eye. Smooth, soft and warm surfaces to be prioritized (ex: wood handle vs metal). Specific textural and stimuli management of household items to be discussed with the occupant during assessment.

7 Accessibility and Supports

All fixtures should comply with ADA standards for use.

B. Building Performance for User Wellness

The performance of the built environment can directly impact mental health (Nicol, Humphreys, & Roaf, 2012; Xu et al., 2020; Zhang, 2022). The patterns in this section focus on components of the built environment that involve materials and structural layout.

B1.

Lighting for Impact

Light plays a critical role in our mental and physical health by influencing our internal biological clocks, or circadian rhythms. Light exposure has an influence on mental health and human performance (Facer-Childs, et al., 2019; Bertani, et al., 2021) where it influences the occupant of the built environment (Evans, 2003).

B2.

Acoustic Environment

The performance of the built environment can directly impact mental health (Nicol, Humphreys, & Roaf, 2012; Xu et al., 2020; Zhang, 2022). The patterns in this section focus on components of the built environment that involve materials and structural layout.

B3.

Thermal Comfort

Thermal comfort is of paramount importance as it directly impacts our overall well-being and productivity (Nicol, Humphreys, & Roaf, 2012).

B4.

Materials

Research indicates that improving indoor air quality by using non-toxic or low-VOC building materials can have a positive effect on mental well-being (Wilson & Boehland, 2005; Tsunetsugu, Miyazaki, & Sato, 2007; Wargocki & Wyon, 2007; Li, 2010; Allen et al., 2016).

B5.

Air Quality

Poor indoor air quality, temperature extremes, and high humidity levels have been associated with adverse mental health outcomes (Satish et al., 2012; Xu et al., 2020). Improving air quality can lead to improved mental health and cognitive performance (Wargocki & Wyon, 2007; Li, 2010; Allen et al., 2016)

B6.

Water Quality

Poor water quality has been associated with increased rates of mental health problems including depression (copper, cadmium) and anxiety (manganese, iron, selenium) (Zhou et al., 2024).

B7.

Energy

Energy efficiency is an often overlooked area of disparities that affect health (Riva et al., 2023) and lead to cumulative stress (Liddell et al., 2015). Investments in energy performance are able to improve subjective wellbeing, especially in low-income areas (Poortinga et al., 2018).

B1. LIGHTING FOR IMPACT

Text?

1. LIGHTING LEVELS

Lighting should be held at levels appropriate to the task and time of day.

Task/Time	Brightness Range (Lux)	Color Temperature (K)
Morning Ambient	500-1000	3000-4000
Task Lighting	1000-2500	3500-4500
Afternoon Ambient	100-500	2700-3500
Evening Ambient	25-50	2700-3000

2. DAYLIGHT

Using a natural light-first approach, add windows to balance required indoor lighting needs with proper shading (exterior or interior) while reducing glare.

3. SHADING

For windows exceeding 0.55 square meters (6 square feet) in size, shading devices must automatically activate when light sensors detect that sunlight could lead to glare in interior space. Shading should have the ability to be adjusted by occupants at any time.

4. WINDOW SIZE/VIEWS

Install Windows, Skylights and lights that meet Energy Star requirements and provide views that are diverse and engaging for occupants.

5. CONTROLS

Every regularly occupied space must have operable windows that allow access to outdoor air and daylight, ensuring occupants can interact with their environment. This requirement considers both indoor and outdoor air quality.

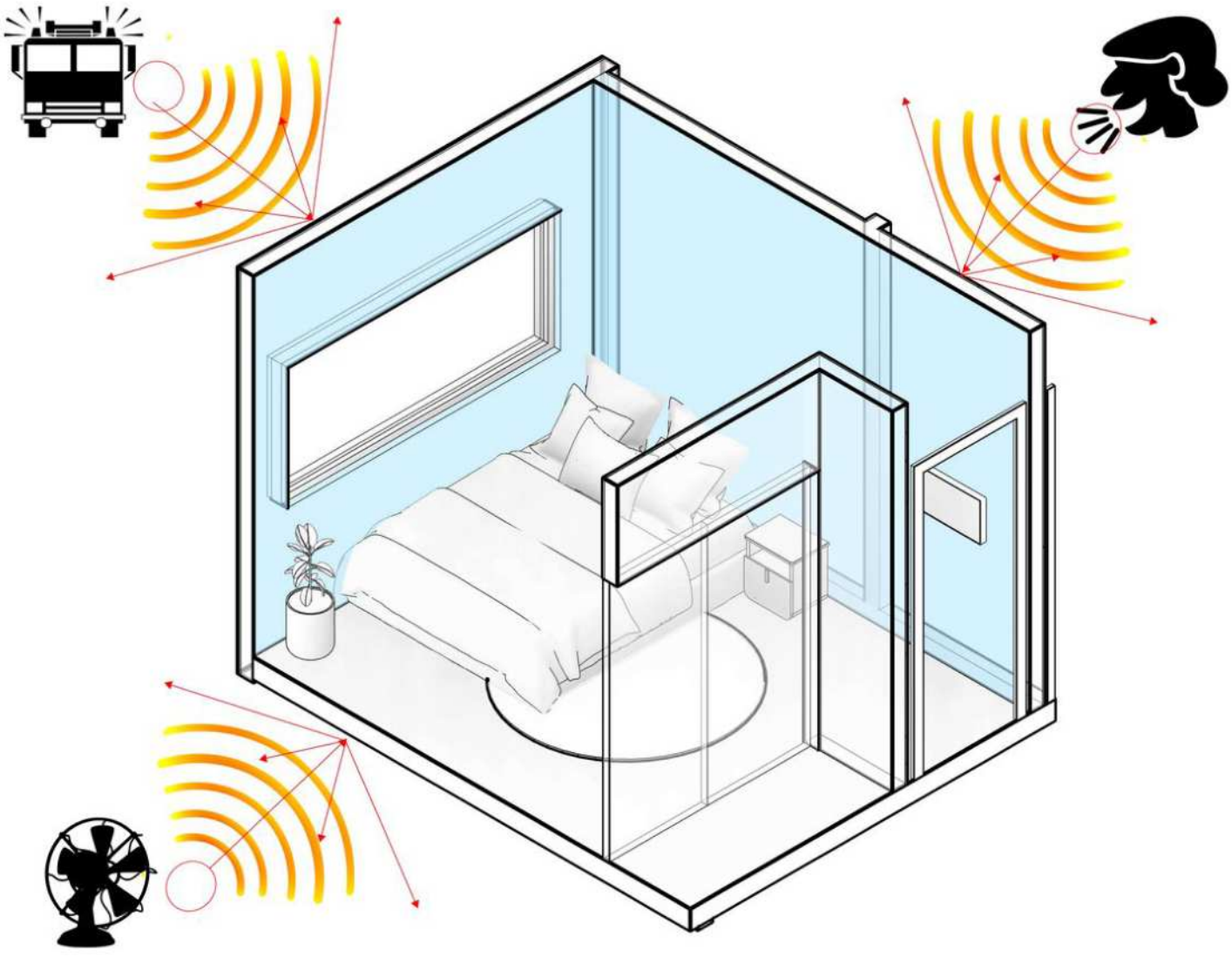
6. GLARE

Maintain a low Unified Glare Rating (UGR) of the electric lighting system and consider the degree of natural sunlight exposure

7. COLOR

Ensure consistent visible light transmittance between 400 and 650 nm, minimizing variations to maintain uniform lighting quality.

B2. ACOUSTIC ENVIRONMENT



There are several considerations for the sensory environment for those with mental disorders, including visual and auditory stimuli. For those with autism, migraine headaches, or seizure disorders, care must be taken to assure adequate soundproofing. Also repeating patterns should be avoided for these groups, but also in general.

1. Sound Masking Limits:

Sound pressure level from interior and exterior sounds should be uniform and maintained below 50 dBA, maintaining a peaceful indoor environment.

2. Sound Transmission:

Maintain reverberation time (RT60) of no more than 0.5-0.6 seconds to minimize noise

3: Mechanical Equipment Sound Levels:

The mechanical equipment system in various spaces must meet specific noise criteria (NC) levels once the interior build-out is complete. Different types of spaces, such as residences, private spaces, hospitals, and public areas, have specific recommended NC ranges.

Space	RC/NC
Residences, Apartments, Condominiums	25 to 35
Private Spaces	25 to 35
Living Room	25 to 30
Hospital Public Areas	35 to 40
Private Rooms	25 to 30
Wards	30 to 35
Operating Rooms	25 to 35

B3. THERMAL COMFORT

Thermal comfort is of paramount importance as it directly impacts our overall well-being and productivity (Nicol, Humphreys, & Roaf, 2012).

1. Thermal Comfort:

Maintain thermal comfort settings for indoor spaces for:

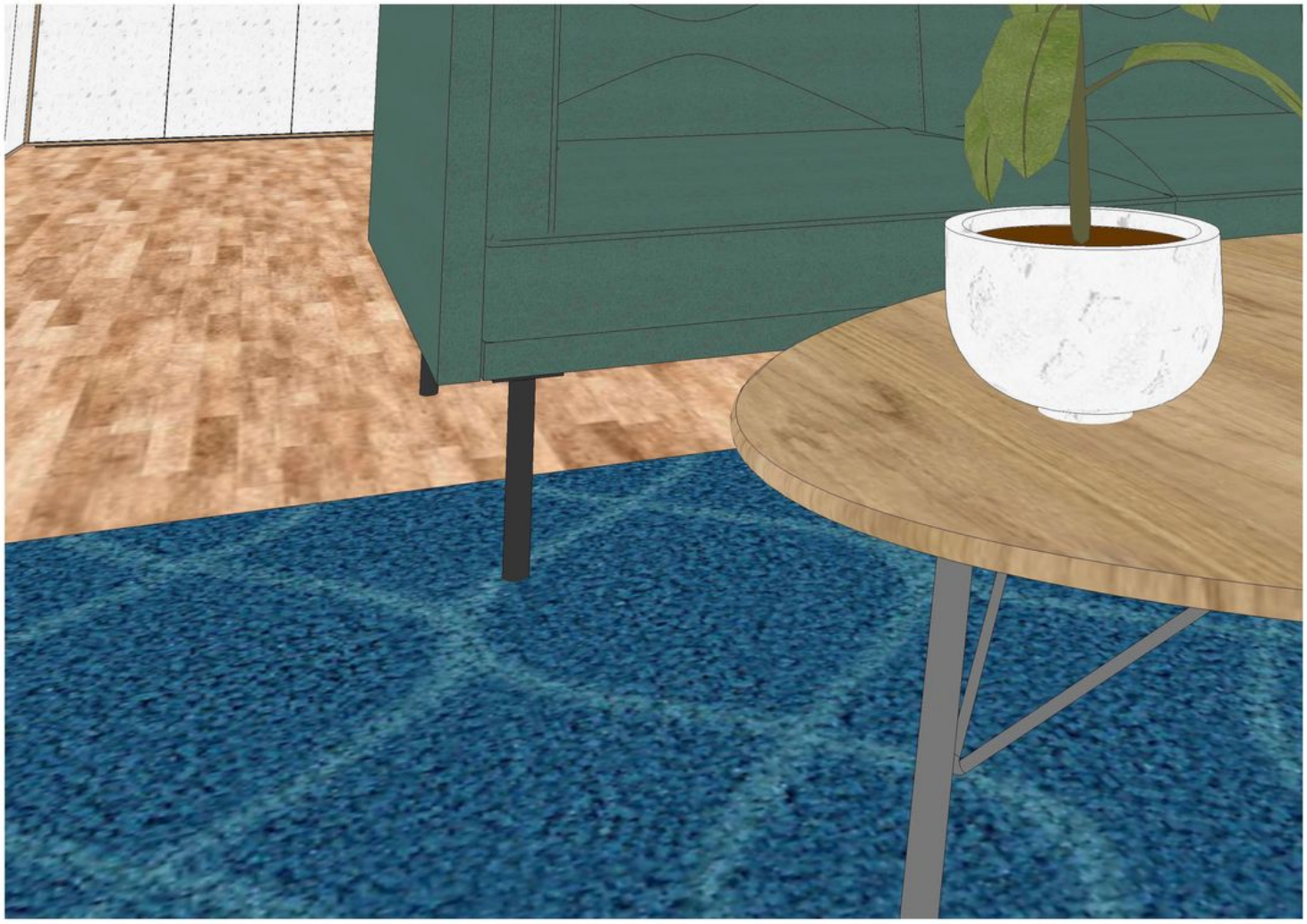
+ Performance of environmental conditions
    + Naturally conditioned spaces
    + Mixed mode (both HVAC and natural ventilation)
+ Humidity Control
+ Operable windows and individual comfort
+ Outdoor thermal comfort
    + Shading
    + Thermal perception and heat mitigation
+ Avoid excessive wind

2. Building Performance:

The following systems of the building must meet LEED v4 Rated Homes and Energy Star standards:

+ Ventilation
+ Insulation
+ Solar absorption and emittance
+ Doors
+ Skylights
+ Internal mass
+ Air infiltration
+ Envelope insulation
+ Windows
+ Space Heating and Cooling

B4. MATERIALS



Traditional building materials often contain volatile organic compounds (VOCs), formaldehyde, and other toxic substances that can off-gas into indoor air (Jones, 2011). Research indicates that improving indoor air quality by using non-toxic or low-VOC building materials can have a positive effect on mental well-being (Wilson & Boehland, 2005; Tsunetsugu, Miyazaki, & Sato, 2007; Wargocki & Wyon, 2007; Li, 2010; Allen et al., 2016).

1. Non-Toxic Products:

- Interior Paints and Coatings
- Interior Adhesives and Sealants
- Flooring
- Insulation
- Furniture and Furnishings
- Hazardous Material Restrictions
- Lead and Asbestos Abatement
- Polychlorinated Biphenyl Abatement
- Mercury Limitation
- Material Health Compliance

2. Circular Economy

Following the principals of “Cradle to Cradle”, ensure that at least 25% of products possess Material Health Certifications (described in more detail in full pattern language).

B5. AIR QUALITY

Poor indoor air quality, temperature extremes, and high humidity levels have been associated with adverse mental health outcomes (Satish et al., 2012; Xu et al., 2020). Improving air quality can lead to improved mental health and cognitive performance (Wargocki & Wyon, 2007; Li, 2010; Allen et al., 2016)

1. ENTRANCE:

Should capture particulates from occupant shoes at all frequently used entrances, with weekly maintenance.

a. Entryway Air Seal: To control the movement of outdoor air into mechanically ventilated main building entrances

2. SMOKE AND DRUG USE REQUIREMENTS:

to assure safety of occupants without limiting the autonomy and personal choice of individual occupants.

3. MECHANICAL VENTILATION

- For all spaces: must meet ASHRAE Requirements (see full pattern language)
- Demand Controlled Ventilation for larger spaces
- Cooling Coil Mold Reduction
- Humidity Control
- System Performance Requirements: Computational Fluid Dynamics analysis for the displacement ventilation system.

4. AIR EXCHANGES AND FILTRATION:

- Air Exchanges
- Outdoor Air
- Air Infiltration Management
- Fresh Air
- Air Filtration

5. VOC, PARTICULATE MATTER, INORGANIC GASSES AND MOLD

The project shall meaningfully incorporate public art while incorporating design facets exclusively for human delight and the celebration of culture, spirit, and place, harmonizing with its function and the native environment. (See chart)

Contaminant	Restricted to Less Than:
Air	
Total volatile organic compounds	500 µg/m³
Carbon monoxide	9 ppm
PM2.5	15 µg/m³
PM10	50 µg/m³
Ozone	51 ppb
Radon	4 pCi/L*
Formaldehyde	27 ppb
Materials	
Perfluorinated Compounds in furniture/finishings	100 ppm
Flame Retardants	0.01% (100 ppm)**
Phthalate (Plasticizers, PVC)	0.01% (100 ppm)
Isocyanate-Based Polyurethane in interior finishes	Avoid
Urea-formaldehyde in furniture, composite wood products, laminating adhesives, resins, and thermal insulation	100 ppm

*in the lowest occupied level
**as allowed by local codes

6. AIR QUALITY MONITORING

Incorporating artwork into interior spaces introduces visual intimacy.

7. CLEANING PROTOCOL AND CLEANABILITY

- Direct Source Ventilation
- Pesticide Management
- Sanitation

8. CONSTRUCTION MEASURES

- Duct Protection
- Filter Replacement
- Moisture Absorption Management
- Dust Containment and Removal
- Construction Equipment Reduce particulate matter emissions from construction equipment and locate equipment away from building air intakes.

B6. WATER QUALITY

Poor water quality has been associated with increased rates of mental health problems including depression (copper, cadmium) and anxiety (manganese, iron, selenium) (Zhou et al., 2024).

1. EXTERIOR LIQUID WATER MANAGEMENT

• Site drainage, including the impact of any site irrigation.
• Protecting the local water table.
• Protecting the building from water.

2. WATER SOURCING:

including collected precipitation

3. ONSITE NON-POTABLE WATER REUSE

4. BASIC WATER MANAGEMENT

Install Windows, Skylights and lights that meet Energy Star requirements and provide views that are diverse and engaging for occupants.

5. EFFICIENT HOT WATER DISTRIBUTION AND EQUIPMENT

6. DRINKING WATER QUALITY

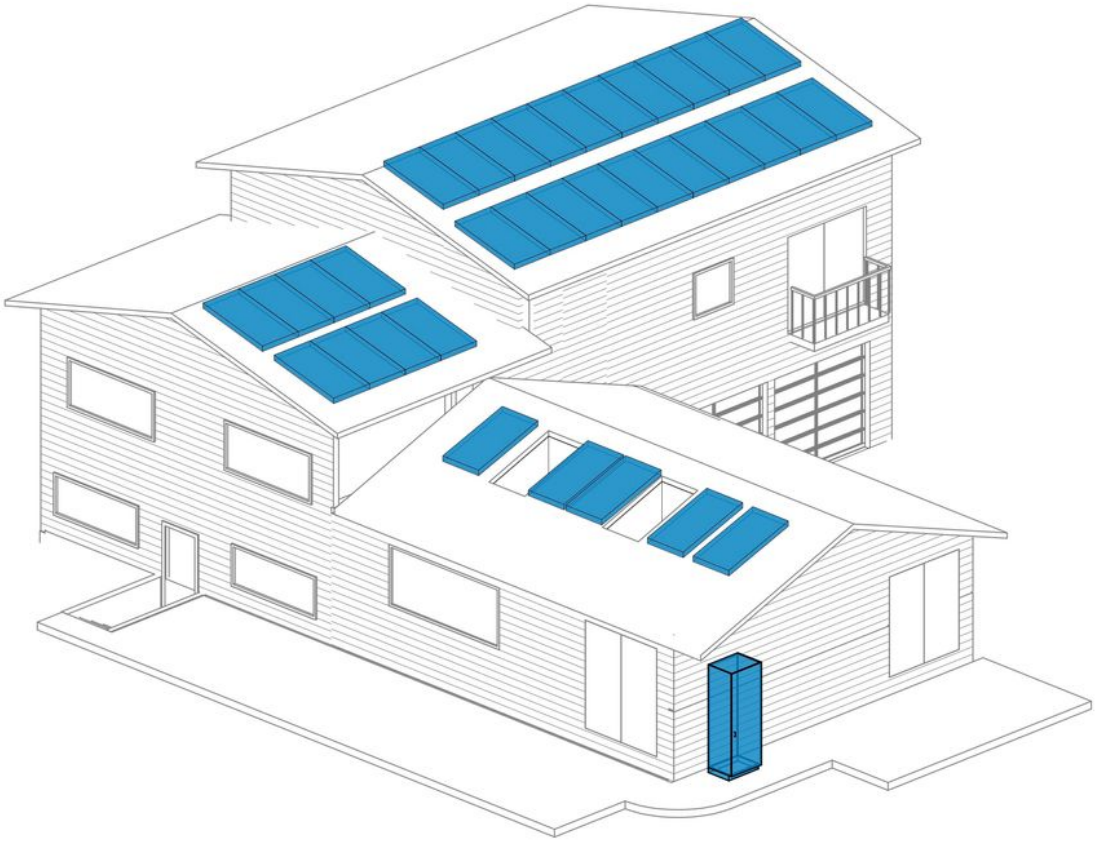
7. CHEMICAL REQUIREMENTS

for drinking water quality (see table) and regular water testing.

Contaminant	Restricted to Less Than:
Metal contaminants	
Lead	0.01 mg/L
Arsenic	0.01 mg/L.
Antimony	0.006 mg/L.
Mercury	0.002 mg/L
Nickel	0.012 mg/L
Copper	1.0 mg/L
Water additives	
Chlorine	0.6 mg/L
Chloramine	4 mg/L
Trihalomethanes	0.08 mg/L
Haloacetic acids	0.6 mg/L
Fluoride	4.0 mg/L
Organic contaminants and pesticides	
Atrazine	0.001 mg/L
Simazine	0.002 mg/L
Glyphosate	0.70 mg/L
2,4-Dichlorophenoxyacetic acid	0.07 mg/L
Nitrates	10 mg/L nitrogen
Styrene	0.0005 mg/L
Benzene	0.001 mg/L
Ethylbenzene	0.3 mg/L
PCBs	0.0005 mg/L
Vinyl chloride	0.002 mg/L
Toluene	0.15 mg/L
Xylene	0.5 mg/L
Tetrachloroethylene	0.005 mg/L

8. SUPPORTING EFFECTIVE HAND WASHING

B7. ENERGY



Energy-efficient buildings often employ technologies and designs that not only reduce energy consumption but also create a more physically and mentally healthful indoor environment (Wargocki, Wyon, Baik, Clausen, & Fanger, 1999; Kats, Alevantis, Berman, Mills, & Perlman, 2003, Figueiro, Steverson, Heerwagen, Kampschroer, & Rea, 2017; Allen et al., 2016). Energy efficiency is an often overlooked area of disparities that affect health (Riva et al., 2023) and lead to cumulative stress (Liddell et al., 2015). Investments in energy performance are able to improve subjective wellbeing, especially in low-income areas (Poortinga et al., 2018).

1. ENERGY, CARBON AND REFRIGERANT REDUCTION

	New Building	Existing Building	Interior
Energy Performance Requirement	70% reduction from an equivalent building baseline	50% reduction from an equivalent building baseline	35% reduction from an equivalent building baseline
Combustion Limits	Not allowed (except through existing exceptions)	Allowed for HVAC systems that are not in project scope. Phase out plan and advocacy are required.	
Renewables	Must be on-site to count toward efficiencies above		

Table 7-1: Energy Use Reduction Requirements Per Living Building Challenge

2. "ZERO READY" DESIGN:

All projects must be designed to be "zero ready," which includes designating specific areas and/or pre-installing wiring and connections to facilitate both electric vehicle charging and the future installation of renewable energy systems. (LBC 4.0, LEED v4 HOMES)

a. Building Orientation for Passive Solar(LEED v4 HOMES)

3. GRID HARMONIZATION (LEED V4.1)

For windows exceeding 0.55 square meters (6 square feet) in size, shading devices must automatically activate when light sensors detect that sunlight could lead to glare in interior space. Shading should have the ability to be adjusted by occupants at any time.

4. LIGHTING AND HIGH EFFICIENCY APPLIANCES:

Compliance with Energy Star

5. MINIMUM ENERGY PERFORMANCE

Compliance with LEED (v4.1)

5. GENERAL ENERGY PERFORMANCE

Meet the requirements of ENERGY STAR for Homes, version 3 (LEED v4 HOMES)

7. ENERGY PERFORMANCE FOR MIDRISE BUIDINGS:

Compliance with EED v4 HOMES

8. WHOLE-BUILDING Energy Simulation:

Demonstrate a 5% improvement over the baseline building performance rating.

9. ENERGY METERING

10. ENERGY COMMISSIONING (LEED V4.1)

11. EDUCATION OF HOMEOWNER, TENANT OR BUILDING MANAGER (LEED V4 HOMES)

C. Smart Systems

The advent of smart systems has opened up unprecedented opportunities for enhancing mental health care, offering a fusion of technology and psychology that promises to revolutionize both diagnosis and treatment. Non-intrusive sensors provide real-time insights into an individual's mental state without requiring active engagement (Kumar et al., 2013).

Ambient sound design is another significant aspect of these smart systems, reducing unwanted noise and the incorporation of pleasant sounds (or even white

noise) can create environments conducive to mental well-being and even cognitive performance, making them a vital element in a holistic approach to mental health (Boyce, Hunter, & Howlett, 2003; Yang & Kang, 2005; Axelsson et al., 2010).

Ecological momentary assessment (EMA) is a tool to measure in vivo mental health symptoms, reducing recall bias (Ebner-Priemer & Trull, 2009; Kramer et al., 2014; Gromatsky et al., 2020; Klein et al., 2021) and offering an opportunity to train sensor datasets for AI interpretation and feedback..

Artificial intelligence (AI)-based feedback loops promise to tie these elements together by analyzing the multifaceted data to provide actionable insights. Whether it's identifying patterns that may signify the onset of a depressive episode or offering adaptive coping strategies, AI algorithms are becoming increasingly proficient at providing real-time, personalized guidance (Martínez-Pérez, de la Torre-Díez, & López-Coronado, 2015).

C1.

Non-Intrusive Sensor Design

Non-intrusive sensors enable continuous, real-time data collection, providing a more accurate and objective assessment of individuals' mental health parameters compared to self-reporting (Chowdhury et al., 2017). Secondly, sensor data can help identify patterns, trends, and triggers related to mental health symptoms, reducing recall bias (Insel et al., 2016) and facilitating personalized interventions and treatment planning.

C2.

Soundscape Design

Research has shown that soundscapes, especially those inspired by nature and "spa" environments, have the potential to reduce stress, promote relaxation, and enhance well-being (Annerstedt et al., 2013; Nilsson et al., 2010). By incorporating soundscapes into living and sleeping spaces, individuals can benefit from a calming environment that helps alleviate moments of overstimulation and fosters a sense of tranquility.

C3.

EMA and User Interface

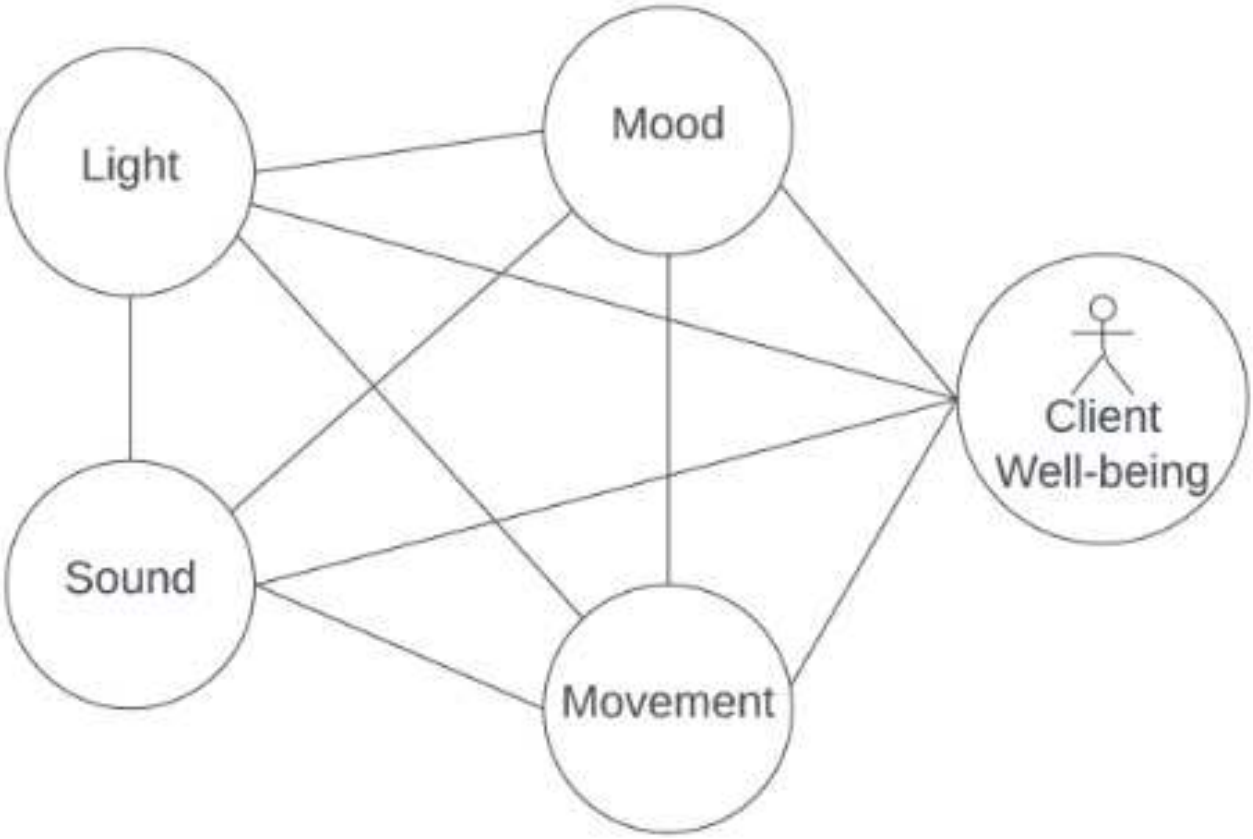
Ecological Momentary Assessment (EMA) involves the collection of repeated measures and observations of individuals' behaviors, experiences, and psychological states in their everyday lives. This approach provides a unique opportunity to understand the dynamic nature of mental health symptoms and their contextual influences.

C4.

Artificial Intelligence Feedback Loop

Feedback Loop...

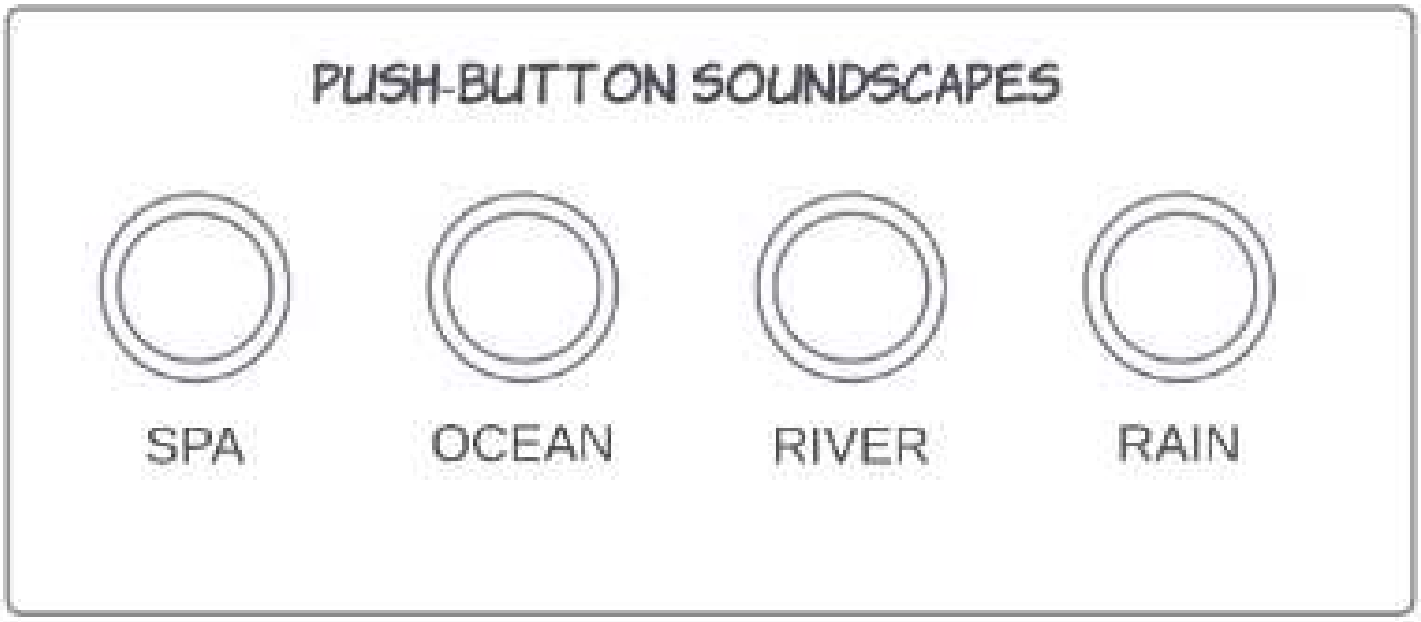
C1. NON-INTRUSIVE SENSOR DESIGN



The integration of sensors for mental health monitoring offers several benefits. Non-intrusive sensors enable continuous, real-time data collection, providing a more accurate and objective assessment of individuals' mental health parameters compared to self-reporting (Chowdhury et al., 2017). Secondly, sensor data can help identify patterns, trends, and triggers related to mental health symptoms, reducing recall bias (Insel et al., 2016) and facilitating personalized interventions and treatment planning.

1. **NEEDS ASSESSMENT:**
   Identify mental health monitoring goals and requirements through a comprehensive needs assessment.
2. **SELECTION OF SENSOR TYPES:**
   Choose suitable sensors, like movement detectors and light sensors, based on monitoring needs.
3. **SENSOR PLACEMENT AND INSTALLATION:**
   Install sensors in strategic locations, considering privacy and accuracy.
4. **DATA COLLECTION AND TRANMISSION:**
   Set up secure and reliable systems for collecting and transmitting sensor data.
5. **EMA ASSESSMENT INTEGRATION:**
   Incorporate real-time Ecological Momentary Assessments for detailed monitoring.
6. **INTEGRATION WITH EXISTING SYSTEMS:**
   Connect sensor data with existing health records for a holistic health view.
7. **DATA ANALYSIS AND INTERPRETATION:**
   Use algorithms and tools to process sensor data and extract actionable insights.
8. **VALIDATION AND CALIBRATION:**
   Ensure sensor accuracy through regular validation and calibration.
9. **STAKEHOLDER ENGAGEMENT AND TRAINING:**
   Involve and train stakeholders in using and understanding the sensor system.
10. **ETHICAL CONSIDERATIONS AND INFORMED CONSENT:** Address ethical issues and obtain informed consent for data collection.
11. **EVALUATION AND CONTINUOUS IMPROVEMENT:**
    Continually assess and refine the sensor system for optimal mental health monitoring.

C2. SOUNDSCAPE DESIGN



Research has shown that soundscapes, especially those inspired by nature and "spa" environments, have the potential to reduce stress, promote relaxation, and enhance well-being (Annerstedt et al., 2013; Nilsson et al., 2010). By incorporating soundscapes into living and sleeping spaces, individuals can benefit from a calming environment that helps alleviate moments of overstimulation and fosters a sense of tranquility.

1 Electronics

A specially designed computer system controls a curated collection of nature and ”spa” sounds that promote relaxation and a calming environment.

2 Control Layers

Ensure that the placement of controls is intuitive and easily understandable for individuals of varying cognitive abilities.

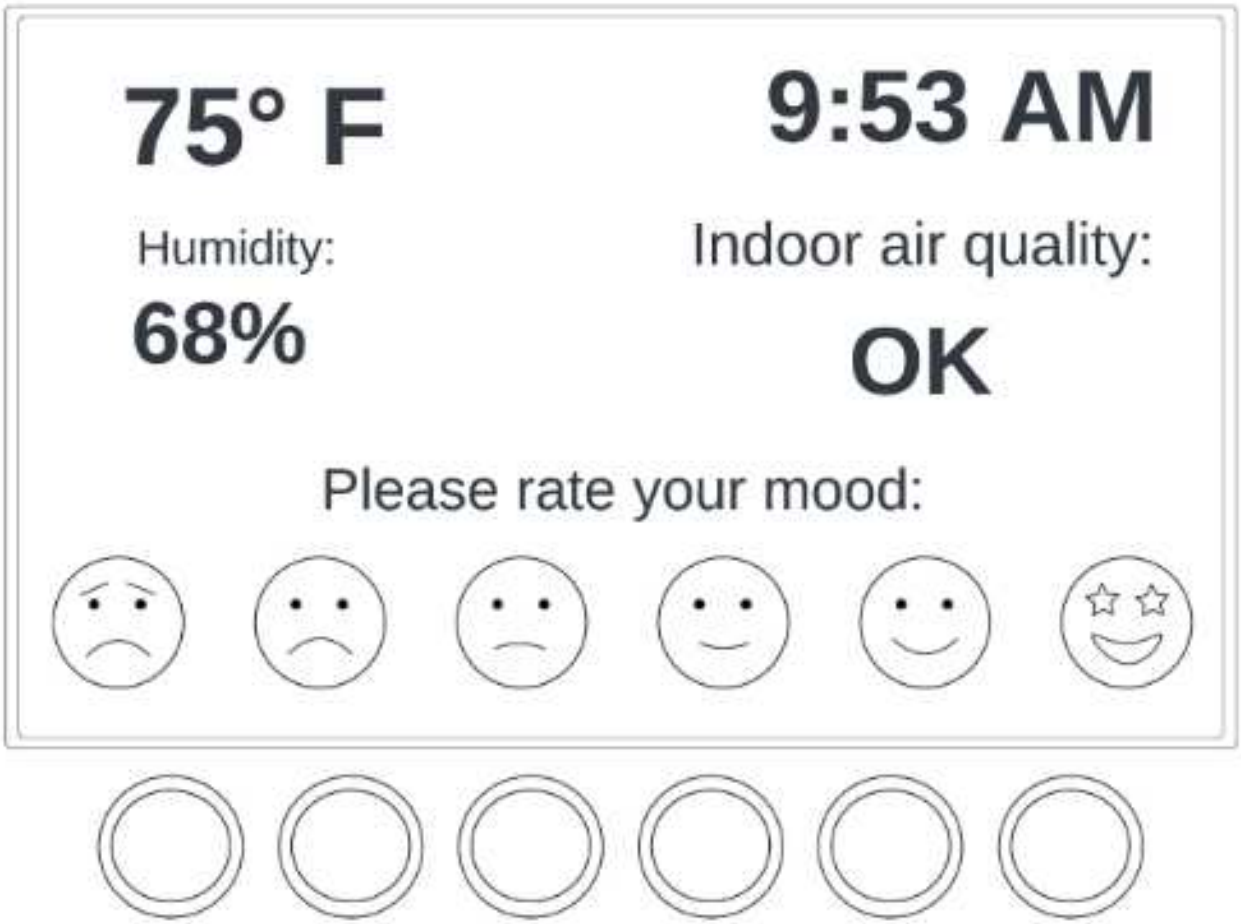
3 Audio Playback

is continuous until it is stopped by the user

4 Placement of Speakers

Determine the optimal locations for installing the speakers in the living and sleeping spaces.

C3. EMA AND USER INTERFACE DESIGN



Ecological Momentary Assessment (EMA) involves the collection of repeated measures and observations of individuals' behaviors, experiences, and psychological states in their everyday lives. This approach provides a unique opportunity to understand the dynamic nature of mental health symptoms and their contextual influences. By capturing data in real-time, EMA minimizes recall biases and provides a more accurate representation of individuals' experiences compared to retrospective assessments (Ebner-Priemer & Trull, 2009; Kramer et al., 2014; Gromatsky et al., 2020; Klein et al., 2021).

One such implementation is a patent-pending method for EMA within the built environment by Martinez et al. (A CLOSED-LOOP SYSTEM WITHIN THE BUILT ENVIRONMENT FOR PATIENT MONITORING AND INTERVENTION). This method uses a series of push buttons on a wall panel allowing for ease of use. The system uses the Discrete Mood Scale, a series of six levels of mood rating, notably without a "middle" value to force a more thoughtful response (Martinez, 2023).

1. DEFINE OBJECTIVES

including whether research instruments are being used for validation

2. SYSTEM DESIGN:

Understand the components and functionalities of the system, such as the wall panel with push buttons and the Discrete Mood Scale.

3. USER INTERFACE AND SOUNDSCAPES:

A visually intuitive interface with clear instructions is critical.

4. SOUNDSCAPES

such as nature sounds, white noise, pink noise, and brown noise, can be activated through the user interface.

5. DATA COLLECTION AND TRACKING

6. PILOT TEST AND REFINE:

Conduct a pilot test of the implemented EMA system within the built environment

7. DATA ANALYSIS AND ASSESSMENT

Analyze the collected data to assess the impact of the implemented EMA system on mental health outcomes.

8. FEEDBACK AND INTERVENTION LOOP

Utilize the data collected from the EMA system to provide feedback and interventions to individuals based on their assessed mood and usage patterns. Develop protocols or algorithms that guide the delivery of personalized interventions or recommendations to promote wellness and address specific mental health concerns.

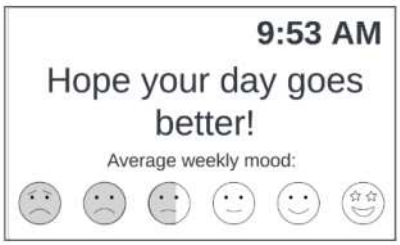


Figure. User Interface after Negative Mood Report

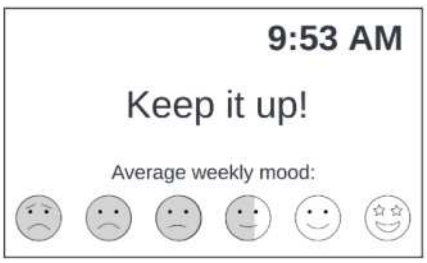


Figure. User Interface after Positive Mood Report

C4. ARTIFICIAL INTELLIGENCE FEEDBACK LOOP

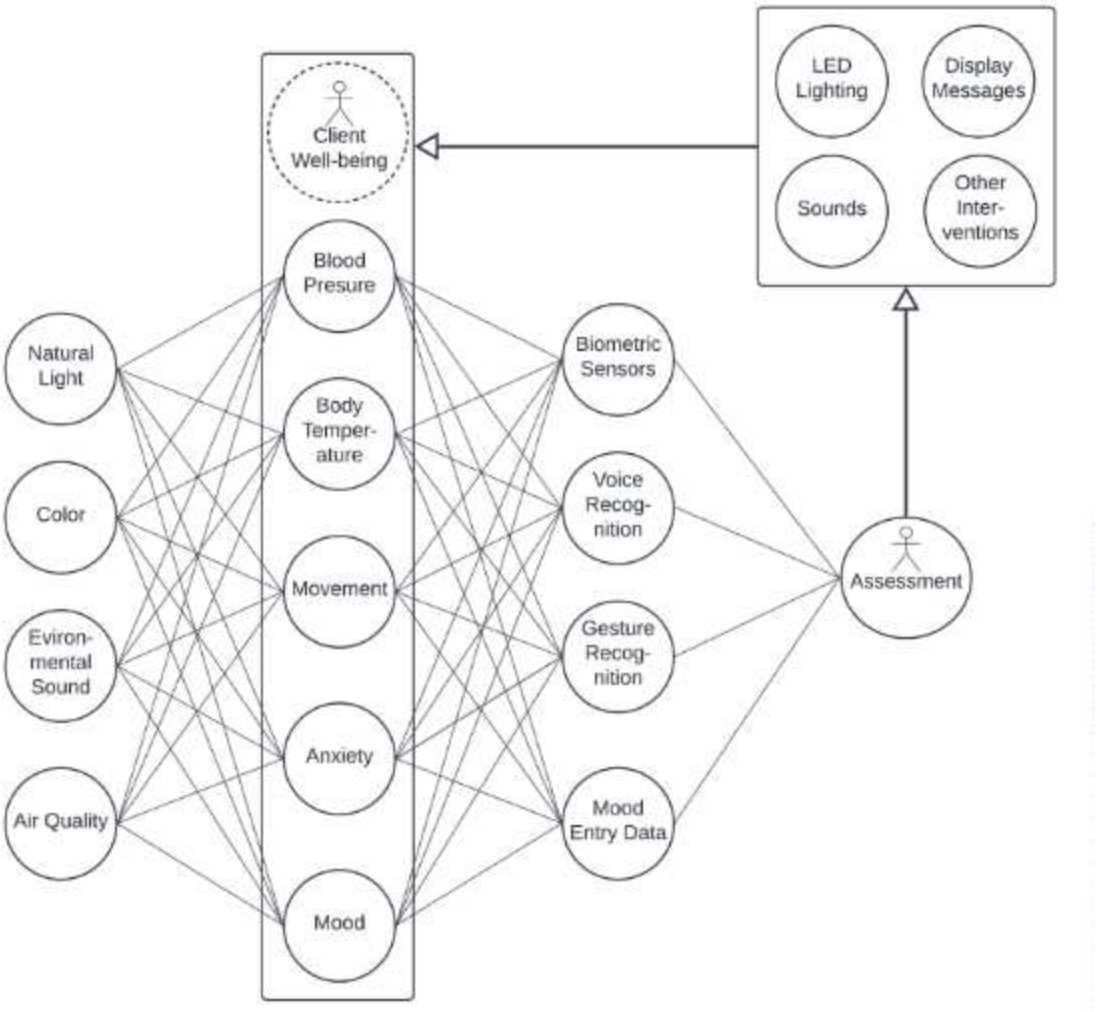


Figure. AI paradigm using various inputs for mental health monitoring. From Martinez et al., A Closed-loop System within the Built Environment for Patient Monitoring and Intervention.
Patent Pending.

1 Define Objectives and Scope

Establish the goals, health parameters to monitor, and desired intervention outcomes.

2 Select Sensors and Devices

Choose suitable sensors like ultrasonic and ambient light sensors to collect diverse patient data.

3 Develop Data Collection Infrastructure

Create a secure and scalable infrastructure for real-time patient data collection and storage.

4 Implement Machine Learning Algorithms

Use machine learning, such as GANs, to analyze patient data and generate assessments.

5 Develop Intervention Strategies

Design real-time, customizable interventions based on data analysis to promote wellness.

6 Optimize and Validate the System

Refine the system and validate its effectiveness through testing and user feedback.

7 Establish Communication and Reporting Mechanisms

Set up secure communication channels to share patient information with healthcare providers.

8 Monitor and Evaluate System Performance

Continuously assess the system's impact on patient outcomes and refine based on feedback.

D. Special Conditions

Here we use insights from psychology, neurobiology, and architecture to create spaces that facilitate healing (Benjet et al., 2016; Nash & Watson, 2012; Norris et al., 2002; SAMHSA, 2014; Samuelson et al., 2017).

D1.

Residential Mental Health Facilities

Several considerations should be made when designing for a residential mental health setting (Hamer, 2019; Shepley et al., 2019). Many individuals recovering from a mental disorder preferred living arrangements that offered shared living spaces and opportunities for social interaction (Whiteford et al., 2000; Sperber et al., 2018). Additionally, research on environmental psychology has highlighted the benefits of transparency and open layouts (Zeisel and Buckeridge, 2001; Joye et al., 2010).

D2.

Designing for Cognitive Dysfunction

Addressing the needs of individuals with cognitive challenges such as dementia, ADHD, and executive function difficulties in residential settings enhances their well-being and functionality. For dementia, clear signage and reorientation devices like calendars and clocks aid navigation and orientation and clear displays of names lead to improved wellbeing and social functioning (Gitlin et al., 2014; Lancioni et al., 2013). ADHD support includes calendars for task management and decluttering aids to improve focus (Zylowska et al., 2008; Puryear, 2017).

D3.

Designing for Mood Disorders

Living environments tuned to support those with mood disorders involves reducing potential triggers and promoting well-being by incorporating nature-inspired elements (Ulrich, 1984; Stigsdotter et al., 2010). Ample natural light and indirect lighting methods such as skylights enhance mood and alertness (Boubekri et al., 2014; Heschong, 2003; Viola et al., 2017) and support healthy circadian rhythms while stabilizing mood (Boyce et al., 2017).

D1. RESIDENTIAL MENTAL HEALTH

Several considerations should be made when designing for a residential mental health setting (Hamer, 2019; Shepley et al., 2019). Many individuals recovering from a mental disorder preferred living arrangements that offered shared living spaces and opportunities for social interaction (Whiteford et al., 2000; Sperber et al., 2018). Additionally, research on environmental psychology has highlighted the benefits of transparency and open layouts (Zeisel and Buckeridge, 2001; Joye et al., 2010).

1. SAFETY MEASURES

Features like controlled access and anti-ligature fixtures enhance resident safety and prevent harm.

2. PRIVACY AND PERSONAL SPACE

Designs ensure private rooms and personal space with features like en-suite bathrooms for resident privacy.

3. OPEN SPACE

Open areas with multiple beds allow for staff visibility and increased monitoring of residents.

4. Open Barrier

Partial-height barriers offer sleeping area privacy while maintaining staff monitoring capabilities.

5. Shared Room

Provides more privacy than open spaces and facilitates resident interaction.

6. Private Room

Reserved for stable residents or as a reward, offering maximum privacy and accommodating disruptive individuals.

7. Therapeutic Spaces

Dedicated areas for therapy are designed with calming colors and comfortable furnishings to support emotional well-being.

8. Flexibility and Adaptability

Modular and movable design elements allow for space reconfiguration to meet changing needs and preferences.

9. SUPPORTIVE ENVIRONMENTS

Communal spaces promote social engagement and a sense of community through thoughtful design.

10.THERAPEUTIC GARDENS AND Outdoor Spaces

Outdoor areas and therapeutic gardens offer nature connection, stress reduction, and emotional restoration.

11. SENSORY CONSIDERATIONS

Attention to lighting, acoustics, and materials creates calming spaces that minimize sensory overload.

D2. DESIGNING FOR COGNITIVE DYSFUNCTION

Addressing the needs of individuals with cognitive challenges such as dementia, ADHD, and executive function difficulties in residential settings enhances their well-being and functionality. For dementia, clear signage and reorientation devices like calendars and clocks aid navigation and orientation and clear displays of names lead to improved wellbeing and social functioning (Gitlin et al., 2014; Lancioni et al., 2013). ADHD support includes calendars for task management and decluttering aids to improve focus (Zylowska et al., 2008; Puryear, 2017).

1. CONDUCT A NEEDS ASSESSMENT

Assess challenges and needs involving stakeholders to understand cognitive difficulties and environmental barriers.

2. IDENTIFY KEY AREAS FOR MODIFICATION

Determine environment sections like living and common areas that need changes for cognitive support.

3. SIMPLIFY AND ORGANIZE THE ENVIRONMENT

Reduce clutter, use clear signage, and organize belongings intuitively to aid navigation.

4. ENHANCE SAFETY MEASURES

Incorporate safety features like handrails and non-slip surfaces to minimize risks for cognitive dysfunction individuals.

5. PROMOTE ORIENTATION AND MEMORY SUPPORT

Use clocks, calendars, and memory aids to assist with orientation and daily routines.

6. OPTIMIZE WAYFINDING

Improve navigation with consistent signage, color-coded paths, and landmarks to reduce confusion.

7. STAFF TRAINING AND SUPPORT

Train caregivers on communication techniques and strategies to support individuals' independence effectively.

8. ONGOING EVALUATION AND ADJUSTMENTS

Continuously assess and adjust the environment based on feedback to better support cognitive dysfunction individuals.

D 3.

Addressing the needs of individuals with cognitive challenges such as dementia, ADHD, and executive function difficulties in residential settings enhances their well-being and functionality. For dementia, clear signage and reorientation devices like calendars and clocks aid navigation and orientation and clear displays of names lead to improved wellbeing and social functioning (Gitlin et al., 2014; Lancioni et al., 2013). ADHD support includes calendars for task management and decluttering aids to improve focus (Zylowska et al., 2008; Puryear, 2017).

D4.PERSONAL DOCK

E. Assessment

Assessment includes evaluation of the site, before and after development, as well as evaluation of the impact on its residents.

E1.

Existing Conditions Assessment

Conducting a site investigation before starting a development project is indispensable. It provides a comprehensive understanding of the site's physical attributes, including soil quality, geology, and environmental factors, guiding design decisions.

E2.

Post-Occupancy Assessment

This assessment involves collecting data, feedback, and observations from both users and professionals to understand how the built environment supports mental health.

E3.

Mental Health Needs Assessment

A thorough needs assessment can help identify the specific mental health needs of the population you aim to serve, available resources, and gaps that the facility could fill.

E4.

Assessing Mental Health Impact

These measures often rely on validated scales, such as the Patient Health Questionnaire-9 (PHQ-9) (Kronke et al., 2001, 2002; Levis et al., 2019). Ecological Momentary Assessment (EMA): a method of collecting real-time data on individuals' behaviors, experiences, and psychological states in their natural environments. It involves using mobile devices or other technologies to prompt participants to report on their mental health, mood, and environmental perceptions in real-time and in context (Shiffman et al., 2008).

Talk to us:

Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt.

Mailing Address
Phone Number -

info@laicommunities.com