Therapeutic Interior Design by concentration on Plan, Color, and Daylight Strategies for Mental Well-Being and Lower Operational Energy for Housing in Canada

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Abstract

Rising depression, anxiety, and social isolation in Canada, particularly in cold, low-daylight, and high-stress urban environments, suggest the need for housing approaches that support emotional regulation while advancing decarbonization objectives. Drawing on environmental psychology and architectural theory, including the inward, light-driven spatial logic exemplified by Tadao Ando's residential work, this paper proposes that interior architectural quality, specifically plan configuration and interior color strategy, can be intentionally designed to transform the dwelling into a therapeutic environment. In highly insulated and airtight homes, where envelope losses are minimized, occupant behavior becomes a dominant determinant of operational energy. The paper therefore frames architectural quality as a behavioral mediator that reduces overstimulation, increases perceived control and comfort acceptance, and lowers system interventions (thermostat changes, excessive lighting, and diffuse heating). A parallel carbon trade-off is analyzed: increased time at home may raise residential energy demand, yet reduced non-essential trips can lower transportation emissions. The paper concludes that a "therapeutic low-energy home" represents a realistic balance point where mental health co-benefits align with net carbon reduction.

1. Introduction

Canada's housing context involves a convergence of mental health pressures (depression, anxiety, social isolation), environmental pressures (winter darkness and climate stress), and energy & carbon pressures, residential energy demand and the need to decarbonize daily life. Environmental psychology provides strong evidence that the built environment influences mood, stress, and behavior through mechanisms such as sensory load, perceived control, and place attachment (Mehrabian & Russell, 1974; Altman & Low, 1992; Gifford, 2014). Health-oriented housing research further links residential conditions to mental well-being and psychosocial outcomes (Evans, 2003; Evans et al., 2003; World Health Organization, 2018).

This paper advances a focused claim that when the building envelope is already high-performance, complete insulation and airtightness, interior architectural quality, especially plan and color, becomes an energy-relevant behavioral intervention.

Thesis Statement

In highly insulated residential buildings, architectural quality, particularly spatial planning and interior color strategies, plays a critical role in shaping occupant behavior, thereby contributing to reductions in operational energy consumption without compromising thermal comfort.

2. Theoretical Background

2.1 Environmental psychology and housing experience

The Mehrabian–Russell model explains how environmental stimuli shape affective states and approach, avoidance behaviors (Mehrabian & Russell, 1974). Place attachment theory further clarifies how emotional bonds to home can strengthen coping capacity and psychological security (Altman & Low, 1992). These foundations support the proposition that housing can be designed as a regulatory environment rather than a neutral container. (Gifford, 2014).

2.2 Prospect–Refuge and restorative conditions

Prospect–Refuge Theory argues that environments combining protection (refuge) with controlled openness (prospect) reduce anxiety and support comfort (Appleton, 1975). Biophilia-aligned literature extends this by emphasizing restorative impacts of nature contact and perceived safety (Heerwagen & Orians, 1993). Empirical evidence also demonstrates that environmental qualities such as view and visual relief can influence stress and recovery outcomes (Ulrich, 1984).

2.3 Color, light, and mood regulation

Color psychology indicates that color perception influences psychological functioning and emotion (Elliot & Maier, 2014; Valdez & Mehrabian, 1994). Light and color conditions affect mood and physiological arousal (Küller et al., 2006). In northern climates, light-based interventions are clinically relevant for mood disorders including Seasonal Affective Disorder (Golden et al., 2005), and lighting quality strongly affects comfort and performance (Boyce, 2014; Veitch & Newsham, 2000).

3. Design Framework: Turning the Home into a Therapeutic Environment

This section translates theory into practical design interventions, structured around plan, color, and daylight.

3.1 Plan interventions

Goal: reduce depression and anxiety, strengthen psychological refuge, and increase voluntary willingness to remain at home.

3.1.1 Creating a "Calm Core"

A small central or semi-central space (approximately 6–10 m²) is proposed as a "calm core," defined by:

- controlled natural daylight
- minimal sensory noise (no dominant TV/screen)
- suitability for sitting, meditation, or reading

Mechanism: reduced overstimulation and improved self-regulation, key pathways in stress and mood management (environmental psychology).

3.1.2 Spatial sequence instead of excessive open plan

Overly open plans often create "continuous exposure," reducing psychological shelter and increasing cognitive fatigue. A therapeutic alternative uses soft spatial differentiation through:

- ceiling height variation
- light gradients
- semi-transparent partitions
- removal of "everything visible from everywhere" conditions

Mechanism: improved perceived control and safety, associated with lower anxiety (Evans, 2003).

3.1.3 Refuge space

Even in small homes, a refuge pocket can be formed with:

- slightly lower ceiling
- warm, localized light
- limited outward views

Mechanism: prospect–refuge balance reduces escape behavior during distress (Appleton, 1975).

3.2 Interior color strategies

Goal: regulate the nervous system and stabilize comfort practices—not merely decorate.

3.2.1 Reducing high-contrast and overstimulating palettes

Avoid:

- very bright whites paired with cool light
- highly saturated colors (e.g., intense reds, vivid yellows, electric blues)

Prefer:

- warm off-white
- greige
- light earth tones
- very muted greens (sage)

Mechanism: lower sympathetic arousal and more stable mood responses (Valdez & Mehrabian, 1994; Küller et al., 2006).

3.2.2 "Deep but muted" accents for grounding

Use sparingly on one or two surfaces:

- warm dark greys
- olive greens
- matte blue-greys

Mechanism: grounding and perceived stability without overstimulation (Elliot & Maier, 2014).

3.2.3 Color as background for light

In the Ando-aligned logic, **color recedes and light becomes the primary spatial agent**. In Canada, warm neutrals paired with controlled daylight can compensate for winter light deficiency without increasing glare or forcing high artificial illumination (Boyce, 2014).

3.3 Light + color as a SAD-relevant mechanism

Although the focus is plan and color, daylight is inseparable in cold-climate mental health design. The plan must allow light to:

- penetrate deeply
- enter indirectly (diffused rather than harsh)

Interior surfaces should:

- absorb or softly reflect light
- reduce glare

Mechanism: improved daylight experience supports mood regulation and aligns with SAD-relevant literature (Golden et al., 2005).

4. Why This Reduces "Excessive External Escapism"

When a dwelling provides:

- psychological refuge
- controlled perceptual variation
- both solitude and shared presence

Occupants become less compelled to seek emotional regulation in cafés, malls, or overstimulating public environments. The home functions as a mental-health regulating system, consistent with environmental psychology models of stress reduction and behavior (Mehrabian & Russell, 1974; Evans, 2003).

5. Energy and Carbon Implications of Spending More Time at Home

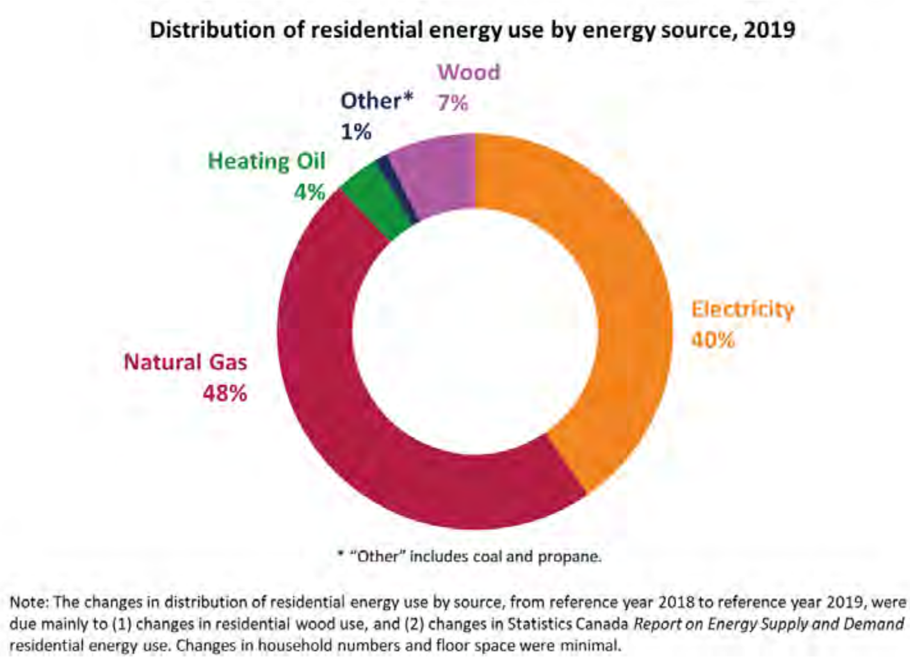
Reduced non-essential outings produce two simultaneous and sometimes opposing effects:

5.1 Direct effect (risk): higher residential operational energy

More time at home typically increases:

- heating runtime (especially winter)
- lighting and plug loads (cooking, IT, entertainment)
- ventilation and moisture management

Canadian household energy use metrics confirm the scale and relevance of residential demand.



5.2 Indirect effect (benefit): lower transportation emissions

Fewer short urban trips reduce fuel consumption and local air pollution burdens associated with vehicle traffic.

5.3 The balance point: the "therapeutic low-energy home"

Net carbon increases are most likely when homes are:

- poorly insulated/air-leaky, and/or

- psychologically uncomfortable (overstimulating, glare-heavy, low refuge), prompting occupants to over-operate systems for emotional comfort.

Net carbon reductions become plausible when homes are:

- high-performance envelope (insulation + airtightness), and
- calming (plan + color + daylight), stabilizing behavior and minimizing system interventions.

This creates an integrated mental-health + low-carbon pathway.

6. Rebound Effect and Architectural Mitigation

High-performance buildings can experience a **rebound effect**, where improved comfort leads to increased energy use. Architectural mitigation is feasible when plan and color strategies:

- reduce overstimulation
- increase comfort acceptance
- support zoning behaviors
- reduce unnecessary thermostat and lighting escalation

7. Conceptual Model

Architectural Quality as a Mediator Between Envelope Performance and Energy Use

Figure: conceptual framework illustrating how interior architectural quality—specifically plan configuration, color strategies, and daylight control—mediates the relationship between high-performance building envelopes and reduced operational energy consumption through occupant behavioral regulation.

8. Practical Summary for Canada

Component	Key intervention	Primary psychological effect	Likely energy pathway
Plan	Spatial sequence + calm core	Anxiety reduction	zoning and reduced system cycling
Plan	Avoid excessive open plan	Safety + control	localized heating and stable setpoints
Color	Warm, muted neutrals	Nervous system calming	reduced lighting intensity/usage
Color	Limited, deep muted tones	Grounding	fewer comfort-driven overrides
Outcome	Therapeutic home	reduced depression/escapism	reduced operational energy + net carbon potential

9. Conclusion and Implications

Reducing non-essential outings is not inherently beneficial or harmful for carbon outcomes. The determining factor is architectural quality, particularly in cold-climate contexts. In highly insulated housing, plan and color strategies operate as behavioral levers: they regulate sensory load, improve comfort acceptance, reduce system interventions, and can therefore contribute to lower operational energy use without sacrificing mental well-being. This positions mental-health-informed architectural design as a legitimate component of low-carbon housing strategy in Canada.

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