The Biopsychosocial-Ecological (BPSE) Model and Wellness Gardens:
An Integrative Framework for Community Health Intervention

Abstract

This paper presents the Biopsychosocial-Ecological (BPSE) model as implemented through wellness gardens at the Pamlico Rose Institute (PRI). Distinguished from traditional community gardens through intentional therapeutic design and systematic multi-dimensional programming, wellness gardens represent a novel intervention framework that integrates biological, psychological, social, and ecological dimensions to address whole-person health through nature-based interventions. Drawing from established theoretical foundations including Engel's biopsychosocial model, Bronfenbrenner's ecological systems theory, and resilience theory, this approach demonstrates measurable outcomes across multiple health domains. Recent empirical evidence supports the efficacy of intentionally designed garden-based interventions in improving dietary behaviors, reducing anxiety, enhancing social connection, and fostering ecological awareness beyond the benefits observed in traditional community gardening programs. This paper examines the theoretical underpinnings, practical applications, and evidence base supporting wellness gardens as a comprehensive approach to community health promotion that extends beyond conventional community gardening models.

Keywords: biopsychosocial model, ecological systems theory, wellness gardens, therapeutic horticulture, holistic health intervention, nature-based therapy

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Introduction

Contemporary health challenges require interventions that address the complex, interconnected factors influencing human wellbeing. Traditional medical models, while valuable, often fail to capture the multidimensional nature of health as influenced by biological, psychological, social, and environmental factors (Engel, 1977). While community gardens have demonstrated health benefits through food production and social interaction, they typically lack the systematic, theory-driven design necessary to optimize therapeutic outcomes across multiple wellness domains.

The Pamlico Rose Institute (PRI) has developed an integrative Biopsychosocial-Ecological (BPSE) model that extends beyond conventional frameworks to include explicit ecological dimensions, implemented through wellness gardens—therapeutic environments that differ fundamentally from

traditional community gardening approaches. Unlike community gardens that primarily focus on food production with incidental health benefits, wellness gardens are intentionally designed intervention spaces that systematically address the multidimensional nature of human wellbeing.

This paper examines the theoretical foundations of the BPSE model and its practical implementation through wellness gardens—designed therapeutic landscapes that serve as structured environments for holistic health intervention. The approach builds upon decades of research demonstrating the health benefits of nature exposure and community engagement while providing a systematic framework for designing, implementing, and evaluating complex, multi-dimensional interventions that extend beyond the scope of traditional community gardening programs.

Theoretical Framework

Foundational Models

The BPSE framework synthesizes several established theoretical approaches:

Biopsychosocial Model (Engel, 1977)**:** Engel's seminal work challenged the biomedical model's reductionist approach by proposing that biological, psychological, and social factors are all important determinants of health and disease. This model emphasizes the interconnectedness of bodily systems, mental processes, and social environments in shaping health outcomes.

Ecological Systems Theory (Bronfenbrenner, 1979): Bronfenbrenner's ecological model positions human development within nested environmental systems, from immediate microsystems to broader cultural macrosystems. This framework recognizes that individual outcomes are influenced by complex interactions between person and environment across multiple levels.

Resilience Theory (Walker et al., 2004): Contemporary resilience theory examines how systems maintain function and adapt to disturbance. In health contexts, this translates to understanding how individuals and communities develop capacity to maintain wellbeing despite stressors and challenges.

The Ecological Extension

a) The BPSE model extends traditional biopsychosocial approaches by explicitly incorporating ecological dimensions that recognize:

b) The fundamental interdependence between human health and environmental health

c) The therapeutic potential of direct nature engagement

d) The importance of place-based knowledge and ecological literacy

e) The role of environmental stewardship in personal and community wellbeing

This integration acknowledges that human health cannot be fully understood or effectively addressed without considering our embeddedness within larger ecological systems.

Methodology: Distinguishing Wellness Gardens from Community Gardens

Conceptual Framework

While community gardens and wellness gardens both utilize horticultural activities, they differ fundamentally in purpose, design, and implementation. Community gardens typically emerge from grassroots organizing around food access and neighborhood beautification, with health benefits occurring as secondary outcomes. Wellness gardens, conversely, are theoretically grounded interventions designed primarily to optimize health outcomes through systematic application of evidence-based principles.

Community Gardens generally feature:

a) Individual or family plots with autonomous management

b) Primary focus on food production and community building

c) Volunteer-led governance with minimal professional facilitation

d) Incidental health benefits through physical activity and social interaction • Limited integration of therapeutic or educational programming

Wellness Gardens are characterized by:

Intentionally designed therapeutic landscapes based on research evidence

a) 'Systematic programming that addresses multiple dimensions of wellbeing simultaneously with professional facilitation by trained practitioners

b) Primary focus on health outcomes with food production as one component

c) Integration of evidence-based practices from therapeutic horticulture, environmental psychology, and community health

Design Principles for Wellness Gardens

PRI's wellness gardens are intentionally designed to activate each dimension of the BPSE model through evidence-based environmental and programmatic features:

Biological Activation: Unlike community gardens where physical activity occurs incidentally through individual plot maintenance, wellness gardens incorporate structured movement opportunities designed to address specific health outcomes. Gardens provide graduated physical

challenges through therapeutic horticulture activities, incorporate medicinal and culinary plants selected for nutritional density, and integrate elements that support beneficial human-microbiome interactions through designed soil engagement activities.

Psychological Activation: While community gardens may provide stress relief through gardening activities, wellness gardens systematically incorporate evidence-based mental health interventions within the garden setting. These include designated mindfulness areas with specific plant selections for sensory engagement, integrated creative expression opportunities using natural materials, and designed spaces that support both solitary reflection and group therapeutic activities.

Social Activation: Community gardens typically facilitate social connection through shared proximity and common interests. Wellness gardens extend this through structured social programming that includes facilitated group activities designed to build specific social skills, intergenerational mentorship programs with defined learning outcomes, and community events that strengthen social cohesion while addressing therapeutic goals.

Ecological Activation: Traditional community gardens may include sustainable practices, but wellness gardens systematically integrate ecological literacy and environmental stewardship as therapeutic modalities. This includes hands-on learning about soil biology and ecosystem relationships, habitat creation projects that provide meaningful environmental contribution, and programs that develop ecological identity as a component of mental health and resilience.

Implementation Framework

The BPSE model guides wellness garden development through systematic processes that distinguish it from community garden approaches:

Theory-Driven Assessment: Unlike community gardens that respond to participant interests, wellness gardens begin with comprehensive assessment of participant needs across biological, psychological, social, and ecological domains using validated instruments and professional evaluation.

Evidence-Based Programming: While community gardens may offer educational workshops, wellness gardens provide structured programming sequences designed to achieve specific therapeutic outcomes, with activities selected based on research evidence rather than general interest or availability.

Professional Facilitation: Community gardens typically rely on volunteer leadership, while wellness gardens incorporate trained facilitators with expertise in therapeutic horticulture, group dynamics, and health behavior change.

Systematic Evaluation: Wellness gardens employ rigorous outcome measurement across multiple domains, using both quantitative measures (e.g., biomarkers, validated psychological assessments) and qualitative methods to track participant progress and program effectiveness.

Adaptive Management: Programming is continuously adjusted based on participant outcomes and evidence-based best practices, rather than traditional practices or volunteer preferences that typically guide community garden evolution.

Empirical Evidence

Biological and Behavioral Outcomes

Recent research provides compelling evidence for the biological benefits of community gardening interventions. A randomized controlled trial conducted by the University of Colorado Boulder (Litt et al., 2023) found significant improvements among community gardeners compared to control groups, including:

a) Increased dietary fiber intake

b) Addition of 42 minutes of weekly physical activity

c) Reduced anxiety levels

d) Improved overall dietary quality

Systematic reviews have consistently demonstrated associations between community garden participation and increased fruit and vegetable consumption, supporting the biological dimension of the BPSE model (Hume et al., 2022). However, wellness gardens show enhanced outcomes in these

domains through targeted programming that systematically addresses nutritional education, cooking skill development, and physical activity integration.

Psychological Outcomes

Evidence for psychological benefits of gardening interventions spans multiple populations and contexts. Research has documented:

a) Stress Reduction: Gardening activities have been shown to reduce cortisol levels and activate parasympathetic nervous system responses associated with relaxation and restoration

b) Mood Improvement: Regular garden participation correlates with reduced symptoms of depression and anxiety, even during periods of broader societal stress

c) Cognitive Enhancement: Engagement with natural environments supports attention restoration and cognitive flexibility

d) Emotional Regulation: The sensory richness and meaning-making opportunities in garden settings support emotional processing and regulation

Wellness gardens amplify these benefits through systematic integration of mindfulness practices, therapeutic activities, and professional facilitation designed to optimize psychological outcomes.

Social Outcomes

Community gardens function as important social spaces that strengthen community bonds and social capital. Research demonstrates:

a) Enhanced Social Interaction: Garden participation increases frequency and quality of social interactions within neighborhoods

b) Knowledge Sharing: Gardens facilitate intergenerational and cross-cultural exchange of knowledge and skills

c) Community Cohesion: Shared garden activities strengthen sense of community and collective efficacy

d) Social Support: Garden communities provide informal networks of mutual assistance and emotional support

Michigan State University research confirms that gardening fosters mental and social wellbeing through the interconnected processes of nurturing plants, engaging with nature, and experiencing accomplishment within community contexts (Rudolph et al., 2024). Wellness gardens systematically enhance these outcomes through structured community-building activities and facilitated social programming.

Ecological Outcomes

The ecological dimension of the BPSE model is supported by research demonstrating:

a) Environmental Stewardship: Garden participation increases environmental awareness and pro-environmental behaviors

b) Biodiversity Support: Community gardens contribute to urban biodiversity through habitat creation and pollinator support

c) Ecological Knowledge: Direct engagement with natural systems builds ecological literacy and understanding of human-environment relationships

d) Mental Health Benefits: Exposure to biodiverse green spaces correlates with reduced antidepressant prescriptions, suggesting mental health benefits of ecological engagement

Participatory research with Denver Urban Gardens demonstrates that gardens function simultaneously as ecological and cultural spaces, supporting collective efficacy while providing environmental benefits (Denver Urban Gardens, 2023). Wellness gardens systematically develop these relationships through integrated environmental education and stewardship programming, participation and stewardship programming.

Discussion

Integrative Benefits and Comparative Outcomes

The strength of the wellness garden approach lies in its systematic integration of therapeutic modalities rather than the incidental health benefits observed in traditional community gardens. While community gardens demonstrate positive outcomes primarily in dietary improvement and social connection, wellness gardens show enhanced effects across all BPSE dimensions through intentional design and programming.

Comparative analysis suggests that wellness garden participants experience more significant improvements in psychological wellbeing, demonstrate greater ecological knowledge acquisition, and maintain longer-term behavior changes compared to community garden participants. This enhanced

effectiveness appears to result from the systematic application of evidence-based practices rather than relying on inherent benefits of gardening activities alone.

The synergistic effects observed in wellness gardens, where biological, psychological, social, and ecological benefits reinforce one another, demonstrate the value of integrated programming over single-dimension interventions. For example, the structured mindfulness practices integrated into garden work enhance both psychological restoration and ecological awareness, while collaborative habitat creation projects simultaneously address social connection needs and environmental stewardship goals.

Theoretical Contributions and Methodological Innovations

The wellness garden model makes several important theoretical and methodological contributions that extend beyond traditional community gardening approaches:

a) Systematic Integration of Therapeutic Modalities: Unlike community gardens where health benefits emerge incidentally, wellness gardens demonstrate how systematic integration of

b) evidence-based practices can optimize outcomes across multiple health domains simultaneously.

c) Professional Practice Framework: The BPSE model provides a structured approach for training facilitators and designing programs, addressing the gap between informal community gardening and clinical therapeutic interventions.

d) Ecological Dimension Integration**:** Explicitly incorporating ecological awareness and environmental stewardship as therapeutic modalities represents a novel contribution to health intervention design that extends beyond traditional biopsychosocial approaches.

e) Multi-dimensional Evaluation Methods: Wellness gardens necessitate assessment approaches that capture complex, interconnected outcomes rather than isolated indicators, contributing to methodological innovations in community health evaluation.

f) Scalable Intervention Model: Unlike community gardens that emerge organically and resist replication, the wellness garden framework provides a systematic approach that can be adapted.