

CHAPTER 1

THEORETICAL MODELS FOR RESEARCH AND PROGRAM DEVELOPMENT IN AGRICULTURE AND HEALTH CARE

Avoiding random acts of research

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Abstract. The need to document the efficacy of nature-based therapeutic modalities is of concern to all who support and encourage this field of endeavour. While a relatively large body of information is available very few of the articles are published in clinical and medical journals that provide the underlying basis for academic, programmatic and policy decisions, and little of it is based on the high level of rigorous research needed to gain respect as a contributing part of health-care science. In addition, the difficulties in forming a coherent profession go beyond the lack of adequate and appropriate research to the core problem of uniform terminology in the field and coherent theoretical framework to guide the research and implementation of treatment. With that conclusion in mind, the majority of this paper will look at models (either as text or diagrams) that have been put forth, as a starting point for establishing effective theories of human–nature interaction in a therapeutic or treatment setting to guide future research in horticultural therapy (HT), animal-assisted therapy (AAT) and Agriculture in Healthcare programs. Based on the experiences discussed relevant to HT, recommendations for future action are given.

INTRODUCTION

The need to document the efficacy of nature-based therapeutic modalities is of concern to all who support and encourage this field of endeavour. Research has been conducted that documents positive and negative aspects of these areas. A relatively large body of published information is available particularly in *animal-assisted therapy* (AAT) and *horticultural therapy* (HT). However a search of the literature rapidly establishes that very few of the articles are published in clinical and medical journals that provide the underlying basis for academic, programmatic and policy decisions. Rather they tend to be published in the journals of professionals and practitioners who seek more applied knowledge that has not been as rigorous in its development. Rapp (2002) states the situation as it applies to AAT very clearly:

Given the large number of variables contained in published studies of AAT, it is understandable we remain convinced in a general sense that AAT is helpful without

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having a unitary description of what it is or why it may work. Arkow and authors in the Fine (2000) handbook raise further ethical concerns about both clients and animal partners in AAT and note the need for more sophisticated research. They urge researchers to provide clearer operationalizations of process and outcome variables, baseline and long-term follow-up data, and control and comparison treatment groups. To date, relatively few AAT studies have shown these elements. According to Arkow (personal communication, February 20, 2002), "All of the questions we have been asking since the 1970s remain to be answered".

Frumkin (2004), Chair of the Department of Environmental and Occupational Health at Rollins School of Public Health of Emory University, Department of Medicine, Emory Medical School, Atlanta, reinforces this same point:

There is evidence that some kinds of environmental exposures, including contact with plants, contact with animals, views of landscapes, and wilderness experiences, may have positive health effects. Indeed, this link is the basis for such clinical practices as horticultural therapy. However, the available evidence falls short of what is routinely required of a new medication or surgical procedure. Physicians, health policy experts, and regulators require rigorous evidence of the efficacy and safety of clinical practices.

To address this short fall he proposes "a marriage of clinical epidemiology and horticulture, identifying key research needs and opportunities at the intersection of horticulture and human health, and suggesting ways that sound science can help evaluate and advance horticultural therapies" (Frumkin 2004).

Not only is there a significant lack of the rigorous research but indeed, the theoretical models on which to base both research and practice have not been clearly and concisely defined and utilized for testing and implementation. This paper will first provide a background overview of the research areas involved in *agriculture and health care*. This will be followed by a discussion of the types of research needed. The focus of the paper is on the theoretical models for research and program development. While the models under discussion are selected from HT and *human issues in horticulture* (HIH) publications, they share underlining philosophy that the interrelationship with a living organism which has existed throughout all of human history is the essential element creating positive benefits.

OVERVIEW OF RESEARCH AND RESEARCH-RELATED PROBLEMS

There are several resources for gaining an overview of the relevant research:

- Frumkin (2001) provides a referred-literature-based argument that there is now sufficient evidence to the efficacy of human-nature interaction for prevention and treatment as to justify a serious research effort.
- The Delta Society on their website Health Benefits of Animals (2005) provides abstracts of presentations, articles with many citations, and bibliographies that list hundreds of additional articles divided into the categories of general, adults, seniors, children, families, companion animals in the community, pet loss and bereavement.
- Relf and Lohr have written several review articles on HIH (Relf 1992a; Lohr and Relf 2000; Relf and Lohr 2003).

- The People Plant Council's bibliography of publication on HT and HIH (including related research cited by researchers in the field) has been updated to contain over 4,000 citations and is available in End-note (Relf 2005a).
- A review of the People Plant Council's history includes citations of proceedings and other sources for research in the field (Relf et al. 2004).
- Several trade-association web pages including *Plants at Work* (Homepage *Plants at Work* 2005) and *Plants for People* (Homepage *Plants for People* 2005) provide extensive information on the research relative to people-plant interaction in general.
- In addition, reviews have been prepared that focus more directly on the relationship between horticulture and special populations (Relf and Dorn 1995) and most recently the value of social and therapeutic horticulture (Sempik et al. 2003).
- Methods used in social sciences are discussed regarding their application to HIH research (Shoemaker et al. 2000).
- Special issues *HortTechnology* have been produced related to HIH and contain numerous relevant articles (Relf 1992b; 1995; Lohr 2000).
- Several volumes of *Acta Horticulturae* are also of interest to researchers in this field (Matsuo and Relf 1995; Relf and Kwack 2004).

These abstracts, articles and bibliographies are useful to lend credence to the idea that the human-nature bond does exist and have therapeutic potential. However further examination of the available literature forces acknowledgment that little of it is based on the high level of rigorous research needed to gain respect as a contributing part of health-care science. Simultaneously, the research fails to provide clear direction in the effective application of techniques.

The difficulties in forming a coherent profession go beyond the lack of adequate and appropriate research to the core problem of uniform terminology in the field. The widely used lay terms 'pet therapy' and 'garden therapy' with inference of a volunteer-led, feel-good activity transitioned to the professional terms horticultural therapy and animal-assisted therapy but without an accompanying transition in meaning to a goal-directed treatment modality under the guidance of a trained professional. Attempts to broaden the profession of HT by claims that it encompasses all positive benefits of human-plant interaction have instead created the impression that it cannot be a legitimate profession because anyone can do it and all people benefit (analogous to claiming that all physical activity is therapeutic; therefore anytime anyone runs/walks/swims, it is physical therapy). The American Horticultural Therapy Association (AHTA) (2005) currently defines HT in the broadest possible terms to be all inclusive of anyone who might have any interest in the profession as "A process in which plants and gardening activities are used to improve the body, mind and spirits of people. HT is an effective and beneficial treatment for people of all ages, backgrounds, and abilities". Thrive (Sempik et al. 2003) on the other hand uses a definition based on the occupational therapy model "Horticultural therapy is the use of plants by trained professionals as a medium through which certain clinically defined goals may be met".

Other terms such as ‘therapeutic horticulture’, ‘therapeutic activities in horticulture’, ‘social horticulture’, ‘horticultural well-being’, ‘horticulture for health’, etc. seek to address the disparity in understanding of the term ‘horticultural therapy’. Thrive (Sempik et al. 2003) uses an appropriately broader and more inclusive definition: “Therapeutic horticulture is the process by which individuals may develop well-being using plants and horticulture. This is achieved by active or passive involvement”. But there is not a widely agreed-upon understanding of the meaning of those terms nor do authors generally define their use of the words. When we cannot even define what we are talking about, it is exceedingly difficult to develop a coherent research program that quantifies and qualifies the depth and breadth of the profession and the efficacy of the activity in a treatment or other therapeutic context.

Unfortunately, large portions of the people involved in the agriculture-related health-care arena are there because of their personal affinity for nature. These professionals utilize HT as a means of staying around plants more of the time, while those individuals in AAT love their dogs and cats. Serendipitously they can help other people at the same time and get paid for it. On the surface there is nothing wrong with this. However, in reality it means they have no motivation to conduct the research needed to turn a job into a professional career. Nor do most practitioners understand the need for research or the type of research that is needed.

RESEARCH NEEDS

The comments on research needs will address only those identified in the US through 35 years of work in (or tangential to) horticultural therapy, along with citation from researchers in allied fields concerned with supporting this emerging field of health care. Web searches and discussions with peers indicate that related professions in the agriculture and health-care arena (i.e., AAT) share these research needs.

Demographic and census data on the application of HT

Currently enumerations of how extensively and where HT is practiced are based on a combination of broad observation, general reading, and citations from other generalists. There have been no comprehensive national studies conducted that would provide the baseline data against which it is possible to determine if the utilization of horticulture and landscaping as a treatment modality is growing, static or declining. Demographic data could be used effectively to target the areas in which research can have the greatest impact and to solicit the funding for that research. In addition, it would help in decision-making regarding providing the educational and professional development support needed to expand the application of HT. Demographic data or enumerations that are needed include:

○ *Programming data*

- The clientele populations actually served by HT/horticulture programs.
- Number of HT/horticulture programs for any (or each) clientele population

that is cited as utilizing it.

- The types of facilities (nursing homes, senior centres, rehabilitation hospitals) using HT/horticulture.
- The number of facilities with HT/horticulture programs.
- The size of the HT/horticulture program within a facility.
- The role of the horticulture program within the over-all facility or the department in which it is practiced (OT, AT, PT, HT as a stand-a-lone).
- The top 20 HT/horticulture activities used for each clientele group.
- The top 20 goals of the HT/horticulture program for each clientele group.
- The top 20 adaptations of the HT/horticulture activities for each clientele group.
- The top 20 plants and/or plant types used.
- *Professional development data*
 - The title (professional qualification) of the person responsible for the program (OT, PT, Voc Rehab Specialist, HT).
 - The number of OT, PT, RT, AT and each other professional group that actually utilize HT/horticulture in their program (and the number that would be interested).
 - The number and role of volunteers with each clientele group or facility.
 - Skill and knowledge required by someone conducting programs.
 - Resources available/needed to effectively support programs.
 - Current and advanced training needed to maintain credentials.
 - Salary expectations at various training levels.
- *Criteria for evaluating success of programs*
 - Number of participants self-selecting to attend.
 - Progress on written goals.
 - Economic or cost effectiveness.

Quantified and qualified research data to support HT as an effective tool in evidence-based medicine

Defined as “the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients or the delivery of health services” (Sackett et al. 1996). Frumkin points out that “few papers report empirical data on the links between contact with plants and human health. Among these, unfortunately, methodological limitations abound”. He concludes that what is needed is a rigorous deductive study based on the concept of “concluding that something works when it successfully withstands formal attempts to demonstrate its worthlessness (Frumkin 2004)”. Factors in research that need to be implemented include:

- Randomized controlled trials or similar designs.
- Sufficient numbers of subjects to make statistically sound conclusions.
- Interventions carefully defined.
- Sources of bias and confounding controlled.

- Collaboration with health scientists such as epidemiologists.
Types of quantified and qualified research data are indicated below by examples of questions that have been addressed (usually in isolated not replicated research) or that could be addressed:
 - Health-related quality-of-life outcomes measures
 - Behavioural changes reflecting increased positive perception of immediate environment.
 - Increases in scores on validated tests of the goal-directed changes.
 - Health-related social outcomes measures
 - Reduced instances of isolation, loneliness, etc.
 - Measurable increases in communications, eye-contact or other indices of interaction.
 - Increases in scores on validated tests of goal-directed changes.
 - Health-related cognitive outcomes measures
 - Measurable increase or maintenance in skills and knowledge related to diagnosed impairment.
 - Increases in scores on validated tests of goal-directed changes.
 - Health-related psychological outcome measures
 - Changes in physiological measurements such as stress indicators in response to treatment activity.
 - Increases in scores on validated tests of goal-directed changes.
 - Health-related physical outcomes measures
 - Reduction in weight, osteoporosis or physical impacts of horticultural activities.
 - Measurable positive changes in targeted physical skills and/or endurance.

The few papers that do report empirical links are hampered not only by methodological limitations, they also lack a unifying theoretical basis that links them in a way that leads toward more generalized conclusions on the efficacy of human–nature interactions in treatment, thus becoming random acts of research functioning to answer isolated questions or to provide a thesis topic for a degree.

DEVELOPING THEORETICAL MODELS FOR RESEARCH AND IMPLEMENTATION

As professions concerned with health-care outcomes mature, the need for a theoretical framework to guide the research and implementation of treatment becomes increasingly evident as indicated by the books and course on the subject in Occupational Therapy (McCull et al. 1993; 2002).

Coyle (2000) reports that problems discussed as related to HT as a treatment modality are far from unique in the health-care arena. According to him in March of 1998:

“The Advisory Commission on Consumer Protection and Quality in Health Industry released a report in response to the US Presidential Executive Order that recommended increasing funding for outcomes research. This report indicated that outcomes research was critical to assessing the effectiveness of treatment and the quality of care.

METHODS: A systematic review was conducted of the pertinent English literature that describes the development, methods, and limitations of outcomes research to identify methods for minimizing its limitations. **RESULTS:** Current evidence indicates that approximately 80% of commonly used medical treatments have not been shown to be efficacious, primarily because the necessary randomized controlled trials have not been conducted because of methodological problems, the time required for their execution, the expense, or ethical reasons. Therefore, physicians disagree on the value of many common clinical practices, which is reflected in the large variation in medical care prescribed for different populations. Outcomes research, which is conducted under actual clinical practice conditions using effectiveness studies, offers an efficient approach for investigating the link between medical care and outcomes. However, the major limitation of past outcomes research has been its limited ability to link medical care with outcomes, because of the lack of theory development to guide the research process, inadequate data sources, or both. **CONCLUSIONS:** The literature review suggests that the use of pertinent theoretical constructs to guide the outcomes research process will generate the results needed to assess the effectiveness of treatment and the quality of care.”

With that conclusion in mind, the remainder of this paper will look at models (either as text or diagrams) that have been put forth as a starting point for establishing effective theories of human–nature interaction in a therapeutic or treatment setting for future research in HT, ATT, and Agriculture in Healthcare programs.

Biophilia Hypothesis provides the underlying philosophy for all aspects of human–environmental interaction (Kellert and Wilson 1993), and there are a number of professional research areas including environmental psychology and sociobiology that provide models for our research conceptualization including the works of the Kaplans (Kaplan and Kaplan 1989) and Ulrich (1983). Additional research areas from which we may draw inspiration for structuring our research include those that seek to improve human health (occupational, physical and recreational therapies) and those that seek to understand human processes (gerontology, psychology). The area in which we work (as compared to outdoor education, wilderness experiences, etc.) looks at the man-made aspect of human–nature experiences and explores it from the perspective of how we can, as agriculturists, horticulturists, veterinarians and related professionals, best understand and insure optimum exposure to other living organisms in a health-care context. We must design and test the theoretical models that will allow us to focus the research efforts and to recognize the links between the findings of various researchers. An effective research focus is critical to gain professional acknowledgment and efficacy.

Modeling the definition of HT

In professional presentations, workshops and course lectures Relf has long presented the model of HT (Relf 2005a), first published by her in a text format in 1995 (Relf and Dorn 1995) and in graphic representation in Figure 1. This model is much more closely aligned with the definition of HT espoused by Thrive, based on the occupational-therapy model, than that of AHTA in that this model requires both measurable (clinically defined) treatment goals and a trained professional. It also differs from the AHTA model in that it defines HT as targeted to clients with a clear

diagnosis rather than being “people of all ages, backgrounds, and abilities” and focuses on the care and nurturing of living plants versus “A process in which plants and gardening activities”. This shift carries HT beyond the experience of landscapes and the use of aromatherapy in defining the action of the clients and the skills of the therapist.

This same model could be easily adapted to represent therapeutic horticulture as the process by which individuals may develop well-being using plants and horticulture, by substituting ‘diagnosed client’ with ‘individual’ and ‘measurable goals’ with ‘well-being’ and including ‘amateur’ with ‘trained professional’ as the person responsible for the outcomes.

Extensive discussion of the interactions zones A, B and C provides useful insight into the factors that limit HT and activity from actually being HT, and can bring focus to both program implementation and research.

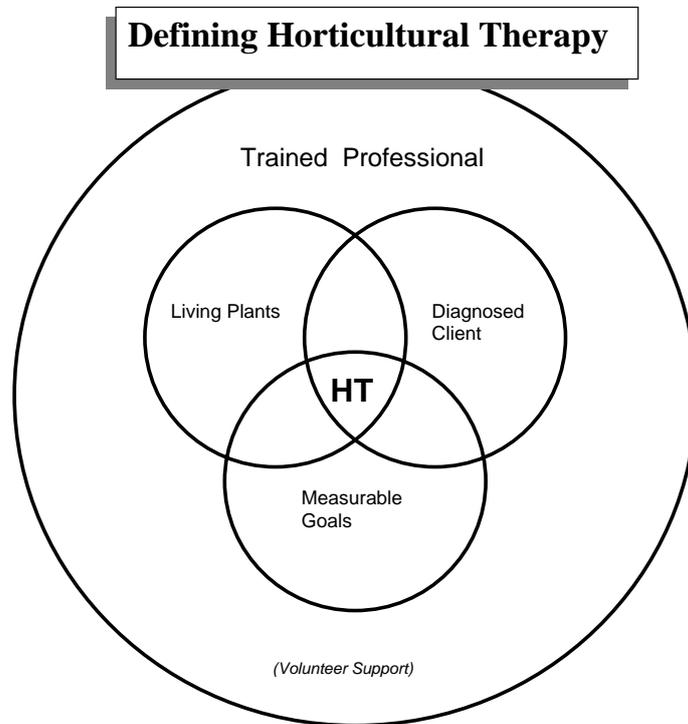


Figure 1. A model defining Horticultural Therapy by integrating the key elements that define it as a profession, based on presentation, workshops and lectures from Relf starting in 1978 using a Venn diagram (Relf 2005a)

Modelling the benefits of HT

As early as 1973, Relf (1973) proposed a model that categorized or organized the areas in which benefits of horticultural therapy could be seen. A graphic representation is presented in Figure 2a. While the model was useful for enumerating or structuring the benefits, it failed to show the relationship between them. Takaesu, psychiatrist, owner and director of Izumi Hospital, Okinawa, Japan in discussion at an HT workshop at Virginia Tech University and subsequently in unpublished lecture notes, restructured the diagram to show the relationship among the areas of benefit, integrate other expressive or creative therapies, and elaborate on the nature of the response by psychiatric patients (Takaesu 1998). His graphic representation is given in Figure 2b.

It was not until 2004 that Relf began to explore the potential of this simple graphic model further, to understand the relationships among the benefits that appear to be presented by HT and to find the loci for the limited empirical research currently available as shown in Figure 2c. This model also represents further thinking on the critical role that plants can play in developing a life-centred philosophy to bring spiritual stability and meaning to individuals. Other changes suggested by this model include the use of the term psychological in place of emotional and cognitive in place of intellectual with the related changes in meaning.

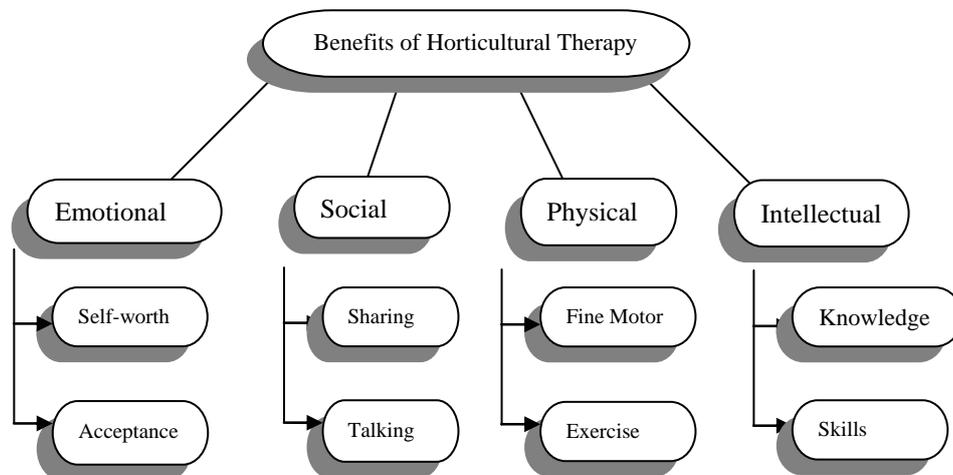


Figure 2a. Graphic representation of the benefits of Horticultural Therapy based on a model proposed by Relf (1973)

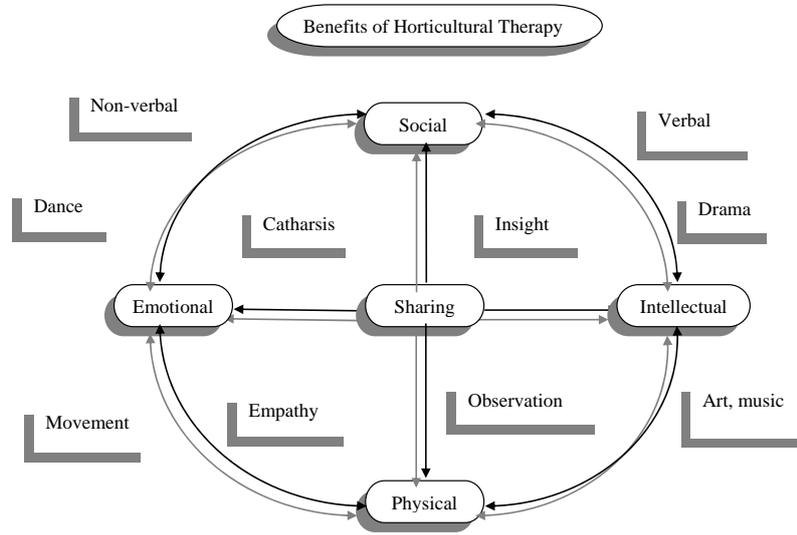


Figure 2b. Adaptations to Relf's model of the benefits of Horticultural Therapy by Takaesu (1998)

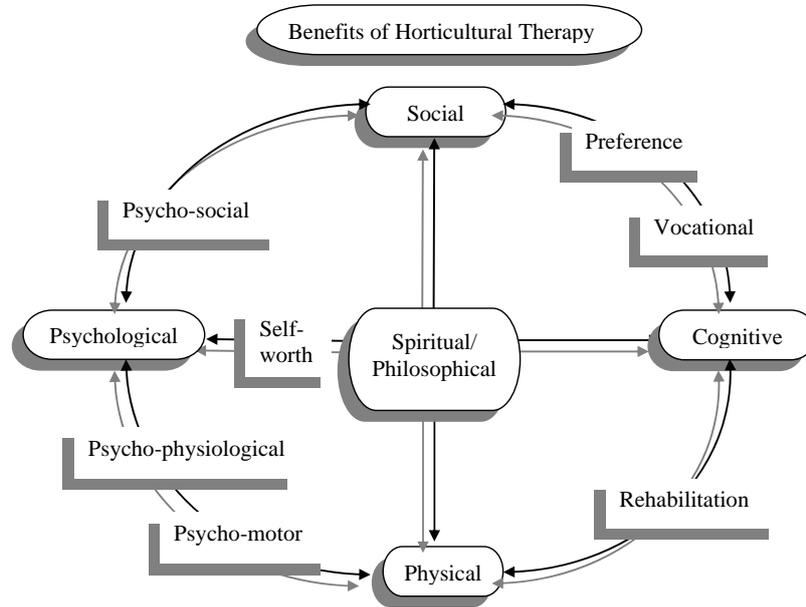


Figure 2c. Adaptations by Relf to the model of the benefits of horticultural therapy in Figure 2b to identify loci of current research and to include the spiritual/philosophical component of the benefits

It is evident from study of this model that it is composed of sweeping generalizations that could apply in both a treatment and non-treatment setting; that is, the benefits in each area are seen by anyone who gardens. Indeed it does not have to be restricted to horticultural benefits but rather could apply to many other activities. This broad structure demands that it be refined for each clientele group in order to address the goals of different treatment programs. The advantage to this approach is that a generalized model presents the potential for greater insight into the human–nature interaction (thus its therapeutic potential) by offering the potential for overlays of information across clientele to create a picture of similarities in response.

A disadvantage to this model is that it is two-dimensional, restricting the graphic display of many critical interactions that would create a confusion of lines and intersections; for example the psycho-cognitive response for the acquisition of new skills and knowledge are not appropriately linked. However with increased skills among researchers in the use of the computer for three-dimensional modelling this weakness can be corrected and a fuller understanding brought to a new model.

Modelling the mechanism of HT

In 1981, Relf published a text model of the dynamics of HT given in graphic representation in Figure 3a (Relf 1981). In this model ‘Interaction’ represents the ability of horticultural activities to provide an optimum setting for social exchange in various forms, based on the writings and theories of Charles Lewis (1979) and Stamm and Barber (1978). ‘Reactions’ represents the innate response of humans to the plants around them based on the theories of the Kaplans (S. Kaplan 1973b; R. Kaplan 1973a; 1977) and Iltis (1974). ‘Action’ represented the impact of the act of cultivating and care for the live plants. Relf put forth the concept that the actual act of caring for living plants worked in many different ways to benefit the client, based on experience, observation and research in the literature. Her theory was that the care of living plants is the unique element that HT brings to a treatment program and the mechanism involved needs to be fully understood and utilized (Relf 1981). Matsuo expanded greatly on one element of the ‘action’ of horticulture, that of creativity, when he articulated his model of horticulture brings balance to a life so that one may live as fully human (Matsuo 1995).

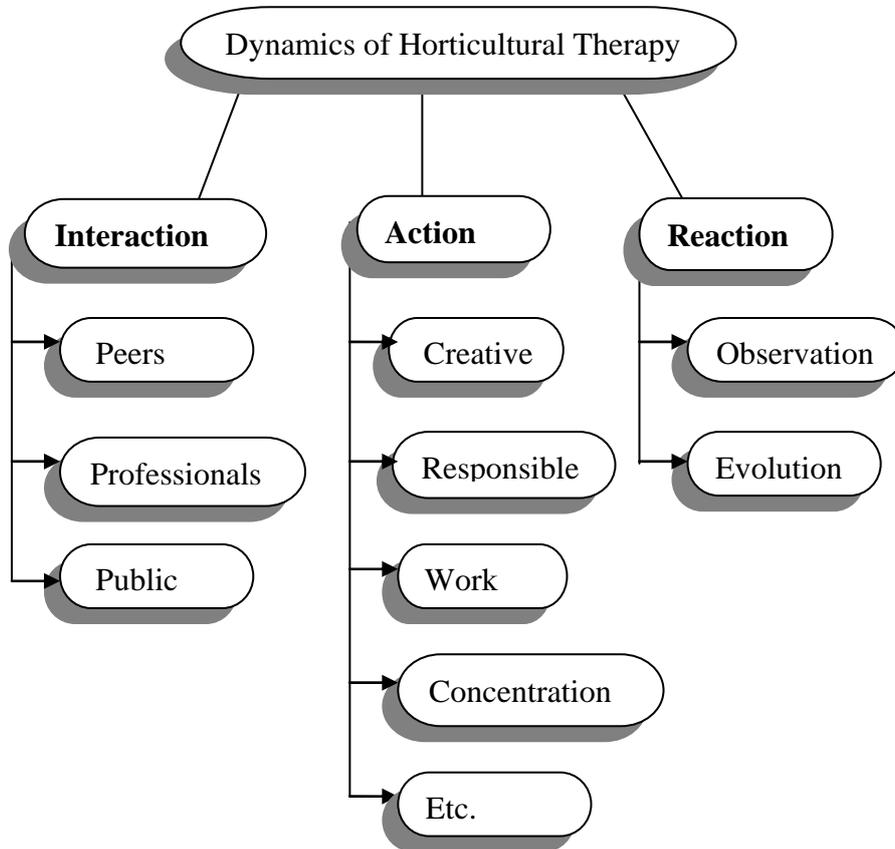


Figure 3a. Graphic representation of the mechanisms by which Horticultural Therapy works based on the model proposed by Relf (1981)

As research in these areas proceeds, the relationship between the elements has become clearer and is expressed graphically in Figure 3b. It is evident that all interaction of humans with plants will result in the responses classified in 'reaction' that are being elucidated by the environmental psychologists and other researchers on human response to visual and other cues about their natural surrounding, and specifically plants. Further, a great deal of the response takes place in an 'interaction' or social context. Thus, in so far as plants influence human social interaction, there would be two factors influencing any research and programming involved in passive (not responsible for the care of the plant) interaction with plants. 'Action' then becomes the focused area in which HT takes place. While by definition all 'action' will elicit the 'reaction' to nature, the care and responsibility for plants may involve 'interaction' with others, including the therapist, or it may involve individual or isolated work, with each of these approaches being represented by an area in the figure.

Dynamics of Horticultural Therapy

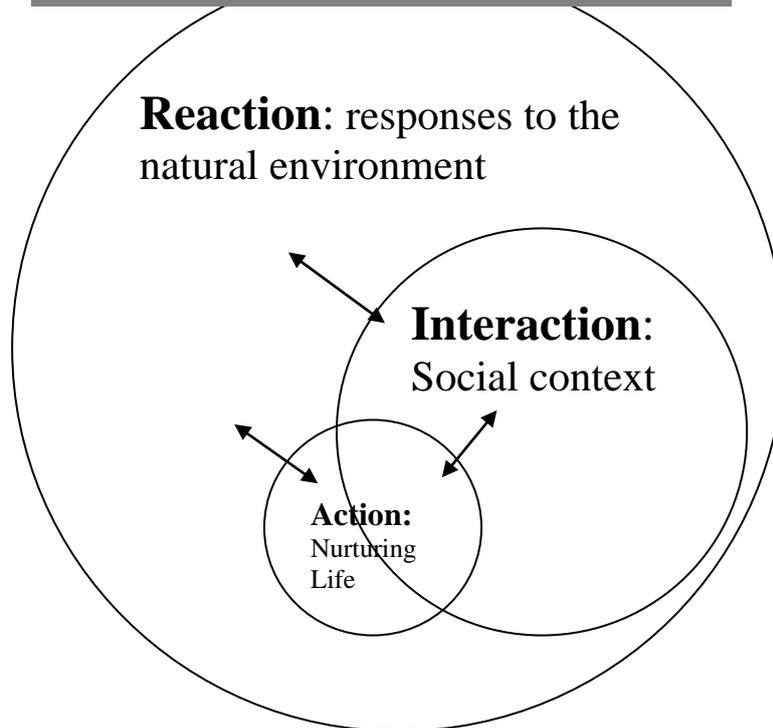


Figure 3b. A model of the dynamics of Horticultural Therapy to illustrate the relationships between the three elements expressed by Relf (1981)

A similar figure could serve as the basis for an understanding of the various forms of landscaped related to health and well-being, based in part on the model put forth by Relf (2005b) and shown in Figure 4a. A significantly more intricate and complex model (Figure 4b) has been proposed by Asano-Miyake (2002) to further understand the experience of healing landscapes.

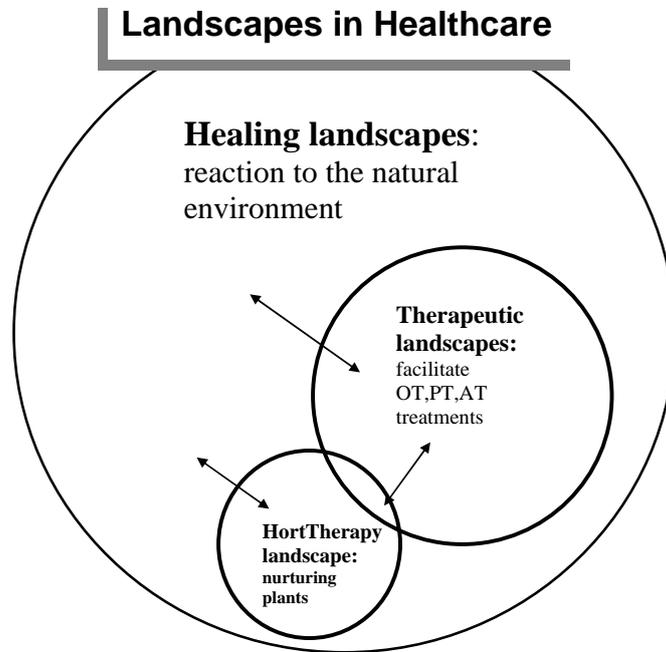


Figure 4a. A model developed by Relf for understanding the interaction of various types of landscapes in health care, based on the model for the dynamics of Horticultural Therapy given in Figure 3b

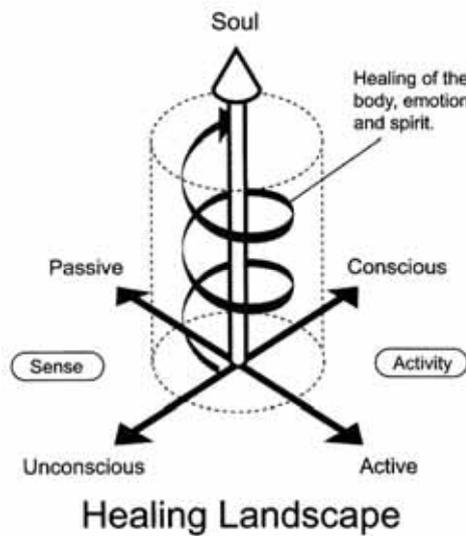


Figure 4b. A model titled "Holistic healing by relating to nature" by Asano-Miyake (2002)

Modelling the mechanism of well-being or quality of life

Originally developed for a presentation in Korea (Relf 1998), then published in the Journal of Therapeutic Horticulture (Relf 1999), this model (Figure 5a) focuses on the larger picture of the role of horticulture in human existence and life quality, identifying specific roles of plants, the horticultural activities that enable these roles, and the human actions and responses that lead to the benefits to be obtained. Thrives' model, given in Figure 5b, provides "a simple model of the processes, activities and outcomes of social and therapeutic horticulture as described in the literature showing the interconnectedness of all elements" (Sempik et al. 2003). These models may serve as points to initiate discussion for further improvements in the model.

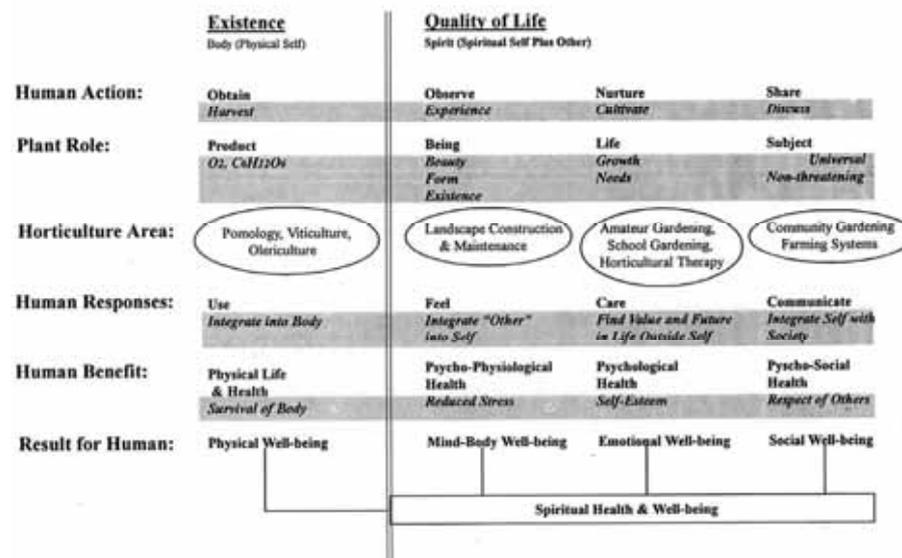


Figure 5a. This model by Relf (1999) addresses the larger picture of the role of horticulture in human existence and life quality

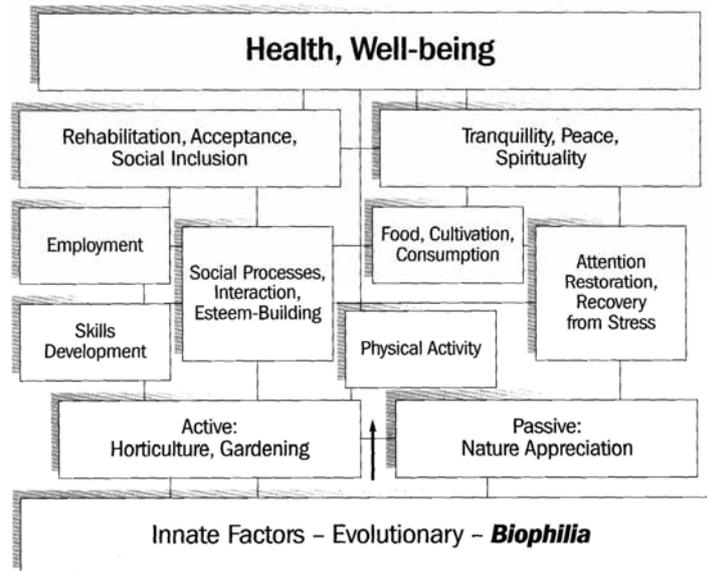


Figure 5b. Model from Sempik et al. (2003)

Adapting models from other disciplines

Ultimately the most fruitful approach to developing useful models may prove to be the study and adaptation of models from other disciplines that have been tested in research and program implementation. The 'Model For Healthy Aging With Horticulture' by Shoemaker and Mu-chuan Lin (2004) given in Figure 6 is based on the model for recreational therapy developed by Austin (1998). The discussion in the paper *Horticulture Therapy for Persons with Dementia: Utilizing an Environmental Press Perspective to Integrate Theory and Research* provides an excellent argument for the application of Lawton's model (Lawton and Nahemow 1973) to research with this specific population (see Figure 7), and serves as a model for grounding work in HT in the basic theories of the disciplines, such as gerontology, in which the research and applications are to be utilized (Gigliotti et al. 2003).

The challenge presented by this approach is the integration of divergent theoretical models into a coherent whole for the profession of HT. The tendency it may be for each researcher to select a relevant theory from another discipline that is specifically related to the question being addressed, adapt that theory to the question, and proceed as though the research will contribute to a unified body of knowledge in HT. In fact without linking the theories to the overall understanding of HT each research effort, even when grounded in theory for other professions, becomes one more random block of information in an amorphous realm of endeavour.

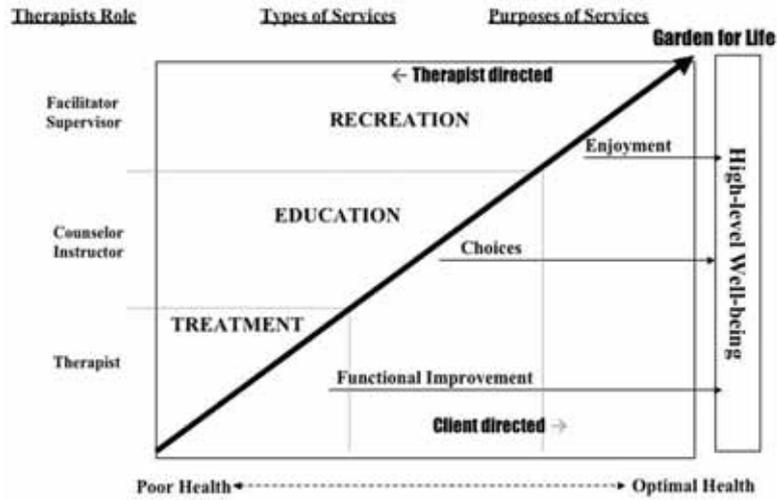


Figure 6. Model developed by Shoemaker and Mu-chuan Lin, Dept. of Horticulture, Forestry and Recreation, Kansas State University (2004), based on the model from Austin (1998), demonstrating the value of this approach

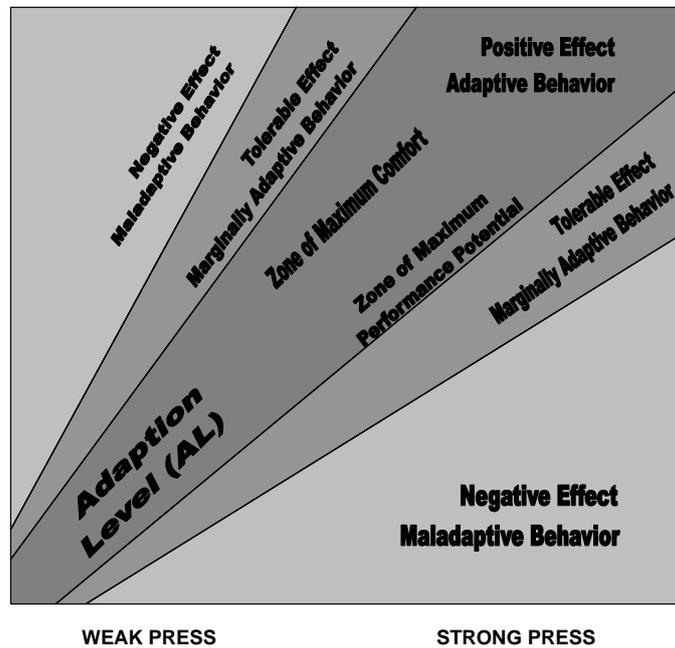


Figure 7. Environmental Press Model adapted from Lawton and Mahemow (1973), modified from the illustration used by Gigliotti et al. (2003)

CONCLUSION

As Frumkin (2004) points out, "... all of us, on the health sciences side and on the horticulture side, need to collaborate in our research, to bring our respective skill sets to the table and to generate the most valid research results as rigorous research results emerge, they need to be published in high quality health science journals. Again, I do not for a moment mean to disparage the professional publications of horticulture, landscape architecture, and allied fields. But if we generate important health information, it needs to breach the disciplinary walls, and penetrate the world of those who make health decisions, set health policy, and treat patients".

Based on the experiences discussed relevant to HT, I would recommend that this group seek to accomplish the following:

- Include equal numbers of committed professionals from the health-care arena in all strategic planning and implementation.
- Develop shared terminology with agreed-on definitions.
- Seek a unifying model for research and program development.
- Identify a core set of journals to publish research articles in and a core set for program design articles. Until many different articles are seen "those who make health decisions, set health policy, and treat patients" practice in this field will remain a novelty.
- Build a strong and stable foundation on which to grow.

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