The Effects of Horticultural Activity in a Community Garden on Mood Changes

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In Japan, Horticultural activity improves the quality of life for all people by beautifying neighborhoods, stimulating social interaction, producing nutritious food, encouraging self-reliance, conserving resources, and creating opportunities for recreation and education. However, the psychological effects of horticultural activities in community based programs have not been discussed in as far as they provide useful tools to improve quality of life. In this study, subjects (61 in total, 22 men and 39 women, mean age = 46) were engaged in activities related to horticulture: active participation involved planting non-flowering pansy plants while passive participation involved observing a community garden. One group engaged in active participation was given 2 h to garden while two other groups were given 6 h to complete their Horticultural Activity (HA). POMS data for all groups was collected both before and after of their gardening activities. The 6 h HA group members in experiment 3 filled out the POMS form 2 h into the activity in addition the before and after inventories. The overall POMS score for 2 h of horticultural activity was significantly higher than that of simply observing for 2 h. The greatest psychological effects were found among the group that engaged in 2 h of horticultural activity. The result suggests that 2 h of horticultural activity induces the best psychological effects. Thus, the POMS scores indicate that horticultural activities have positive psychological effects under suitable conditions. These findings indicate that horticultural activity improves mood state, suggesting that it may be a useful tool for community based programs aiming to reduce stress. Therefore, to the extent that horticultural activities contribute to community residents’ stress reduction, these findings support the role of horticultural activity as an effective component of community based programs. A principal goal for community based programs is establishing the conditions that will encourage individuals to participate. The benefits of stress reduction gained from 2 h of horticultural activity may be an important condition for sustainable participation.

Keywords: community based program, horticultural therapy, moods change, POMS, psychological effect

INTRODUCTION

Recently, the research on the relationship between human beings’ psychological states and horticultural activities has been developing, and its progress has been considered significant (Endo et al., 2001; Furuhashi, et al., 2006; Hayashi, 2004a; Hayashi, 2004b; Hayashi et al., 1999; Yamane...
et al., 2002). Horticultural activity for stress management has been applied in practice (Hayashi, 2004a; Hayashi et al., 2007). Now that horticultural science has expanded from the traditional basic plant production technologies to those of human environment and life sciences, research on the use of horticultural activity as a form of community based stress management has become increasingly important. The development of a clearer and deeper understanding of horticultural activity in community based education programs is necessary (Hayashi and Murase, 2004). However, today’s community garden programs are managed by trial and error in actual daily practice. Community garden support is conducted on the basis of the accumulated experiences and knowledge of local leaders.

The perceived and actual quality of community life, along with the successful integration of culture into residents’ daily life, can be affected by regular psychosocial support. A resident’s overall mood may also modify educational efforts at rehabilitation in community based programs involving gardens. Individuals, such as disabled residents, suffering from inferiority complexes may be less likely to believe they can carry out positive behaviors and are more likely to have pessimistic expectations for the effectiveness of these behaviors. Whereas, positive emotional states can offer people the opportunity to consider and plan for future events (Salovey and Birnbaum, 1989; Salovey et al., 2000). In line with this, it has also been demonstrated that subjects participating in stress reduction activities show greater improvement in rehabilitation outcomes such as stress management compared to those not receiving such interventions (Erdman, 1986; Krantz and McCeney, 2002; Langosh, 1994; Rozanski et al., 1999).

Gardening is a popular and accessible method of recreation that lends itself readily to a variety of healthy habits. Horticultural Therapy (HT) is a process through which plants, gardening activities, and an innate closeness to nature are used in therapy and rehabilitation programs. Horticultural Therapy is utilized for physical, cognitive, social, emotional, and recreational benefits. In practice, HT combines the therapeutic nature of a specially designed environment with activities aimed at meeting the therapeutic needs of the target population. Although horticultural activities have been used therapeutically for hundreds of years (Davis et al., 1998), objective documentation of benefits is relatively recent.

An increasing body of research has shown that HT is effective in reducing stress. Kaplan and Kaplan (1989) cite the stress-reducing, restorative effect resulting from viewing certain types of natural environments. Similarly, other studies have shown the stress-reducing capacity (as measured by decreasing blood pressure and heart rate (HR), skin conductance, and cortisol levels) and mood improvement effects of viewing and spending time in a natural environment (Hartig et al., 1991; Hartig and Staats, 2003; Igawahara et al., 2007; Kasetani et al., 2007; Park et al., 2007; Rodiek, 2002; Tsunetsugu et al., 2007; Ulrich et al., 1991).

Educational classes should be an integral part of community based stress management programs which include horticultural activity and garden watching. The effect of these classes on the residents’ subjective sense of wellbeing has not been assessed. We hypothesized that subjects participating in a HA session would have a greater positive shift in mood as measured by the Profile of Mood States (POMS) inventory compared with subjects engaged in Garden Watching (GW). However given the role of stress and negative mood states, such as fatigue, as risk factors for participants’ quality of life we also investigated the effects HA sessions of different durations (2 and 6 h sessions) have on mood.

METHODS

Profile of Mood States (POMS)

Mood state as an index of stress was evaluated using the self-administered POMS questionnaire, an objective rating scale designed for assessing emotional states that are transient, and
therefore expected to respond rapidly to interventions (McNair et al., 1992). The POMS consists of 65 single-word items rated from 0 (not at all) to 4 (extremely). Six dimensions are scored: (1) tension/anxiety, (2) depression/dejection, (3) anger/hostility, (4) fatigue/inertia, (5) confusion/hostility, and (6) vigor/activity. The first 5 dimensions are regarded as reflecting negative mood dimensions, and the sixth is considered to be positive. Total mood disturbance (TMD) is obtained by adding the 5 negative mood dimensions and subtracting the vigor/activity score. A decreased TMD score indicates an improved emotional state. The POMS reliability and validity are well supported in the literature (Lorr et al., 1967; McNair and Lorr, 1964).

**Experiment 1 — Comparison of the effect on moods of active and passive participation in a community garden.**

A representative group of residents participating in the community based stress management program of a community garden in Osaka-Sayama were approached for their informed consent in December, 1998. The HA session group consisted of 20 participants (7 men and 13 women, mean age of 46) who attended a 2 h HA session. The GW session consisted of 20 participants (7 men and 13 women, mean age of 46) who attended a 2 h GW session.

Prior to the HA or GW session, participants filled out the POMS form in 15 min. The HA subjects were then escorted to a community garden where they participated in a 2 h HA session and the other subjects were led to a room where they participated in a 2 h GW session. At the end of the session they again filled out the POMS form in 15 min. The horticultural activity consisted of planting pansies in pots.

The procedure for the HA sessions began with a talk regarding the benefits of a healthy lifestyle in the community. Participants then took a brief tour of the community garden, including the laboratory, which emphasized the educational and recreational applications of horticulture. The tour immersed participants in a vast array of stimulating sensory elements. The procedure for the GW sessions consisted of an interactive lecture held in the laboratory covering the same material as the HA session.

**Experiment 2 — Determining the different effect on moods according to length of time spent on horticultural activity in a community garden, comparison of 2 groups’ POMS data.**

In November, 1998 after obtaining informed consent, an HA group which consisted of 11 Patients (4 men and 7 women, mean age of 46) attended a single horticulture session for 6 h in a community garden in Osaka-Sayama. Prior to the HA session, participants filled out the POMS form in 15 min. HA subjects were then escorted to the community garden where they participated in a 6 h HA session. At the end of the session they filled out the POMS form in 15 min again. The subjects engaged in same procedures as the HA session subjects in experiment 1. We compared the post-session POMS data with that from the 2 h HA session group in experiment 1.

**Experiment 3 — Variation in mood changes at different points of time during horticultural activities in a community garden.**

In January 1999, after obtaining informed consent, the HA group consisting of 11 Patients (4 men and 7 women, mean age of 46) attended a 6 h HA session in a community garden in Osaka-Sayama. Prior to the HA session, participants filled out the POMS form in 15 min. HA subjects were then escorted to the community garden where they participated in a 6 h HA session. When the HA session reached the 2 h point, patients filled out the POMS in 15 min. At the end of the 6 h they filled out the POMS again in 15 min. Subjects engaged in the same activities as the 2 h HA session group of experiment 1.

**Statistical analysis**

TMD data from experiments 1 and 2 was analyzed using repeated-measure ANOVA with manner of participation and length of time as variables. When no differences were measurable with ANOVA, the t test for two unpaired samples was used to detect differing amounts of influence on moods. For experiment 3, specific changes in individuals’ pre-intervention, second hour and post-
intervention POMS results were analyzed with the Wilcoxon test.

RESULTS

Experiment 1 — Comparison of the effect on moods of active and passive participation in a community garden.

Baseline TMD (Table 1) was similar in the HA and GW session groups. Immediately following the HA session, TMD fell from a score of 30.4±8.6 to 2.9±5.7 (mean±SD. P<.001). The reduction in TMD resulted from a significant reduction (P<.001) in all negative dimension scales (i.e. tension, depression, anger, fatigue, and confusion) and an increase in the positive dimension of vigor/energy (Table 2).

Experiment 2 — Determining the different effect on moods according to length of time spent on horticultural activity in a community garden, comparison of 2 groups’ POMS data.

The TMD of the 2 h HA session group was significantly lower than that of the 6 h HA session group (Table 3), the “Depression”, “Vigor”, and “Fatigue” scores from the 2 h group’s POMS forms improved significantly compared with that of the 6 h HA session group’s scores (Table 4).

Experiment 3 — Variation in mood changes at different points of time during horticultural activities in a community garden.

The TMD and individual POMS dimensions changed most significantly with 2 h of activity compared to before and after the participants’ 6 h HA session (Table 5). These results suggest that horticultural activity engaged in for lengths of time greater than 2 h does not produce as positive an effect on mood.

DISCUSSION

Depression is a psychosocial factor shown to contribute to morbidity and mortality in nursing

<table>
<thead>
<tr>
<th>Table 1</th>
<th>TMD before and after HA and GW sessions (mean±SD).</th>
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<tbody>
<tr>
<td></td>
<td>2 h of GW (n=20)</td>
</tr>
<tr>
<td>Pre activity</td>
<td>33.8±9.7</td>
</tr>
<tr>
<td>Post activity</td>
<td>22.3±11.8</td>
</tr>
<tr>
<td>Interclass significance</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Effect of HA and GW session on the individual mood dimensions assessed by POMS (Scale Variation: mean±SD).</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2 h GW session (n=20)</td>
</tr>
<tr>
<td>Tension</td>
<td>2.85±1.57</td>
</tr>
<tr>
<td>Depression</td>
<td>2.70±1.66</td>
</tr>
<tr>
<td>Anger</td>
<td>2.36±1.54</td>
</tr>
<tr>
<td>Vigor</td>
<td>0.55±1.42</td>
</tr>
<tr>
<td>Fatigue</td>
<td>2.12±1.20</td>
</tr>
<tr>
<td>Confusion</td>
<td>2.02±1.61</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3</th>
<th>TMD before and after the 6 h and 2 h HA sessions (mean±SD).</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>6 h HA session (n=11)</td>
</tr>
<tr>
<td>Pre activity</td>
<td>35.8±11.9</td>
</tr>
<tr>
<td>Post activity</td>
<td>15.4±10.7</td>
</tr>
<tr>
<td>Interclass significance</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
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Table 4  Six h and 2 h HA session effects on the individual mood dimensions as assessed by POMS (Scale Variation: mean±SD).

<table>
<thead>
<tr>
<th></th>
<th>Engaged 6 h (n = 11)</th>
<th>Engaged 2 h (n = 20)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension</td>
<td>5.63 ± 2.06</td>
<td>5.30 ± 0.86</td>
<td>NS</td>
</tr>
<tr>
<td>Depression</td>
<td>4.81 ± 1.46</td>
<td>9.55 ± 2.13</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Anger</td>
<td>5.18 ± 1.67</td>
<td>7.30 ± 1.41</td>
<td>NS</td>
</tr>
<tr>
<td>Vigor</td>
<td>0.72 ± 1.46</td>
<td>4.30 ± 1.49</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Fatigue</td>
<td>2.36 ± 1.76</td>
<td>5.95 ± 1.10</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Confusion</td>
<td>3.18 ± 1.37</td>
<td>3.70 ± 0.88</td>
<td>NS</td>
</tr>
</tbody>
</table>

Table 5  Extent of change in individual mood dimensions assessed by POMS modulate by length of HA session (Scale Variation: mean±SD).

<table>
<thead>
<tr>
<th></th>
<th>Pre activity (n = 11)</th>
<th>2 h HA (n = 11)</th>
<th>Interclass significance (Pre-Post 2 h)</th>
<th>6 h HA (n = 11)</th>
<th>Interclass significance (Pre-Post 6 h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension</td>
<td>10.2 ± 2.92</td>
<td>3.9 ± 1.66</td>
<td>&lt; 0.01</td>
<td>7.3 ± 2.16</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Depression</td>
<td>12.4 ± 4.02</td>
<td>2.9 ± 1.12</td>
<td>&lt; 0.01</td>
<td>10.9 ± 3.35</td>
<td>NS</td>
</tr>
<tr>
<td>Anger</td>
<td>11.6 ± 3.76</td>
<td>2.8 ± 1.00</td>
<td>&lt; 0.01</td>
<td>8.5 ± 2.93</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Vigor</td>
<td>26.4 ± 2.23</td>
<td>32.7 ± 2.88</td>
<td>&lt; 0.05</td>
<td>25.4 ± 3.36</td>
<td>NS</td>
</tr>
<tr>
<td>Fatigue</td>
<td>11.6 ± 3.86</td>
<td>3.00 ± 1.93</td>
<td>&lt; 0.01</td>
<td>11.8 ± 4.02</td>
<td>NS</td>
</tr>
<tr>
<td>Confusion</td>
<td>13.6 ± 3.15</td>
<td>7.7 ± 2.85</td>
<td>&lt; 0.01</td>
<td>10.3 ± 2.57</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

homes. Stress management for nursing home residents integrates horticulture, animal contact and music into the daily schedule (Kanamori et al., 2001; Sugihara et al., 2006; Sugihara et al., 2006; Suzuki et al., 2005; Yamada and Toba, 2005). Positive psychological states are associated with healthier patterns of response in both cardiovascular activity and the immune system (Salovey et al., 2000). Positive mood state is also associated with reports of subjective reductions in bodily pain.

Improving residents’ mood, therefore, is an important outcome for a successful community based program of stress management, particularly because the response to an educational intervention is in part determined by participants’ subjective perception of their own health and wellbeing. The POMS assesses mood state (Lorr et al., 1967; McNair and Lorr, 1964; McNair et al., 1992), and is a well established tool for assessing current emotional health. POMS has been used to evaluate the effect of a variety of interventions involving horticulture (Endo et al., 2001; Furuhashi et al., 2006; Hayashi, 2004a; Hayashi, 2004b; Hayashi et al., 1999; Yamane et al., 2002), music (Ichimura and Kishimoto, 2001; Itoh et al., 2005; Urakawa, 2003) and natural environments (Igawarahara et al., 2007; Kasetani et al., 2007). However, the psychosocial effect on mood state among participants in a community garden program has not yet been assessed.

The baseline scores for the POMS after HA sessions revealed significantly lower overall scores and markedly lower scores in the depression/dejection and the anger/hostility dimensions than in previously published data. Research has shown that in healthy populations, older subjects (55 years old) had lower POMS scores than younger subjects (Adler et al., 1998; Milani et al., 1996; Nyenhuis et al., 1999). Therefore HA sessions may show even greater positive effects for younger populations suggesting a fertile field for further research into community based stress management programs as an aspect of public health practice (Hayashi et al., 2007).

Although the effect of HA sessions has not been tested previously in similar populations similar to that of this study’s participants, the assessed mood improvement is consistent with previous research indicating improved mood (as assessed by the Zuckerman Inventory of Personal Reactions) from viewing and spending time in a natural environment (Hartig et al., 1991; Hartig and Staats, 2003; Rodiek, 2002; Ulrich et al., 1991), As for the benefits of HA, Matthew found a
greater positive affective state among students completing horticultural activities compared with those completing non-horticultural activities (Matthew et al., 2005).

Horticultural therapy has been shown to reduce stress as measured by a variety of physiological markers (blood pressure, HR, skin conductance, and cortisol levels) (Endo et al., 2001; Furuhashi et al., 2006; Hartig et al., 1991; Hartig and Staats, 2003; Norimatsu et al., 2006; Rodiek, 2002; Sugimoto et al., 2004; Yamane et al., 2002). We chose to use POMS as the most useful and easily accessible marker for psychological stress as we are of the opinion that the HA effect might actually be more pronounced in ways that observers are unable to detect (Hayashi et al., 1999). This suggests that future studies should take advantage of more specific markers, such as levels of cortisol, catecholamines, and indicators of immunocompetence, which would be more sensitive in assessing the effectiveness of HA (Amsterdam et al., 2000; Hayashi, 2004a; Hayashi et al., 2004b; Matthew et al., 2005; Nyenhuis et al., 1999; Parsons, 1991; Sugihara et al., 2006). We feel the need for easily applicable methods of evaluation such as preferred colors and drawings which indicate mood state (Kunikata et al., 2002; Ujita and Murase, 2006).

In addition to these objective measures, the affective shift in the HA group was clearly noticeable to the healthcare professionals working with the participants (Hayashi, 2004a). The subjects routinely appeared to be in a better mood, they were more lively and animated, and engaged with greater frequency and ease in personal interactions.

LIMITATIONS

Although this study demonstrates that HA has a positive effect on mood, it also raises several questions. The mood enhancing effect was short term; there was no attempt to evaluate how long the effect lasts (Hayashi et al., 1999). Because this study’s experiments involved one off interventions, we do not know how multiple HA intervention would modulate the mood response. This study also does not identify the unique characteristics of HA that could account for the observed impact on mood. Finally, in the absence of random sampling, as the subjects were chosen from a fairly homogeneous population, selection bias cannot be ruled out.

CONCLUSION

The data supports the notion that HA in a community garden can improve mood state and reduce stress among community residents. This suggests that the introduction of HA as an integral component in community education programs may have significant psychosocial benefits for participants (ie, subjects appear less stressed and anxious, and are invigorated by their experience). These findings support Usui’s (Hayashi, 2006; Hayashi, 2007) view of horticultural activity as a form of community building that seems to be the most potentially effective means for stress management and should be an important part of community based programs.

The authors would like to acknowledge the director of the herb garden and members of Horticultural Therapy West Japan, without whose support this study would not have been possible. We owe a special debt for the invaluable support from Ms. Keiko Terauchi and Ms. Yoshiie Miyagami, two members of the community garden unit, for their patience and assistance in the data collection phase.

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