

COMPARISONS OF HORTICULTURAL AND NON-HORTICULTURAL ACTIVITIES
IN THE REHABILITATION PROCESS OF MILDLY RETARDED ADULTS

by

Rebecca L. Haller

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Approved by:

Richard A. Mattson

Major Professor

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Historically, hospitals and institutions have maintained vegetable gardens or farms to supply food for their patients or have landscaped grounds for therapeutic benefits. It was noted that patients who engaged in horticultural activities recovered quicker than those who did not garden. Since the 1800's gardening has been reported beneficial for the mentally ill. The therapeutic value of horticulture has been recognized as more important than the economic value of the food or ornamental plants produced. Horticultural therapy was widely used as a form of occupational therapy following World War I to rehabilitate veterans. Today, horticultural therapy is being applied to the bedridden, handicapped, geriatric, mentally ill, imprisoned, developmentally disabled, and the socially deprived (11).

The reported values of horticultural therapy are many. "In all settings, regardless of climate, age, or diagnosis, horticultural therapy offers an adjunctive therapy which gives the recipient a forward look--a sense of achievement and knowledge to enrich his future years" (2). It may function as a safety valve for a society which is under constant pressure (12). Gardening may also help an emotionally disturbed person to feel that something needs him (3). In rehabilitation, horticultural therapy can be used for mental and physical re-training through exercises of a disguised nature (1,7). McCandliss (8) adds that gardening provides social and educational opportunities as well as a chance to satisfy creative

instincts and build self-esteem. Another benefit of most programs is to help the individual find a useful place in society (9).

"The specific goals toward which a horticultural therapy program is directed may differ distinctly from one institution to another and from one population of handicapped individuals to another. However, the ultimate goal of these programs is the improved physical and mental health of the individual. The benefits may be in four areas--intellectual, social, emotional, and physical development."(5)

In order to achieve this goal of improved physical and mental health the horticultural therapist uses plants as his/her major tool. Because the medium is living, horticulture is a unique form of therapy (10). The nature of people and plant relationships is little understood, and only recently has begun to be researched. Some scientists in the field believe mankind has a primal need for plants. Plants are essential in that they provide the basis for food chains, and until recent urbanization they filled the immediate environment in which man lived. "Subtle plant--man relationships become obvious in the extreme urban environment, where field and forest have been replaced by asphalt and brick." (7) The character of these relationships has not yet been revealed.

One value seen by those working with the mentally retarded is the sense of security provided by the monotony and repetition of some horticultural tasks (3).

"With the mentally retarded, horticultural therapy seems to be extremely successful. Through working with plants, the mentally retarded are given a challenge that is not too difficult for them to meet. Also, it presents them with new skills and interests and it can become useful as a vocational tool."(6)

A mentally retarded person has an impairment in one or more of these areas: maturation, learning, or social adjustment. Individuals with low intelligence are divided into four groups by educators:

"1) the slow learner (IQ 80-90); 2) the educable mentally retarded (IQ 50-55 to 75-79); 3) the trainable mentally retarded (IQ 30-35 to 50-55); and 4) the totally dependent or profoundly mentally retarded (IQ below 25-30). The educable are able to achieve in academic subjects at a minimal level, to adjust socially to a point where they can get along independently in the community, and to develop occupational adequacies to a degree so that they can support themselves partially or totally at the adult level. The trainable individual has the potential to learn self-help skills, social adjustment in the family and in the neighborhood, and economic usefulness in the home, a residential school, or a sheltered workshop."(6)

In a sheltered workshop setting, the emphasis is on a work environment. The mentally retarded, or otherwise developmentally disabled, adult is able to find therapeutic activities through meaningful work, long-term sheltered employment, or job-readiness training, depending upon his needs. Clients are paid for the work they perform, often on a piece-rate basis. Typically, in sheltered workshops, the mentally retarded do routine jobs such as collating documents, stuffing envelopes, or assembling packets of eating utensils. Many horticultural tasks can be equally

routine in nature, but also offer appropriate challenges and learning opportunities.

Despite many broad statements of the positive effects of plants on people, the benefits of plant-related activities for the mentally retarded need further exploration. This study was done with a selected sample of mentally retarded adults in two sheltered work center settings to compare work productivity on horticultural and non-horticultural tasks. Tasks selected were routine in nature, repetitious, and suitable for the mentally retarded (4,10).

A null hypothesis tested is that there is no difference in productivity in potting cuttings and non-horticultural tasks by a group of mentally retarded adults. An alternative hypothesis asserts that productivity is higher when potting cuttings than doing non-horticultural tasks. A second null hypothesis is that the setting and/or therapist do not influence work production. Its alternative hypothesis implies that setting and/or therapist influence productivity. If working with plants is truly habilitative, work productivity should be higher on plant related tasks than on non-plant related tasks at both work centers.

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MANUSCRIPT

Greenhouse skills facilitate rehabilitation of mildly retarded adults.¹

Rebecca L. Haller and Richard H. Mattson²

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Abstract. Greenhouse tasks were analyzed according to cognitive and physical skill requirements. The percentage of normal work productivity for potting cuttings was compared to a non-horticultural task, both of which required multiple skills for trainable or educable mentally retarded adults. Work productivity significantly increased on horticultural tasks as compared to non-horticultural tasks at two greenhouses and rehabilitation centers studied.

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² Graduate Student and Associate Professor of Horticulture, respectively.

Horticultural therapy programs have been reported as highly effective for the rehabilitation of the mentally retarded (1,3,4). For some individuals, especially mildly retarded young adults, the goal of such programs is vocational training in horticultural skills (3,4). For others, gardening activities expedite improvement in physical and mental health and offer opportunities for learning and building self-esteem (1,3,5,6). The repetitious nature of some greenhouse tasks helps to provide a sense of security to the mentally retarded. However, appropriate challenges can also be provided through an environment of plants which is constantly changing and stimulating.

To an experienced horticulturist, potting a rooted cutting or fertilizing a plant is not a complex assignment. When tasks are broken down into progressive steps and analyzed in terms of the cognitive and physical skills required for their performance, a better understanding of the task results. Task analyses are valuable for modification of various activities to suit individual needs, to assess individual capabilities, and for training or instructional procedures.

This study (1) developed task analyses of greenhouse activities suitable for trainable or educable mentally retarded adults and (2) compared work productivity of traditional sheltered workshop activities with horticultural tasks at two greenhouses and two rehabilitation centers.

Task analyses: The minimal number of cognitive and physical skills necessary for completing ten representative greenhouse tasks were itemized. The tasks ranged from simple (washing pots) to complex (cutting and sorting flowers.) Cognitive and physical skills encompassed visual discrimination, spatial relations, retention of sequences, counting, eye-hand coordination, fine motor control, and gross motor control. As shown in Fig 1, the minimal number of skills varied from two to seven for ten selected horticultural activities. Washing pots requires only gross motor control and visual discrimination, while the cutting and sorting of flowers requires at least seven cognitive and physical skills.

Potting cuttings was selected from the horticultural tasks listed to compare to the non-horticultural tasks performed. Task analyses (Fig 2) were written for each activity to provide a clear and consistent sequence of procedure (2). Both required at least four cognitive and physical skills for completion. Non-horticultural task data was collected at two adult sheltered workshops; the potting task research was performed in two 7 by 13 meter greenhouses located near the workshops.

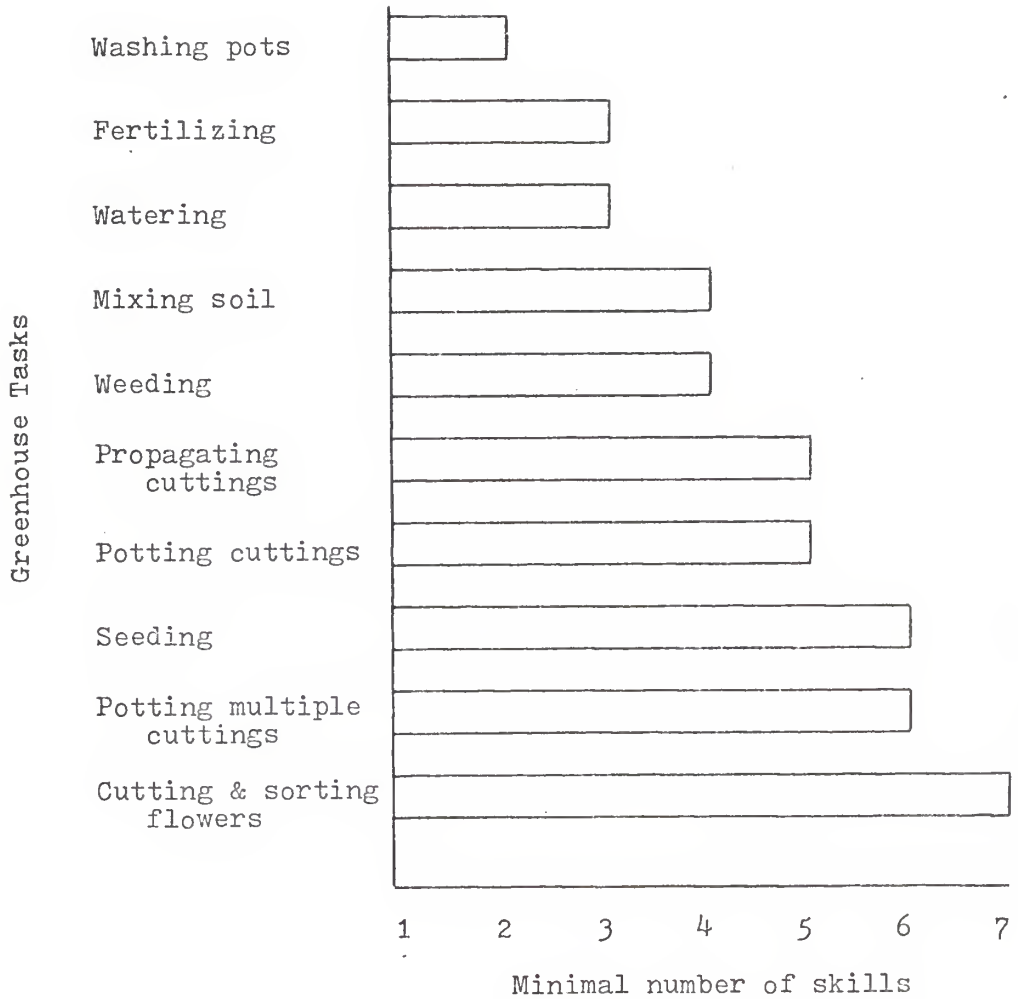


Fig 1. Minimal number of cognitive and physical skills necessary for completion of greenhouse tasks.

Fig. 2. Task analyses of a horticultural and a non-horticultural task, each requiring several minimal cognitive and physical skills.

Task objective: Potting rooted cuttings--one per pot.

Materials required: pots, soil media, clay chips, and rooted cuttings.

Task analysis:

Step 1. Put 2 or 3 clay chips in pot.

Step 2. Fill pot with soil media to about 2/3 full.

Step 3. Place cutting in center of pot.

Step 4. Place and firm soil around cutting.

Step 5. Add more soil if necessary leaving 1/2 inch space at top of pot.

Step 6. Place potted cutting in flat.

.....

Task objective: Pattern sorting.

Materials required: patterns and boxes in which to place the three different types of paper.

Task Analysis:

Step 1. Select pattern.

Step 2. Tear open pattern.

Step 3. Place tissue in correct box.

Step 4. Place sewing guide in correct box.

Step 5. Place envelope in correct box.

Step 6. Throw away any other materials found such as rubber bands, transfers, and other types of paper.

Training procedure: At work center A, nine mentally retarded adults, aged 19 to 51, who performed similarly on the Wide Range Achievement Test (WRAT) were selected. Three males and six females were chosen with similar levels of functioning estimated as educable or trainable mentally retarded. All subjects obtained standard scores between 47 and 66 on all three subtests of the WRAT, except one who scored 80-89 on two of the subtests. Standard scores falling below 69 are classified as "defective". At work center B, four clients were selected with WRAT scores classified as "inferior" or "defective".

Subjects were paid similar piece-rates for both horticultural and non-horticultural tasks. Training had previously taken place for pattern sorting at work center A and spork³ assembly at work center B, and all clients knew and were able to perform the tasks. However, it was necessary to train even those who had previous greenhouse potting experience in order to assure that the same procedure was being used by all subjects. After demonstration of the steps shown in the task analysis by the experimenter, each subject learned the procedure before data collection began. Periodic checks were made on the quality of the work performed. Improper soil level or an uncentered cutting caused the item to be returned to the subject for correction before counting it as completed.

³ Spork = combination spoon and fork assembly packet at work center B.

The number of cuttings potted per hour was recorded for the potting task. For each subject three to six time samples ranging from .5 to 2.5 hours each were taken. The mean number of cuttings potted per hour for each client participating in the study was then expressed as a percentage of the norm⁴ (67.5 cuttings per hour). The actual number of cuttings potted per person was only important as it related to this production standard. At work center B, the norm was set and time samples were recorded in the same manner by staff.

Pounds of pattern tissue sorted per hour were collected from production records kept by staff at work center A. The pattern tissues sorted by each client were weighed twice a day. The weight obtained and number of hours worked was recorded for each. Production records for one month were averaged and computed as a percentage of norm. The norm for pattern sorting was 61 pounds per hour. At work center B, potting cuttings was compared to assembling packets of eating utensils (sporks). The number of sporks assembled, hours worked, and percentage of norm were recorded by staff.

A statistical comparison of the mean production rates on the two types of tasks at each center was done using a one-tailed t-test. Comparisons between work centers were made using a two-tailed t-test.

$$^4 \text{ \% Norm} = 100 \times \frac{\text{mean production/hour of subject}}{\text{mean production/hour of 'normal' group}}$$

Work productivity: As shown in Table 1, trainable and educable mentally retarded adults' productivity rates significantly increased from 33.3 percent of norm on a non-horticultural task at work center A to 57.9 percent of norm on a horticultural task. Production rates on horticultural tasks increased with all subjects, but varied from slight to major improvement.

Several factors may have influenced work productivity at center A. Subjects typically spent most of their working day at the workshop sorting patterns. Thus, the greenhouse potting activity was a change of setting, a different routine at least once a week, and a new experience for the majority of the clients. Sufficient cuttings, bench space, and wages were not available to allow for equal time spent on both tasks. Patterns for sorting were contracted jobs which provided payment for the clients. The staff/client ratio was also higher at the greenhouse, generally about 1:4. At the workshop the ratio averaged 1:6. Closer staff/client interaction may have influenced results.

Another factor which may have influenced productivity is the degree to which the subject "liked" each task. When told they were going to the greenhouse, a few usually responded in protest, stating that they would rather stay at the work center. Often after an hour or so of potting, the client would express a desire to return to the work center. This was interpreted as a need for the security of something well known (the work center and the familiar job). Most clients were eager to do greenhouse work and showed disappointment if this was not allowed.

Table 1. Production rates on horticultural and non-horticultural tasks at work center A.

Subject Number	Production Rates ^x (% of norm)	
	Potting	Patterns
1.	37	33
2.	46	28
3.	46	19
4.	59	44
5.	60	27
6.	49	24
7.	90	46
8.	66	21
9.	68 ^y	58
Means ^z	57.9	33.3

^x Based on three to six time samples.

^y The potting rate for subject no.9 is based on a different potting task with a norm=180/hour. Expressed in the form of % of norm, it may be analyzed with the other figures.

^z t-test $P < .005$

The potting task consisted of an assembling process that may have encouraged production by developing a sense of pride in the finished product. The pattern sorting task consisted of a disassembling process and encouraged tearing and aggressive release coupled with a need to fill boxes.

The clients sorted patterns while sitting down. The potting task required standing, which may have stimulated "speedier" work habits. This effect seemed to be balanced by the fact that subjects stopped working to lean or to sit down periodically during the potting task because they were unaccustomed to standing for more than brief periods of time.

Work center settings: To reduce the influence of the work center or therapist, data was obtained from two work centers and greenhouses with several therapists involved. At work center B, mean productivity rates on both tasks were lower, but not significantly different than at work center A. As shown in Table 2, mean productivity rates increased significantly from 24.8 % of norm on the non-horticultural task to 42.3 % of norm on the horticultural task. These findings support the idea that a positive response from working with plants is independent of location and therapist.

Potting cuttings is one of many horticultural tasks suitable for vocational rehabilitation training of the mentally retarded. Greenhouse work offers a wide range of

Table 2. Comparison of mean productivity rates on horticultural and non-horticultural tasks at two rehabilitation centers.

Work center ^x	Horticultural (% Normal)	Non-Horticultural (% Normal)	(P) ^y
A	57.9	33.3	< .005
B	42.3	24.8	< .005
(P) ^z	N.S.	N.S.	

^x Means at work center A based on n=9; at work center B, n=4.

^y Comparison based on single tailed t-test.

^z Comparison based on double tailed t-test.

activities from routine tasks suitable for most clients to challenging jobs for more advanced clients. The constantly changing and living materials worked with in the greenhouse stimulate productivity to a higher level than do non-living media used in most rehabilitative activities.

This study indicates that trainable or educable mentally retarded adults can be taught basic greenhouse skills through task analysis training procedures. Work performance may be of adequate quality and quantity for employment by greenhouse managers.

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APPENDIX

Table A. Characteristics of the sample.

Subject	Age	Sex	WRAT (Standard Scores)		
			Reading	Spelling	Arithmetic
Big Lakes Industries.					
1.	19	M	60	60	56
2.	19	F	60	60	60
3.	20	M	62	66	55
4.	31	F	51	64	48
5.	39	F	50	59	47
6.	48	F	51	60	49
7.	50	F	55	62	56
8.	51	F	87*	86*	59
9.	51	M	62	66	63
Means	36.4		59.7	64.7	54.8
Kansas Elks Training Center.					
1.	17	M	67	69	68
2.	23	F	88*	79*	67
3.	26	F	75	67	58
4.	25	F	67	65	61
Means	22.8		74.3	70.0	63.5

* Two subjects scored comparatively much higher on these subtests. However, both production rates were within one standard deviation of the mean, so the subjects were included in the study.

Norms

Norms, or production standards, were set for each task. They were derived by averaging the amount of work done by several individuals (often the staff members) in a ten minute time sample. This average was multiplied by five to get the hourly production rate or norm. The norm is based on a fifty minute work period with 10 minutes per hour for breaks and other off-task behaviors. (Under experimental conditions, the subjects received about five minutes of break time for each hour worked.)

For sorting patterns, a norm of 61 pounds per hour was set by staff prior to the beginning of this study as outlined above. The potting task norm was determined by adults selected with similar age, sex, and amount of horticultural experience. Staff members were not chosen because of their knowledge of the research project, except for one new employee who had not yet been hired during the period of data collection and testing. None of those in the norm group were mentally retarded or disabled. They were trained to pot cuttings in the same manner as the experimental group. They were told that their work would be judged by its quality as well as its quantity in order to reduce the tendency to work as fast as possible for the short period. The norm was then set by observing and recording ten minute time samples for each participant. Table B shows how the figure of 67.5 cuttings per hour was derived as the norm for this task.

The norms for both tasks were set and the data were collected by the staff at the second institution.

Table B. Potting norm.

Age	Sex	# potted/hour
21	F	60
24	M	90
29	M	70
34	F	55
40	F	75
48	F	55

Mean # potted/hour = 67.5

Table C. Spork^y and potting data from Kansas Elks Training Center.

Client No.	Potting ^z	Sporks
1	42	20
2	34	26
3	48	22
4	45	31
Means	42.3	24.8

^y Spork = combination spoon and fork assembly packet.

^z Based on three time samples.

Potting Easter lily bulbs

One subject participated in a variation of the potting task--potting Easter lily bulbs. This task differed from potting cuttings in three ways. No clay chips were placed in the pot; the bulb was buried, eliminating the need for careful centering; and the soil was not firmed but merely leveled off. The norm was set as described for the other tasks using two horticulture undergraduates. Subjective impressions formed during the ten minute time sample were that the students worked at a fast rate which would have been impossible to maintain over a longer time period. Nevertheless, the resulting production rate of 180 bulbs per hour was used, because it would create a lower percentage of norm for the subject, thus decreasing the chances that the subject would perform at a comparatively higher rate on the horticultural task.

Employment potential

During the course of the study, an attempt was made to gather potting data from businesses of the area. It was thought that this information would indicate the feasibility of employment of the subjects involved. Ten minute time samples of two employees at one local greenhouse revealed an average rate of 162 cuttings per hour. The task differed somewhat in that no clay chips were used and the employees frequently had to get more clay pots and to remove those already potted. The impressions of the experimenter were that the subjects hurried because of the known presence of an observer.

Another greenhouse operator reported a potting rate of approximately 250/hour by a crew of two. The method differed considerably from the one used by the clients at Big Lakes. One worker filled the pots with soil from a wheel barrow (with no chips in the bottom) while the other followed, placing plants in the pots. Employees worked together in an assembly line manner. It is interesting to note a similar innovation by one of the clients at Big Lakes. Of her own accord, the subject began a similar kind of assembly line procedure, along with another subject. One of them placed the chips in the pot and filled it with soil, while the other added the cutting and more soil. The client recognized the greater efficiency of this method of potting. This ability to innovate seems extremely important in a real job situation, and leads to a conclusion that horticultural employment may indeed be feasible for some of the subjects (especially those who could be classified as educable mentally retarded).

Charting progress

Further research may indicate the progress of individuals over time. Data would be collected in the same manner as in this study beginning with the individual's first exposure to the horticultural task. If the task were performed and data collected on a daily basis, the results could be charted as in Figure A.

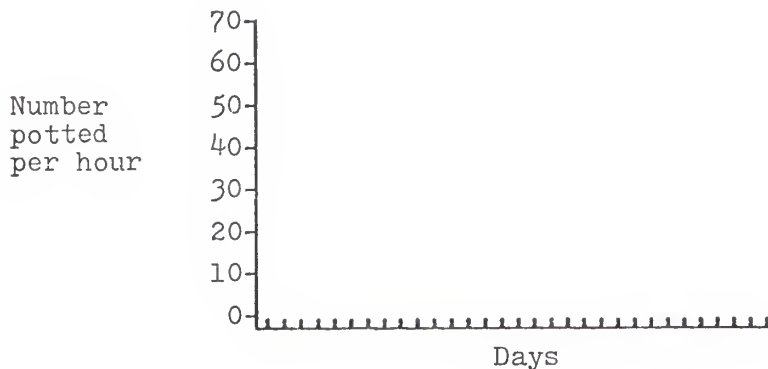


Fig A. Progress charting.

An accurate picture of the client's progress as he became more familiar with the task would result. If it were possible for a subject to spend several hours per day on the potting task, results would indicate whether productivity increases or decreases as the task becomes routine.

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Rebecca L. Haller

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KANSAS STATE UNIVERSITY

Manhattan, Kansas

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Abstract

Horticultural activities have been successfully used for therapeutic and rehabilitative purposes with diversified groups of disabled or disadvantaged individuals. This thesis examined the value of vocational training in horticultural skills for mildly retarded adults.

Ten greenhouse activities were analyzed according to cognitive and physical skill requirements. Comparative studies were made of educable and trainable mentally retarded clients performing horticultural and non-horticultural tasks at two rehabilitation centers. Production rates (% of normal) were statistically similar at both centers. Results indicate that mildly retarded adults perform at significantly higher rates (% of normal) on horticultural tasks than on non-horticultural tasks.

The constantly changing and stimulating environment of living plants seems to provide therapeutic and rehabilitative benefits. Many mildly retarded adults can be taught vocational skills for future placement in greenhouse or horticultural work.