



International Journal of Intellectual Disability

E-ISSN: 2710-3897

P-ISSN: 2710-3889

IJID 2023; 4(1): 01-03

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www.rehabilitationjournals.com

Received: 01-11-2022

Accepted: 05-12-2022

Nikhil N

Department of Community
Science, College of Agriculture,
Vellayani, Kerala, India

Rafeekhar M

Department of Floriculture,
College of Agriculture, Vellayani,
Kerala, India

Beela GK

Department of Community
Science, College of Agriculture,
Vellayani, Kerala, India

Accessible garden structure to impart horticultural therapy for differently abled population

Nikhil N, Rafeekhar M and Beela GK

Abstract

The aim of the study was to develop an accessible assistive technology garden structure for the differently abled population to impart horticultural therapy. A prototype of the garden structure was developed after a preliminary study to make it more accessible. The user-centered approach to design was used to design the product. In order to study the feasibility and accessibility of the garden structure, a qualitative approach was taken in the study. A sample of twenty adolescents with disabilities was selected randomly for the feasibility study. The data collection techniques used in this study included observation, an interview schedule using a rating scale, and documentation. The results of the study indicated that the structure was highly acceptable, and it was reported that it is highly accessible, likeable, safe to use, produced no pain, and is appealing to the eyes.

Keywords: Horticultural therapy, assistive technology, differently abled population, garden structure, accessibility

Introduction

Everyone can utilize tools and technology to make life easier and perform tasks with more efficiency. However people with disabilities face even greater challenges in performing essential tasks in life. These challenges are specially evident with those individuals with a disability involved in agriculture. With the use of assistive technology, children with a disability can maintain their independence and productive lifestyle on the garden.

Assistive technology is technology used by individuals with disabilities in order to perform functions that might otherwise be difficult or impossible. Assistive technologies are primarily used to improve functional outcomes for persons with disabilities. An Assistive technology system may involve the use of commercially available or custom made, low or high tech devices. The purpose of Assistive technology intervention is neither remediation nor rehabilitation, but to enable the individual with a disability to carry out a certain activity in a safe and effective manner. While technology can make life easier on everyone, assistive technology can make farming possible for individuals with a disability. Assistive technologies in agriculture is the application of ergonomics that can help in increasing the efficiency and thereby productivity of the people with disability.

Horticulture is a field that is frequently overlooked by physically challenged people due to their physical limitations. When physical limitations make gardening challenging, one needs to be very inventive to keep gardening without experiencing too much discomfort or sustaining further injuries. Farming is considered to be an intensive occupation that involves physically demanding work. But if proper assistive technology is used and structures are provided horticultural therapy can be made fun and easier for children.

Review of literature

Horticultural therapy is the participation in horticultural activities facilitated by a registered horticultural therapist to achieve specific goals within an established treatment, rehabilitation, or vocational plan. Horticultural therapy is an active process which occurs in the context of an established treatment plan where the process itself is considered the therapeutic activity rather than the end product (AHTA, 2010) [1]. Horticultural Therapy is an integrated approach to human development using horticulture with behavioural science. (Beela *et al.*, 2010) [3] Several studies have shown that horticulture therapy resulted in an improvement in fine motor skills (Beela *et al.*, 2015) [4], encourage creativity (Dorothy Blair, 2009) [5], and developed higher self-esteem.

Corresponding Author:

Nikhil N

Department of Community
Science, College of Agriculture,
Vellayani, Kerala, India

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Methodology

The following steps were taken to develop in order to make the structure more accessible and ergonomical.

1. Preliminary Study
2. Planning and designing
3. Product Development
4. Feasibility and acceptability study
 - a) Selection of locale
 - b) Sample selection
 - c) Assessment tool
 - d) Administration of the tool
 - e) Feasibility study
5. Qualitative Analysis

Preliminary Study

This study aims in developing an accessible assistive technology garden structure for the differently abled population to impart Horticultural therapy. Based on the review of literature, a preliminary study was conducted to analyse the opinion of the differently abled children about their needs and requirements in doing horticultural activities. An outline of the structure was first drawn and because it resembled that of a giant wheel, it was named Ferris wheel pots.

Planning and Designing

In this study, the user-centered design (UCD) method was used to create an assistive gardening structure. User-centred design is an iterative process that focuses on an understanding of the users and their context in all the stages

of design and development. The goal of user-centered design is to make the structure very usable, which means that it is convenient in terms of usage, effectiveness, manageability, and how well the structure is mapped to the user's requirements.

The implementation of the user-centred design method in this study involves four phases, namely:

1. The analysis phase is used to thoroughly examine the assistive garden structure that will be created. The elements and criteria of ergonomics needed for the disability were analyzed.
2. **Design phase:** In this phase, the structure was designed based on the elements and requirements mentioned by the children with disabilities selected for this study.
3. **Implementation phase:** In this phase, the design was implemented into working systems that were ready to be used based on feedback from actual users. Certain modifications were made to the structure based on the feedback.
4. **Evaluation phase:** In this phase, the assistive garden structure was again evaluated by the users.

Product Development

The structure is Ferris wheel pots was developed based on the planning and designing phases of the study.

Feasibility and Acceptability Study

Selection of locale

The study is conducted at the Horticultural therapy garden located at the College of Agriculture, Vellayani.

Sample Selection

Twenty Differently challenged children participating in the horticultural therapy project implemented by the Kerala Agricultural University were selected for this project.

Assessment Tool

4 Point rating Scale is constructed and it was subjected for reliability and validity. Users evaluated and rated the tools based on 4 point rating scale e.g: Strongly agree, Agree, Disagree, Strongly Disagree.

Administration of the tool

A questionnaire was used to compile a complete list of descriptors through an Interview Schedule

Feasibility Study

The participants were allowed to use the structure for 15 minutes, after which they were asked to provide feedback. The feedback of the participants was consolidated.

Qualitative Analysis

A Qualitative research approach to gathering data from an interview process using questionnaire and subsequent analysis of the data.

Results and Discussion

The Results of the study entitled “accessible garden structure to impart horticultural therapy for differently abled population” is presented in this chapter under the following headings.

1. Ferris Wheel Pots
2. Feasibility of the developed garden structure

Table 1: Responses of the participants based on the descriptors for the evaluation of the structure

Descriptors for evaluation	Strongly Agree	Agree	Disagree	Strongly Disagree
Accessible	18	2	0	0
Likeable	20	0	0	0
Easy to use	10	7	3	0
No force exerted to the structure	3	6	10	1
Safe	20	0	0	0
No pain	18	2	0	0
No blisters	20	0	0	0
Feels comfortable to use	8	5	7	0
No peak pressure on hand	10	6	2	2
No assistance required	18	2	0	0
Comfortable working posture	13	0	5	2
Solid design	16	2	2	0
Appealing to eyes	18	0	2	0
Easy to water	18	2	0	0
Has Good grip	10	3	5	2

Ferris wheel pots

The Garden structure resembles like that of a Giant wheel. The structure measures 2 feet side to side, 5 feet front to back and 7 feet in height. This structure consists mainly of 2 parts i.e one support stand and a rotating wheel. All the parts of this structure are made using Galvanized Iron pipes as it is having higher longevity and durability. The support stand is made using 1 inch G I square pipe. The rotating wheel is made using 1 inch round pipe. The support stand is joined to the rotating structure by a horizontally positioned circular round rod. A Rotating handle is attached to one end of circular round rod to allow rotation of the structure with the hands. The rotating wheel is attached with 6 set of G I round circular rings of 6 inch diameter for placing the pots.

Feasibility of the developed garden structure

The feasibility study's findings revealed that of the twenty children with disabilities, 18 of them strongly agreed and 2 of them agreed that the structure is accessible. Of the Participants, 18 had strong motor abilities. All the participants unanimously agreed that the structure is quite liked, largely as a result of the lovely colour scheme it has.

When asked whether the structure is easy to use, 10 participants highly agreed, 7 participants agreed, and 3 participants disagreed with the statement. The structure was put close to the pathway that is accessible to the wheel chair users.

Out of the total number of participants, 3 highly agree, 6 agree, 10 disagree, and 1 highly disagree that no force is exerted on the structure. It is reported that a slight force needed to be applied to rotate the wheel. All the participants unanimously agreed that the structure is totally safe for using.

When asked whether the structure produces no pain on hands, 18 participants strongly agreed and 2 participants agreed. All the participants agreed that no blisters formed on their hands after using the structure.

When asked whether they felt comfortable in using the structure, 8 participants highly agreed, 5 participants agreed and 7 participants disagreed. Out of the total participants, 10 highly agreed, 6 agreed, 2 disagreed and 2 strongly disagreed that no peak pressure on the hands should be exerted while rotating the developed structure.

Out of the total number of participants, 18 strongly agree and 2 agree that no assistance is required while using the structure. They were of the opinion that they can single handedly rotate the structure without any help or assistance from others. When asked whether the structure is placed in a comfortable working posture, 13 participants strongly agreed, 5 participants disagreed and 2 participants strongly

disagreed.

When asked whether the structure has a solid design, 16 participants strongly agreed, 2 participants agreed and 2 participants disagreed. It was observed that participants found immense joy in rotating the structure using the rotating handle. The design of the structure resembles that of a giant wheel.

Out of the twenty participants, 18 strongly agreed and 2 agreed that the structure is quite appealing to the eyes. When asked whether it is easy to water the pots placed on the structure, 18 participants highly agreed and 2 participants agreed. When asked whether the structure had a good grip while rotating the handle, 10 participants strongly agreed, 3 participants agreed, 5 participants disagreed and 2 participants strongly disagreed.

Conclusion

The data collection techniques used in this study included observation, an interview schedule using a rating scale, and documentation. The results of the study indicated that the structure was highly acceptable, and it was reported that it is highly accessible, likeable, safe to use, produced no pain, and is appealing to the eyes. However, it was also reported that a slight force needed to be applied to rotate the wheel. The technology of the prototype developed in the study can be transferred to other institutions where horticultural therapy is implemented. Motivate children with disability to take up agriculture as an occupation. Further research is required to develop more and lower tech as well as high tech assistive structures for the differently abled population.

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