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1 **Evaluating the effects of a Therapeutic Day Rehabilitation program and inclusion of gardening**  
2 **in an Australian Rural Community Health Service**

3  
4 **Abstract:** Therapeutic day rehabilitation (TDR) is a non-residential intensive structured program  
5 designed for individuals recovering from substance misuse. A weekly afternoon of therapeutic  
6 gardening was a new incentive initiated in a TDR program at one Australian community health  
7 service, designed to give participants the opportunity to spend time outdoors connecting with nature  
8 and each other. The aim of this study was to explore perceptions of participants enrolled in this  
9 program by employing a convergent parallel mixed-method design using qualitative individual,  
10 semi-structured interviews ( $n=14$ ) and longitudinal quantitative Quality of Life (QOL) data at three  
11 different intervals ( $n=17$ ). The analysis of the quantitative data showed that there was a statistically  
12 significant increase in the participants' QOL scores in three of four domains (physical health,  
13 psychological, social relationships) when comparing baseline and post completion of the TDR.  
14 These observed changes were maintained at the four-week follow-up. The key findings from the  
15 semi structured interviews include positive effects for participants on social connectivity, structure  
16 and achievement, understanding of recovery and relaxation from contact with nature. This study  
17 shows that a combination of TDR and therapeutic gardening can improve participants' physical  
18 health, psychological health and social relationships.

## 1 **1. Introduction**

2 Therapeutic day rehabilitation (TDR) is a six-week non-residential intensive structured  
3 rehabilitation program designed for individuals recovering from substance misuse. The program staff  
4 support individuals to learn relapse prevention skills, build life skills and promote their general  
5 wellbeing (LCHS, 2015). TDR involves motivational enhancement, cognitive behavioral therapies,  
6 individual and group counselling, self-help and peer support (Health.Vic, 2017). A new initiative at  
7 one Australian rural community health setting was to enhance the TDR curriculum with an afternoon  
8 of Therapeutic Gardening (TG) in the Grow Hope Garden (GHG) once a week. The role of nature  
9 and therapeutic gardening has been recognized in the literature for enhancing the health and  
10 wellbeing of individuals and providing psychological benefit (Clatworthy et al. 2013; Marsh et al.  
11 2018). Horticultural therapeutic gardening has also been known to be a meaningful therapeutic  
12 modality for veterans with substance abuse issues (Lehmann et al. 2018). Gardening was also used  
13 as a modality to help prisoners recover from substance abuse (Brown et al. 2016). In this paper, we  
14 explore the perceptions of program participants on the TDR program and the new GHG component,  
15 as well as longitudinal evaluation of its effect on their QOL.

16 TDR is a program specifically designed for low risk individuals who have enough stability and  
17 support in their lives to address their substance use (Health.Vic, 2017). This program allows the  
18 participant to remain at home surrounded by their individual support network whilst being immersed  
19 in holistic person centered therapeutic and recovery services to assist them with a broad range of  
20 issues to reach and maintain an optimal state of well-being (Health.Vic, 2017). The content of the  
21 program varies between recreation, work and formal therapeutic interventions across the six weeks.  
22 Previous evaluations of non-residential rehabilitation programs have demonstrated a range of  
23 positive treatment outcomes including abstinence or reduced substance use, better management of  
24 substance use triggers, and an overall increase in participants' self-reported confidence to resist using  
25 their primary substance at a three-month follow-up (Kiehne & Berry, 2012; Harney & Lee, 2015)  
26 Service users in addiction treatment programs have also identified an improvement in their quality  
27 of life (Lubman et al. 2014).

28 An existing evidence-base acknowledges the potential benefits of exposure to the natural  
29 environment. These benefits include a decrease in depression and anxiety, reduction in stress levels,  
30 improved social skills and positive impacts on a person's general wellbeing (Rappe et al. 2008; Kam  
31 & Siu, 2010; Marsh et al. 2018; Thompson, 2018; Howarth et al. 2020). The outcomes from evidence  
32 based models reporting on the diversity of TGs and gardening interventions provide confidence for  
33 clinicians considering gardening as a social prescription for a range of populations (Howarth et al.  
34 2020). From this evidence it was decided with the support of an experienced community volunteer  
35 to add gardening to the mix of activities offered in the TDR program at one community health  
36 service. TG has been designed to be used as a component in rehabilitation, or vocational programs

1 with the specific aim of getting participants to reconnect with nature, to assist them to reach their set  
2 personal goals and maximise their health benefits (Therapeutic Gardens Australia [TGA], 2021). A  
3 garden can be defined as being therapeutic when it has been purposely designed to meet the  
4 requirements of a particular group. TG models have been documented as being employed with older  
5 populations, people experiencing mental illness and those with developmental disabilities in a variety  
6 of healthcare organisations (Smidl et al. 2017; TGA, 2021) though there is limited research on its  
7 use within TDR programs. The GHG at this community healthcare service is a purposefully designed  
8 outdoor area with fruit trees and raised vegetable garden beds. This TG model includes weekly  
9 gardening sessions with the service users being involved in the garden planning, watering, seed  
10 planting, weeding and crop rotation. The produce from the garden is used in the weekly home-cooked  
11 lunch session, which is prepared by program service users with the help of a staff member. Extra  
12 produce is taken home by the service users.

13  
14 In this paper, we examine the longitudinal impact of the TDR program participants' quality of life  
15 and explore their perceptions of the overall program, including the GHG component. Specifically, it  
16 aimed to answer the following three questions:

- 17 1. Is there a significant difference in the participants' QOL before the program, at the end of  
18 the program, and at 4-weeks follow-up?
- 19 2. What are the perceptions of participants on their experiences with the six-week TDR  
20 program?
- 21 3. What are the perceptions of participants engaging with TG?

## 22 **2. Materials and Methods**

### 23 *Study Design*

24 To gain an in-depth understanding of the perceptions of participants and the effects that TDR  
25 and TG has on participants; we employed a convergent parallel mixed-method design. This approach  
26 relied upon qualitative individual, semi-structured interviews and quantitative QOL satisfaction  
27 responses to obtain information collected during the same phase, analysed separately, and compared  
28 (Creswell & Clark, 2011).

### 29 *Sampling*

30 A purposive sampling approach was used with all service users ( $n=25$ ) who completed one of  
31 the four consecutive six-week TDR programs running from September 2018-April 2019 invited to  
32 take part in this research. Service users were informed that participation in the study was voluntary  
33 and received a verbal briefing and a written explanatory statement explaining both data collection  
34 methods for this research. Written informed consent was obtained from all participants for  
35 completing the survey and from those willing to take part in an interview at the end of their program.  
36 Participants were assigned numbers to protect their identities in the reporting of findings. Following

1 ethical approval by MUREC (project number: 2018-14148), data collection commenced September  
2 2018.

### 3 *Data Collection*

4 The World Health Organization [WHO] (2019) QOL-BREF (WHOQOL-BREF) survey was  
5 used to assess the participants' perception of their QOL. The WHOQOL-BREF instrument  
6 comprises of 26 items, two items from the overall QOL and general health and the remaining 24  
7 items are divided into four broad domains: physical health (7 items), psychological health (6 items),  
8 social relationships (3 items), and environment (8 items) (WHO, 2019). The psychometric properties  
9 of the WHOQOL-BREF has shown this instrument to display good discriminant validity, content  
10 validity and test-retest reliability (WHO, 2019). Data collection using this tool was conducted at  
11 three-time points: start of the program (T0), end of the program (T1), and at 4-weeks follow-up (T2).

12 Participants' perceptions of the overall TDR program and the GHG component were sought  
13 through individual semi-structured interviews. An experienced researcher, external to the TDR  
14 program, conducted the interviews face-to-face in a room at the program venue that ensured privacy.  
15 A predetermined ten-question interview schedule was used (Appendix One). Interviews were  
16 undertaken on the final day of each of the four programs between October 2018 to April 2019. The  
17 audio recorded interviews took between 15-30 minutes to complete and were transcribed verbatim  
18 by a second researcher

### 19 *Data Analysis*

20 The results of the WHOQOL-BREF were encoded in Stata version 14 (2015) for analysis. Repeated  
21 measures ANOVA and a posthoc Bonferroni test were used to determine if there was a significant  
22 difference in the participants' QOL score at baseline (T0), end-of-program (T1), and a 4-week  
23 follow-up (T2).

24 A thematic analytic process was conducted collaboratively and reflexively by two researchers  
25 on the interview transcripts to generate themes which would tell the stories of the participants'  
26 experiences with the program (Braun and Clark 2013, 2019).

## 27 **3. Results**

28 A total of 25 participants from the four TDR programs that ran during the eight months period  
29 dedicated to this research from September 2018 until April 2019 were asked to complete the survey.  
30 Out of 25 participants only 17 participants completed the WHOQOL survey tool at all three-time  
31 points and analysis was limited to the data provided by these 17 participants. Demographic data  
32 collected revealed that there were nine ( $n=9$ ) females and twelve ( $n=8$ ) males and their ages ranged  
33 from 24-56 years of age.

### 34 *WHOQOL scores*

35 The analysis showed that there was a significant increase in the participants' WHOQOL scores  
36 in three of four domains (physical health, psychological, social relationships) when comparing

1 baseline (T<sub>0</sub>) and post-intervention (T<sub>1</sub>). These observed changes were retained during follow-up  
2 (T<sub>2</sub>).

3 Analysis of the physical domain scores showed a significant difference when comparing  
4 baseline (T<sub>0</sub>) scores with post intervention (T<sub>1</sub>) scores ( $p=0.028$ ) and when comparing baseline (T<sub>0</sub>)  
5 with the four-week follow-up (T<sub>2</sub>) scores ( $p=0.000$ ). This demonstrated an improvement in the  
6 participants' perception of their physical health on the completion of TDR. There was no significant  
7 difference observed in participants' physical health when comparing post-intervention (T<sub>1</sub>) with  
8 four-week follow up (T<sub>2</sub>) scores ( $p=0.368$ ). This suggests a retention of the observed post  
9 intervention changes during follow-up

10 Analysis of the psychological domain scores showed a significant difference when comparing  
11 baseline (T<sub>0</sub>) scores with post-intervention (T<sub>1</sub>) scores ( $p=0.005$ ) and when comparing baseline (T<sub>0</sub>)  
12 with the four-week follow-up (T<sub>2</sub>) scores ( $p=0.000$ ). This demonstrated an improvement in the  
13 participant's perception of their psychological health on the completion of TDR. There was no  
14 significant difference observed in participants' psychological health when comparing post  
15 intervention (T<sub>1</sub>) with four-week follow up (T<sub>2</sub>) scores ( $p=0.751$ ). As with physical health perception  
16 this indicates a retention of the observed post intervention changes during follow-up.

17 Analysis of the social relationships domain scores showed a significant difference when  
18 comparing baseline (T<sub>0</sub>) scores with post-intervention (T<sub>1</sub>) scores ( $p=0.039$ ) and when comparing  
19 baseline (T<sub>0</sub>) with four-week follow-up (T<sub>2</sub>) scores ( $p=0.035$ ). This demonstrated an improvement  
20 in the participant's perception of their social relationships on completion of TDR. There was no  
21 significant difference observed in participants' social relationships when comparing post-  
22 intervention (T<sub>1</sub>) with the four-week follow up (T<sub>2</sub>) scores ( $p=1.000$ ). Post-intervention changes  
23 during follow-up also appeared to be retained.

24 There was no significant difference in participants' environmental domain scores ( $p=0.054$ )  
25 when comparing baseline to post-intervention measures. The changes in the means from the baseline  
26 to post-intervention of participants' QOL scores are listed in Table A. This would not be unexpected  
27 due to the timing of the questionnaire. Aspects of the environment include changes in financial status,  
28 physical safety and security, access and quality of health and social care, the home and physical  
29 environment, all aspects of life that are impacted significantly by addiction but also would not have  
30 changed significantly while a person is focused on managing their addiction and participating in a  
31 therapeutic day program. As these areas are complex, a person's perception of their agency or ability  
32 to see change in these areas is likely to only be evident after a longer time period.

33 **Insert Table A here**

34  
35 To gain a deeper understanding of perceptions of participants regarding TDR program and GHG  
36 component, semi-structured interviews were conducted with fourteen (14) consenting participants.  
37 Demographic data for this cohort showed there were eight (8) females and six (6) males and their

1 ages ranged from 24-56 years. Four themes were generated through the analysis of the qualitative  
2 data, these themes were building social connections, providing structure and a sense of achievement,  
3 better understanding of recovery, and relaxation from accessing nature. The subsequent results are  
4 illustrated in the descriptions and text extracts for each theme. Illustrative quotations are used to  
5 demonstrate participants' voice.

## 7 **Building Social Connections**

8 Participants recognized building social connections as a key benefit of TDR with several  
9 participants highlighting that they were able to build friendships with others in the program.

10 *“So I really liked forming some friendships, and it was amazing how quickly friendships*  
11 *formed in six weeks...there’s a couple of friends that I’ve met that I’ll continue to keep*  
12 *contact with outside of the TDR” (TDR1).*

13 The participants found that being with a group of individuals having had similar experiences of  
14 addiction helped in building these social connections. This shared experience allowed participants  
15 to open up and be honest to other individuals in the group and not feel judged for their addiction and  
16 their usage. This is exemplified by a participant who stated:

17 *“You don’t feel judged or anything here. Which is a big thing when you are using drugs...*  
18 *Everyone is a judge. Everyone tends to really look down at me...I could come here it’s just*  
19 *safe, it’s good” (TDR5)*

20 Participating in the TDR program minimised the feeling of isolation and differences for participants.  
21 They became aware of the commonalities in their experiences during group sessions where they  
22 spoke about their personal experiences with other participants.

23 *“You don’t feel alone, there are other people that are going through things*  
24 *similar to what you have.” (TDR12)*

25 The GHG provided a relaxed external environment giving the participants another opportunity to  
26 socialise and work together in teams.

27 *“Once we knew we were doing gardening, everyone sort of relaxed and you just talked to*  
28 *anyone about anything and people were really helpful.... definitely was a team approach”*  
29 *(TDR11)*

30 Social connections were further developed as participants wandered around the garden helping each  
31 other, openly talking in this informal unstructured activity. One participant noted that some  
32 participants acted differently when in the garden, more relaxed than when they were inside.

33 *“Just watching everyone else participate in it, it just kind of like, we seem to act a little bit*  
34 *differently in the garden than when we do when we are sitting around TDR in a group setting.*  
35 *They [service users] would come out of their shell more in the garden” (TDR1)*

## 1 **Providing Structure and a Sense of Achievement**

2 Enabling participants to establish structure and routine for their week was identified as an  
3 important element of TDR. Participation in the program gave participants something to do on a  
4 regular basis and a reason to get out of bed in the morning.

5 *“It’s given me more structure to my life I didn’t really have any. It has given me reason to  
6 get up and to work on my stuff.”* (TDR12)

7 *“Just a feeling of achievement, to stay sober, during the day, something to get up out of bed  
8 for, something to get me back on my feet.”* (TDR14)

9 Being able to take part in the program gave the participants a sense of doing something to benefit  
10 themselves. There was a feeling of accomplishment for joining and completing the program and this  
11 helped participants build their self-confidence – especially if they managed to decrease their  
12 substance use.

13 *“I benefited a lot [from the program]. I’m not sitting at home drinking [or] smoking. That’s  
14 a big difference.”* (TDR6)

15 *“I wanted to actually finish something because when I was using, I just always start things  
16 and never finish, it was good to see it through”* (TDR13)

17 Several participants also highlighted a sense of achievement they felt from the gardening activities  
18 in the GHG by watching plants grow, cultivating them and growing them for future groups. For  
19 example:

20 *“I felt like I had a purpose... giving back because we use seedlings and start a plant. So,  
21 we’re not necessarily going to see the outcome but we, you know, we cultivate zucchinis and  
22 other things that other people have grown, put some love towards, it’s really good. Now, in  
23 the future, some people will be cultivating some snow peas and watermelon and broccoli  
24 and things like that to take home”* (TDR9)

25 Overall, participants gained confidence at the end of the 6-week TDR program allowing them to feel  
26 more comfortable in tackling and accomplishing life goals. This is exemplified in the following  
27 quotes:

28 *“You know, in all aspects, not just with myself but now I feel more confident about getting a  
29 job and stepping out into the work, setting myself up a bit better.”* (TDR14)

30 *“I’ve enrolled in a TAFE course next year. That’s the best thing that I got out of this place  
31 is getting my confidence back. Yeah. that’s huge.”* (TDR3)

## 32 **Better Understanding of Recovery**

33 TDR enabled participants to have a better understanding of their recovery by reflecting on their  
34 personal experiences and experiences of other participants. Various elements in TDR program  
35 allowed participants to contemplate a broader perspective of recovery, discovering that it is more  
36 than just being abstinent. This is evident in the following quotes:



1           *“I’ve got a lot more insight into recovery, into triggers, into people’s life experiences and*  
2           *more into my own journey.”* (TDR10)

3           *“I have discovered more about myself...more about addiction. And recovery is not what I*  
4           *thought it was. Definitely. I thought abstinence is recovery. And it’s not... I really got an*  
5           *education from it [TDR].”* (TDR11)

6 Participants also valued learning about strategies to avoid substance use and learning about other  
7 services that are available to them. For this participant, being part of the day rehabilitation program  
8 was helpful after being in residential rehabilitation. It offered them an understanding of how to move  
9 back into their own community and to be more in control of situations that interfered with their  
10 recovery.

11           *“I think that it's really helpful to be able to know how to be clean, but how to do it with life*  
12           *in general, like, when you're in rehab, you kind of get told what to do and when to do it. Not*  
13           *that's a bad thing. But here you're given tools and stuff, but then you go back to life. So, I*  
14           *think that stepping out of rehab and coming into here into the day rehab is really helpful.”*  
15           (TDR7)

16 The GHG had an impact on participants during their time spent in TDR, with two participants  
17 drawing analogies between what they were doing in the garden to their recovery process.

18           *“There was just so much to do down there [garden] ... it was good to be able to pull out a*  
19           *lot of weeds, refresh the flower bed and everything. That was like cleansing I would say”.*  
20           (TDR13)

21           *“Learned something new, learnt something about gardening and you get to watch this thing*  
22           *grow. A bit like ourselves, I guess”.* (TDR5)

### 23 **Relaxation from Accessing Nature in the GHG**

24 Participants highlighted that gardening activities provided them with a feeling of tranquility and  
25 relaxation in the GHG. Some participants attributed this to the relaxed atmosphere and exposure to  
26 nature. As exemplified by one participant who stated:

27           *“[Gardening] gives you like a tranquil mind frame for the day, it actually inspired me to do*  
28           *my own garden.”* (TDR9)

29 Other participants mentioned that they got a sense of enjoyment from the sensory experience of  
30 working in the garden by getting back to nature.

31           *“The hands on, touch, feel, smell. There’s the sharing, the look on peoples’ faces, the*  
32           *excitement associated with getting back to basics...A lot of people don’t get a chance to stop*  
33           *and smell the roses.”* (TDR8)

34 Due to varied backgrounds of participants not all participants found the GHG relaxing. One  
35 participant actually experienced adversity whilst working in the garden and found it difficult to  
36 suppress memories from their childhood, so this participant chose to spend this time cooking and  
37 preparing lunch.

1           *“I really struggled as a child... we were not only hit but we were made to do the*  
2           *gardening...it just unearths a lot of triggers for me.... It’s kind of like PTSD or whatever.*  
3           *But I then had to face it, I’ve got a good bunch of people in this class. So it’s been easier to*  
4           *do. I do drag my feet ...it’s not my favorite thing to do...I usually spent the time cooking*  
5           *though it is awesome to have fresh veggies” (TDR7)*

6 Another two participants found gardening to be physically challenging, with one participant stating  
7 their health issues made it difficult for them to participate in gardening activities and is exemplified  
8 by the following quote.

9           *“There was nothing that I didn’t like. I went to the garden one day, but I got really bad*  
10          *arthritis and I wasn't really capable of doing much planting, I planted a few sunflowers and*  
11          *that was it. I sat down for the rest of the day. But the other times I was in here doing the*  
12          *cooking and enjoying it” (TDR10).*

#### 13 **4. Discussion**

14           The aims of this study were to gain an understanding of how participants perceived both the  
15 TDR and GHG, and to report on any significant changes in their QOL scores at three separate  
16 intervals. We found that participants had statistically increased their QOL scores post program in  
17 three out of the four dimensions of the WHOQOL tool, demonstrating overall improvement in their  
18 general wellbeing. These results are consistent with other studies that demonstrated significant gains  
19 in the QOL scores of their participants post-program compared to their baseline scores (Kiehne &  
20 Berry, 2012; Lubman et al. 2014). The only notable difference was that our research showed no  
21 significant improvement in the environment dimension and it could be proposed that this may be due  
22 to the short follow up period of 4-weeks of our re-evaluation, one may assume that items in this  
23 dimension might not show change quickly.

24           Environmental domain in the context of WHOQOL tool refers to an individual’s relationship to  
25 the salient features of their environment (WHO, 1997). This specifically includes important  
26 environmental factors such as living conditions, financial status, safety, security, access to  
27 services, quality of health care, and ease of transport which are all shaped by structural factors  
28 that go beyond individual agency to change. As these factors are complex, a person’s perception  
29 of their agency or ability to perceive change is likely to be only evident following an extended time  
30 interval. The lack of change in this domain could also reflect the reality that participants returned to  
31 their normal home environment every evening whilst participating in this program. Certainly, the  
32 results reported in this study reflect the positive value of participation in the program on physical,  
33 psychological health and social relationships of participants but leaves us with little understanding  
34 of why this is so. The qualitative data findings from the semi-structured interviews are essential to

1 unpack the positive reception of TDR and to develop a richer representation of participant's  
2 experiences.

3  
4 The findings from interviews highlighted the success of this TDR program in helping  
5 participants to gain a better understanding of their recovery. This is consistent with Kiehne and  
6 Berry's (2012) study where participants developed a better understanding of the risks and triggers  
7 for them and was shown to have lasting impact six- and twelve-months post completion of program.  
8 Participants in our study reported that partaking in TDR gave them a purpose and it decreased their  
9 social isolation by meeting peers who have had similar experiences. It gave participants a sense of  
10 connection as they were able to openly share their experiences with each other, without feeling  
11 judged for their problematic addiction. This helped participants reconnect with people and form  
12 new friendships, often decreasing the isolation that they had been experiencing previously. These  
13 are positive outcomes but as the data was collected on the last day of the six-week program, future  
14 research needs to be undertaken to see if participants continue to experience these outcomes long  
15 term. The findings also highlight the benefit of interventions that utilises group work for individuals  
16 that may be experiencing social isolation. There is value in utilising groups in primary health care  
17 despite the global trend towards a more individual focus (Freeman et al. 2020).

18  
19 Having access to a garden, working within it, and being responsible for the garden was a new  
20 experience for several participants in this study. The practice and opportunity to do something  
21 different particularly in the context of rehabilitation was highly valued. The findings from this study  
22 found participants enjoyed doing activities in the garden, which they perceived as meaningful, and  
23 gave them a sense of achievement. This resonated with other studies where they found therapeutic  
24 gardening decreased the passivity and improved the occupational balance in their participants in  
25 various settings (Kam & Sui, 2010; Clatworthy et al. 2013; Haith & Trenoweth, 2015; Marsh et al.  
26 2018). A key benefit of the GHG acknowledged by participants was that they enjoyed working  
27 together and building social connections during their time in the garden, as they found this outdoor  
28 activity relaxing. This is consistent with other studies on horticulture and ecotherapies, where this  
29 improvement in social skills was accompanied by the development of comradery and connectedness  
30 and a sense of shared purpose while developing new gardening skills (Haith & Trenoweth, 2015;  
31 Smidl et al. 2017; Soga et al. 2017; Cutcliffe & Travale, 2018). As found in the study by Smidl et al.  
32 (2017) there was improvement in social skills, and participants developed communication skills as  
33 they relaxed in a non-judgmental environment with a joint endeavor.

34  
35 Although participants in other studies have reported increased energy (Smidl et al., 2017;  
36 Cutcliffe & Travale, 2018), and enhanced cognition (Hardin-Fanning et al. 2018) due to the vigor of  
37 gardening activities, some of the participants in the current study found they actually struggled with

1 the physical demands. This demonstrates that when it comes to designing therapeutic gardens the  
2 fitness and capabilities of potential participants needs to be considered to reduce physical workload  
3 and enhance accessibility. Although participant's QOL scores showed an improvement in the  
4 physical health domain, this theme was not highlighted by participants during interviews. This  
5 suggests that from the participant's perspective, the perceived primary benefits of the program are  
6 psychological and social in nature.

#### 7 8 Limitations of the study

9 The sample size was small compared to other similar programs and limits the transferability of  
10 the findings to other programs. In addition, we recognize that the formation of a control group could  
11 have improved the research design for this study but was not operationally feasible. However, the  
12 outcomes from this research has given us insight into this program and the inclusion of the GHG and  
13 has hopefully raised the need to evaluate such elements in other programs. Using the WHO QOL  
14 over a shorter-term may not afford the data required to influence policy and inform program direction  
15 as program impact is limited. Addiction is a chronic condition and shorter-term studies while useful  
16 for service improvement require ongoing follow up to yield more constructive data. It was not  
17 possible to isolate the impacts and perceptions related to participation in TG from the wider TDR  
18 program. Although specific questions were included to draw out the participants' experience, the  
19 GHG was only one component of the overall program.

#### 20 21 5. Conclusions

22 The results of this study validate the appropriateness of incorporating therapeutic gardening  
23 within this TDR program by showing that when participants have contact with nature, they  
24 experience a sense of tranquility, relaxation and more importantly a sense of achievement. It has  
25 demonstrated that therapeutic gardening may improve psychological health and social  
26 relationships, but that questions remain about physical health and the need to customise TG  
27 designs depending on the participants' mobility levels. Ultimately, the findings of this study  
28 can help inform staff facilitating the TDR program at this rural community health service and further  
29 improve its implementation particularly with the therapeutic gardening aspect.

30  
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32 **Conflicts of Interest:** The authors declare no conflict of interest.

33 The data that support this study will be shared upon reasonable request to the corresponding  
34 author.

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**Table A: Statistical analysis of the participants' WHOQOL scores for the three-time intervals**

WHOQOL Domain	Mean T <sub>0</sub>	Mean T <sub>1</sub>	Mean T <sub>2</sub>	Repeated measures ANOVA	Post-hoc: Bonferroni test		
					T <sub>0</sub> vs T <sub>1</sub>	T <sub>0</sub> vs T <sub>2</sub>	T <sub>1</sub> vs T <sub>2</sub>
Physical health	49.82	61.24	67.76	<i>p</i> =0.000	<i>p</i> =0.028	<i>p</i> =0.000	<i>p</i> =0.369
Psychological health	45.29	60.06	65.12	<i>p</i> =0.000	<i>p</i> =0.005	<i>p</i> =0.000	<i>p</i> =0.751
Social relationships	46.71	59.65	59.88	<i>p</i> =0.004	<i>p</i> =0.039	<i>p</i> =0.035	<i>p</i> =1.000
Environment	59.29	70.00	61.24	<i>p</i> =0.054			

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