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ARTICLE

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Outcomes on health, recovery and activity level for mental health service users attending a novel nature-based intervention: a prospective study

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ABSTRACT

Purpose: Mental illness due to longstanding stress is increasing. It has been shown that service users with mental illness may benefit from nature-based interventions (NBI), including equine-assisted therapy, to support their health, recovery, and activity level of daily life. However, the evidence base to support this is still weak. The aim was thus to evaluate and provide knowledge of the possible effects on health, recovery and activity level from participating in a novel nature-based intervention among mental health service users with mental illness due to longstanding stress.

Materials and methods: Forty participants took part in the study, which had a single group pretest-post-test design. The program was delivered in groups at a farm-based rehabilitation centre in a southern part of Sweden. It consisted of 24 weeks in two 12-week phases. Data were collected using well-tested questionnaires reflecting health, clinical and personal recovery, and activity level.

Results: The analysis showed an improvement with medium to large effect sizes over time according to outcomes on aspects of health, recovery and activity level with exception for self-mastery. All outcomes were statistically significant with p -values $\leq .005$.

Conclusions: This novel nature-based program has the potential to be a recovery-oriented intervention that could enhance health, both clinical and personal recovery, as well as activity level for mental health service users. The intervention could thus also be a beneficial complement to current psychiatric care services.

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Introduction

Mental illness due to longstanding stress is increasing rapidly and is currently the most common cause of long-term sick leave among Swedish men and women, causing both personal suffering as well as an increased utilization of health-care and high societal costs [1]. Mental health service users on long-term sick leave due to stress and anxiety have a greater likelihood, compared to service users in primary health care, of being excluded from both working life [2] and social life [3]. This situation affects the whole person and causes major difficulties with their general ability to engage in and organize everyday life [4–6].

Despite the knowledge about these detrimental consequences for people suffering from mental illness due to longstanding stress, often with diagnoses such as anxiety disorder, post-traumatic stress disorder (PTSD), exhaustion disorder and/or depression [7–9] the evidence base for effective interventions is still weak. While some people with stress-related mental health problems receive multi-modal rehabilitation within primary health care [10–12], the interventions that are traditionally provided for people with more severe mental ill health due to

longstanding stress within mental health services focus on medical treatment and talk-based therapies [13,14]. Unfortunately, these interventions do not always support a process towards person-centred recovery goals [15]. These interventions are often derived from the biomedical approach focusing on aspects of so-called clinical recovery, defined as the professionals' perspective of recovery as the achievement of reduced symptoms and improved functioning [15,16]. The concept of personal recovery has developed from qualitative research that underscores the importance of considering the person's own experiences of recovery as an important complement to the traditional notion of clinical recovery [15,17]. Personal recovery is thus a unique, subjective process where people with mental illness improve their health and well-being, despite experiencing challenging symptoms [18]. The personal recovery framework includes concepts such as connectedness and hope, optimism, meaningfulness, identity, and empowerment [19]. It is thus equally as important to strive to strengthen self-mastery [20] and self-efficacy [17] in recovery-oriented services together with a process to facilitate clinical recovery with symptom remission [21,22]. Mastery is the perceived sense of

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self control over life circumstances and self-efficacy is the perceived ability to cope with challenging situations despite current mental distress, and these two concepts combined with being able to be active in everyday life can have major influences on the perceived quality of life [23–26]. However, Dell et al. [15] reinforce the use of personal recovery complementing clinical recovery. The authors emphasize the importance of integrated-health practice models in mental health care to support recovery where clinicians use person-centred models, as within personal recovery, combined with services addressing physical health and psychiatric symptoms, as within clinical recovery. “Recovery-oriented services” is used in this article in the sense that, even though personal recovery is in focus, aspects of clinical recovery are integrated.

Even though effective interventions for the target group of people with mental illness due to longstanding stress are scarce, there is a growing evidence base for interventions with more of a personal recovery approach. Research shows that interventions with a holistic and embodied approach such as mindfulness can both support emotional regulation [27] and also reduce anxiety [28–31]. Furthermore, it was concluded by Sjösten et al. [32] that supporting people with stress-related disorders requires a tailored and person-centred approach that benefits from giving space for existential discussions and learning through an activity perspective on everyday life.

Supporting the personal recovery of mental health service users is hence acknowledged as important for the target group and researchers also raise the important issue of finding an evidence base for these treatments [33–36]. Recovery-oriented services have also gradually been introduced in mental health services internationally, and recently in Sweden [17,37–39].

Nature-based interventions (NBI) may be considered as recovery-oriented services [40–43]. NBI is a concept where the intervention is supported by, and grounded in, the natural environment. NBI is provided by professionals in mental health services and includes therapy sessions with a person-centred approach for different target groups [7,44]. There is a growing evidence base on the positive impact of nature on health regarding both cognitive and affective symptom outcomes [45–49]. Research also indicates improved changes in physiological conditions, perceived level of stress, experienced occupational values, and recovery [50–55]. Furthermore, a recent qualitative synthesis by Bergenheim et al. [50] presents moderate to low certainty evidence that service users with longstanding stress-related mental illness, who were provided NBI, experienced positive health effects such as feelings of calm and joy, that needs were being met, of gaining new insights and personal growth. This indicates that NBI could be a beneficial intervention for service users with mental illness due to longstanding stress, however more research is needed. Equine-assisted therapy is a general concept within NBI that involves horses, their environment, interaction, and riding as forms of therapy conducted by healthcare professionals [56]. Preliminary results in research into equine-assisted therapy, as a complementary intervention focusing on recovery within mental health, have shown positive treatment effects for people with mental illness, such as reduction of anxiety and PTSD symptoms [57,58] and

in supporting a process against taking control over themselves and their lives [42]. Zhu et al. [59] found in a study using neuro imaging that an equine-assisted therapy, provided for military veterans suffering from PTSD, generated clinical improvement and activated the reward-system in the brain, and also activated other brain areas, which was not found in people receiving traditional, trauma-focused therapy. Furthermore, therapy and activities with horses have demonstrated possibilities for improving empathy, self-esteem, and self-efficacy for adolescents and adults with different types of mental illness even though more research is needed [42,60–62].

Although studies have shown that NBI has a positive influence on health, and both clinical and personal recovery, there is a knowledge gap regarding how people with mental illness due to longstanding stress may benefit from participating, and there is an urgent need for further research to expand this knowledge base [7,10]. A new NBI program including equine-assisted therapy, to which this study is connected, was developed in 2019. The intervention, with a focus on stress-reduction, was originally directed to clients within primary health care but was here re-designed to target mental health service users. NBI including conceptualized equine-assisted therapy has, to our knowledge, not previously been studied for this target group in a Swedish context.

The aim of this study was thus to evaluate the possible effects on aspects of health, recovery and activity level of the newly developed nature-based intervention for mental health service users with mental illness due to longstanding stress.

Materials and methods

Design

The current study has a single group pretest-post-test design.

Participants

The participants decided to take part in the intervention after a discussion with the ordinary contact or the team in mental health care. Staff had been informed that the intervention was designed to meet persons with mental illness on sick-leave who had experienced longstanding stress and who were interested in taking steps towards future opportunities to return to work. In most cases the person also visited the farm. The referral and invitation to participate in the study was then made by a psychiatrist, a psychologist or a rehabilitation coordinator. Inclusion criteria were being a mental health service user in general outpatient mental health services who, due to diagnoses related to longstanding stress, were referred to the intervention, and being between 18 and 65 years of age. Exclusion criteria were having psychotic problems, ongoing substance abuse, developmental disorder, a primary diagnosis of dementia, an imminent risk of suicide, and not understanding Swedish. The participants' self-reported diagnoses were primarily exhaustion disorder also known as burnout, anxiety disorder, PTSD, and depression. There were also participants who reported combinations with attention deficit hyperactivity disorder and bipolar disorder. Forty-eight individuals in total went through the program. Forty-two of

these consented to participate in the study and forty completed it. The six persons who declined to participate and the two who dropped out were too exhausted to carry out all the questionnaires at base-line.

The characteristics of the participants are presented in Table 1.

The setting

The TiDieR checklist was used to describe the setting and the intervention [63]. The setting was a farm-based rehabilitation centre situated in the countryside in a southern part of Sweden, offering scenic surroundings with deciduous and coniferous forests plots with brooks, valleys, heights, open spaces, and pastures. The intervention was provided primarily outdoors in different places or in the stable, while gatherings also could be held in a gazebo. The animals, which apart from horses included dogs and cats, were all based on the farm. All horses involved in the intervention were specially recruited, trained and prepared for participation. The on-site staff were the manager, who is a registered nurse with a specialization in psychiatry and a certification for providing equine-assisted therapy, and a co-worker with experience from working with groups in equine-assisted therapy and with a specialization in horse-training, horse-learning, breeding, and training dogs to be therapy dogs. Both the staff have long experience in providing NBI and different equine-assisted interventions [44]. There were also assistants from the stable staff available during sessions with equine-assisted therapy. The centre was private, independent from mental health care, but standing under supervision of The Health and Social Care Inspectorate in Sweden.

The origins of the development of the specific program were that the manager aimed to further develop the existing

rehabilitation concept after several years of experience from providing activities to clients with different health issues who came to the farm. She then created a specific 24-week program consisting of two 12-week phases for medical use, which is founded on current evidence-based knowledge in the field of NBI. The intervention was delivered in groups of up to eight people. Each day included a schedule with specific routines, although some flexibility was accepted. The therapy aimed at supporting participants to slowly approach vocational rehabilitation by providing a gradual transition. This developed from the participants experiencing enjoyable and calming activities that stimulated their senses and their bodies, termed "body-up". The activities initially had an emphasis on occupational values [52,53,64] with mainly self-rewarding values (such as relaxing in nature). The process then gradually continued towards engaging in activities with more concrete occupational values (such as finishing a specific work-like task). There was also a possibility to take part in a third phase, not focused on in this paper, aiming at vocational rehabilitation. Phases 1 and 2 are schematically described below in Table 2.

Some modifications were carried out during the project. There was one psychologist, with special training in equine-assisted therapy, initially included to provide talk-based therapy. However, the manager found while providing the intervention to the first group that there was no need for this, since the focus primarily was on body-up therapy with a later engagement in more concrete activities. Furthermore, the program was modified during the pandemic in 2020–2021 so that all meetings were held outdoors.

Data collection

The data were collected using self-report questionnaires administered at the start and when Phase 2 was completed.

Table 1. Characteristics of participants in the intervention (N=40) at baseline.

Characteristics	n	%	Missing
Sex			
Male	7	18	
Female	33	82	
Education, highest			2
Compulsory school	2	5	
Upper secondary school	10	26	
University	26	68	
Cohabitation			
Living together	25	64	
Living alone	15	36	
Living conditions			1
Own villa or apartment	32	82	
Own villa or apartment with housing support	2	5	
Living together with relative/friend	5	13	
Children			
Yes	23	57	
No	17	43	
Having children at home at least 50% of time	13	33	
On medication			6
Yes	29	85	
No	5	15	
Born in Sweden			
Yes	36	90	
No	4	10	
	M	SD	Range
Age, years	40.0	11.9	(19–63)
Contact with psychiatry, years	9.8	8.3	(0–30)
Self-reported work ability 0–10, (0= none, 10= good)	1.1	1.4	(0–5)

Table 2. Description of the content in the intervention.

Content and arrangement	Phase 1 – week 1–12	Phase 2 – week 13–24
Focus on	Calming and enjoyable “body up” activities, feeling safe, building routines, inbuilt psycho- education regarding self-regulation of emotional and psychological arousal.	Introducing work-like tasks, psychoeducation regarding maintaining routines and acquired tools from Phase 1 for transition to everyday life.
Time on site	3 times a week/3 hours a day	2 times a week/3 hours a day
Staff	2 with group, 1 at the facility	1 with group
Therapeutic activities, examples	<ul style="list-style-type: none"> Guided resting on horse-back Mindful walks in the forest (forest-bath) Forest-bath on horse-back Resting in hammock or on the ground Learning about stress signals and self-regulation Other activities that gave self-rewarding value Informal peer support 	<ul style="list-style-type: none"> Participate in occurring activities at the farm Learning more about human and animal stress reactions as well as calming strategies Setting individual goals Meetings on site with Public Employment Service or employer and the Social Insurance Agency to support further rehabilitation, vocational rehabilitation, studies or employment Other activities that gave concrete value Informal peer support
Optional activities, examples	<ul style="list-style-type: none"> Resting alone Silent walks Sitting with the horses Spending time with dogs and cats Meeting staff face-to-face 	<ul style="list-style-type: none"> Resting alone Silent walks Sitting with the horses Spending time with dogs and cats Meeting staff face-to-face

Close collaboration with healthcare services and health administrators throughout the intervention.

The baseline examination was carried out at the start of the intervention and a follow-up assessment was performed at the end of the 24-week intervention. A researcher was present on the site on both occasions in case of questions or if help was needed to read the questionnaires.

Instruments

The instruments used in the project, which are presented below, are all well tested and reflect health from both clinical and personal recovery aspects as well as activity level.

Socio demographic data were collected with a background questionnaire with socio-demographic characteristics such as age, gender, living conditions, educational level, and years of contact with psychiatry. The questionnaire was constructed specially for the project and was completed at baseline.

The Beck Anxiety Inventory (BAI) is a self-report questionnaire measuring the severity of anxiety symptoms with 21 questions, each describing a symptom of anxiety. The participant rates each item on a scale from 0 to 3, indicating how much he/she experiences each symptom. The scores range from 0 to 63, with higher scores indicating more severe levels of anxiety. The instrument is widely used and has shown

good validity and reliability, and internal consistency with Cronbach's $\alpha = .94$ [65,66].

The Hopkins Symptoms Checklist (HSCL-25) is a widely used screening instrument with 25 items measuring symptoms of anxiety and depression. The scale for each question includes four response categories from 1 (not at all) to 4 (very much). The total score is the average of all 25 items. It has been shown to have a strong internal consistency with Cronbach's α generally $\geq .90$ [67], and is reliable, valid, and highly correlated with serious emotional distress [68,69].

The Manchester Short Assessment of Quality of Life (MANSA) consists of 16 questions, covering different domains of life such as physical health, social relationships, employment, and overall life satisfaction. Each question is rated on a scale from 1 to 7, with higher scores indicating better quality of life. The instrument has been found to be a reliable and valid measure of quality of life across different populations showing an adequate internal consistency with Cronbach's $\alpha = .81$ in the Swedish version [70,71].

The World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) is a questionnaire used to assess an individual's perceived level of functioning and disability across six domains of life with 12 questions covering: activities and participation in society. Each question is rated on a scale from 0 to 4, with higher scores reflecting greater levels of disability. WHODAS 2.0 is widely used in both clinical and research settings and has been found to be reliable and valid for assessing disability and monitoring changes in functioning over time [72].

The Swedish version, Mastery-S, of the Pearlin Mastery Scale is used to assess an individual's perceived sense of control over their life circumstances, containing seven questions to rate the level of agreement with statements about the ability to control and influence life. It covers areas such as personal growth, problem-solving, and self-mastery and is rated on a scale from 1 (strongly disagree) to 4 (strongly agree), with higher scores indicating greater levels of mastery. The instrument has shown satisfactory psychometric properties concerning both reliability and validity in individuals experiencing stressful life events [25,73,74].

The Swedish Version of the General Self-Efficacy Scale (S-GSE) is designed to assess an individual's perceived ability to cope with challenging situations, overcome obstacles and achieve their goals despite current health problems or symptoms. It consists of ten items, each of which is scored on a 4-point Likert scale ranging from “not at all true” to “exactly true”, where a higher score indicates greater levels of perceived general self-efficacy. The instrument has been found to be reliable and valid in different populations and has also shown to be associated with self-assessed mental work capacity [75].

The Process of Recovery Questionnaire (QPR-7) is a short version of the instrument QPR-Swe with 16 items [76]. QPR-7 has seven questions concerning which aspects of recovery have been meaningful for the participants on a five-graded scale from 0 (disagree strongly) to 4 (agree strongly). The instrument has shown good validity, reliability, and internal consistency with Cronbach's $\alpha = 0.82$, and has shown to be associated with psychosocial well-being, quality of life and empowerment [76,77].

The Satisfaction with Daily Occupations and Occupational Balance (SDO-B) is an instrument in which the activity level as one measurement is assessed when the participant is asked to answer yes (1) or no (0) about his/her current participation in specific occupational areas of work, leisure, domestic tasks, and self-care. There are 14 questions and consequently the highest score is 14 and the lowest score is 0. The SDO test of activity level has demonstrated very good test-retest reliability, and the test SDO-B is a developed test version that also includes questions about occupational balance [78].

Data analysis

Descriptive statistics were used for analysing the participants' characteristics.

Non-parametric statistics were used as the data were ordinal and categorical in nature. Missing data were inspected and analysed, considered to be missing completely at random and were replaced using multiple imputation [79]. The Wilcoxon Signed Rank test was performed, and the IBM SPSS software, version 28.0 was used for the analysis.

Ethical considerations

The Swedish Ethical Review Authority approved the study, with Dnr. 2019-01734. The participants received oral information about the study prior to starting the intervention, and one of the researchers presented written and oral information about the study at the start. The participants were then provided an informed written consent to participate. To secure the welfare of the horses and the safety of the participants, the horses that were involved were all well-trained and prepared according to IAHAIO international guidelines on care, training, and welfare requirements for equines in equine-assisted services [80].

Results

The analysis showed changes on all outcomes. All outcomes were statistically significant with p -values $\leq .005$. The effect size is described using the Cohen [81] criteria of .1= small effect .3=medium effect and .5=large effect. The data are summarized in Table 3.

The Wilcoxon Signed Rank test revealed a statistically significant lower scoring of anxiety and severity of emotional distress following participation in the program, $p < .001$, with

a medium to large effect size. The median score on the BAI decreased from baseline (Mdn =27.0, severe) to follow-up at 24 weeks (Mdn = 21.2, moderate). The median score on HSCL-25 showed that the participants scored significantly lower at follow-up. The scores were, both at baseline and follow-up, above the cutoff point of >1.75 which is often used to screen for psychiatric cases in need of treatment. The scores indicating better quality of life and lower levels of disability on MANSA and WHODAS-12, respectively, were statistically significant from baseline to follow-up with large effect sizes. The rating on self-mastery decreased significantly from baseline (Mdn = 18.8) to a lower value at follow-up (Mdn = 17.5) with a medium effect size. Self-efficacy, measured with S-GSE, showed significantly increased scores from baseline (Mdn = 19.8) to follow-up (Mdn= 23.5) with a large effect size. The scores on personal recovery measured with QPR increased significantly from baseline (Mdn = 19.0) to follow-up (Mdn = 24.0) with a large effect size. The activity level, as measured with SDO-B, increased significantly from baseline (Mdn = 6.3) to follow-up (Mdn = 8.1) from a total of 14, with a large effect size. According to staff on site the adherence was high during the intervention period.

Discussion

The results show significant improvements over time in terms of both health, clinical and personal recovery as well as activity level. Although this is a small study without a comparison group, these are promising results indicating that these types of interventions are beneficial to the target group. Where the clinical variables are concerned, it is notable, however, that participants in this intervention rated, for example, severe anxiety at baseline and moderate anxiety at follow-up. This suggests an initial movement towards clinical recovery while there are steps still need to be taken towards full clinical recovery. The result for anxiety is comparable to the reduction of anxiety achieved in multi-modal rehabilitation interventions directed to people with exhaustion disorder reported in earlier research by Glise et al. [11] and van de Leur et al.[12].). In these studies, with participants referred from primary care, the symptoms of anxiety decreased significantly during the first three months of treatment, but from levels of moderate to mild symptoms. However, the participants in this study initially reported more severe symptoms of anxiety, which is expectable since the participants were referred from specialised mental health care. This fact is supported by a recent study by Lindsäter et al. [8], that also included specialised

Table 3. Outcomes of the intervention on participants' ($N=40$) health as aspects of recovery and activity level at baseline and follow-up.

Pre- post, Wilcoxon Signed rank test instruments	Mdn Baseline (range)	Mdn Follow-up (range)	P-value	Z -value	Effect size $r =$	Positive score change $n =$	Negative score change $n =$	No score change $n =$
BAI	27.0 (4–50)	21.2 (5–39)	<.001	–3.79	.42	9	31	0
HSCL-25	2.7 (1.4–3.7)	2.2 (1.3–3.5)	<.001	–4.35	.49	4	35	1
MANSA	39.3 (15–72)	49.4 (29–72)	<.001	–5.32	.59	37	3	0
WHODAS-12	36.0 (27–51)	31.8 (15–53)	<.001	–4.43	.50	7	31	2
Mastery	18.8 (9–26)	17.5 (10–25)	=.005	–2.83	.32	10	28	2
S-GSE	19.8 (9–29)	23.5 (12–31)	<.001	–4.10	.46	30	9	1
QPR 7	19.0 (7–28)	24.0 (13–33)	<.001	–5.15	.58	35	2	3
SDO-B	6.3 (0–11)	8.1 (4–13)	<.001	–4.78	.53	33	2	5

mental health care, where the authors found that self-reported moderate to severe anxiety is a common reported symptom in stress-induced exhaustion disorder. The participants in this study also had a long history of contact with mental health care, thus indicating that this target group might need more time to achieve a larger remission of symptoms. This is in line with Glise et al. [11], who concluded that a long duration of symptoms before being referred to effective treatment was associated with prolonged time of recovery. The third and final part of the intervention is thus important and should be further investigated in order to gain a greater understanding if the recovery process continues and leads towards return to work. The scores on quality of life and functioning showed significant improvement and it is notable that the change in range, with a larger concentration of high scores on quality of life and a larger spread of scores on functioning and health at follow-up, mirrors the movement in the participants' recovery process. Earlier research on recovery concludes that clinical recovery can, but must not, have a positive impact on personal recovery, since the reach for reduction in symptoms and improved levels of functioning can support, but also hinder, the person's own engagement in creating a meaningful life with valued activities and roles [15,16].

Personal recovery seems, however, to have been well facilitated by the intervention since the scores on both personal recovery and self-efficacy were significantly improved. This can be said to be in line with earlier research on mindfulness-based interventions, NBI and equine-assisted therapy [42,50]. The positive progress of participating in the intervention is also shown in the participants' scoring of their activity level that significantly changed, indicating that they participated in their everyday activities to a greater extent. It is surprising to note that mastery showed a significant decrease, which suggests that the program did not enhance the participants' experience of being in control of their own life circumstances. One explanation for these results could be that key elements in the intervention actually aimed at allowing a reduced level of control by building trust in a safe and supportive environment through different mindfulness exercises facilitated by the nature and the horses. Furthermore, as recovery can be described as a nonlinear dynamic change process [20], the participants might have experienced a fluctuating degree of self-mastery during their recovery process reflected in their scoring at follow-up. However, further investigations with qualitative research methods are needed in order to understand what influenced a decrease in mastery.

The concepts of the intervention were informed by recent research and long experience but are innovative in the way that the program has combined elements from both NBI and equine-assisted therapy to optimize the possibility to meet the needs of people with severe stress-related mental health problems. The intervention differs from existing Nature-based rehabilitation programs that are run in different parts of Sweden, in which the participants are referred from primary healthcare services to a nature-based rehabilitation provider as a recovery intervention to support ongoing medical treatment and the staff on site are not necessarily healthcare professionals [81]. Even though these interventions do not provide onsite treatment, they still have shown good results

for people with mild to moderate symptoms of stress, depression, or anxiety [41,54,82].

Combining NBI and conceptualized equine-assisted therapy, as in this intervention, presents a broad palate of experiences for the participants. The studied intervention gives opportunities to connect and relate to both nature and animals, especially horses, offering meaningful, multisensory experiences and occupational values combined with elements of psychoeducation and informal peer-support. According to Zhu et al. [59], the equine-assisted therapy intervention, focusing on "body-up" treatment, activated other brain-areas than those that were activated when using traditional trauma-focused talking therapy, which focus on a "head-down" type of treatment. The intervention might thus be further investigated as a complement to existing treatments, adding valuable dimensions through providing non-verbal communication, offering situations of what Hörberg [46] name as unconditional beingness, and embodying experiences for the service users with moderate to severe stress-related mental health problems. This is of particular importance for those who are not solely helped by medication or more cognitive and talk-focused therapies [26,29,43,57]. Furthermore, knowledge about how sensory processing relates to coping with mental health problems has developed recently and this knowledge is used in occupational therapy interventions in mental health services to help facilitate self-regulation of emotional and physiological arousal [6,43,45]. Some of the effects of participating in the intervention might be explained as facilitating a way for sensory modulation, to help the participants cope with anxiety and other health issues that enhance their personal recovery process, their quality of life and occupational engagement in everyday life. Further research is needed in order to increase the understanding of this field and should be undertaken to deepen the knowledge by investigating the participants' experience of the recovery process during the intervention.

Limitations and strengths

The most important limitation of this study concerns the lack of a control group due to its naturalistic design. It is therefore not possible to draw any firm conclusions about the cause or causes of the detected improvements [83]. Future research with a more rigorous design, using both quantitative and qualitative methods, is thus required to establish the generalisability, investigate the cost-effectiveness, and contribute to the optimization of the intervention. The seasons and weather conditions varied and as described some modifications were carried out during the pandemic. However, the program is planned to be very flexible and takes into consideration important adaptations to meet the participants' needs, as well as necessary adjustments for the different weather conditions and the daily state of the participating horses.

Previous research, especially on equine-assisted therapy, has been criticised for having small intervention groups, varied designs or having a large level of heterogeneity in the interventions provided, resulting in an uncertainty identifying the crucial elements behind the effects [62]. This study followed a conceptualized intervention over time with a

relatively large group of participants, which thus strengthened the findings that the improvements are due to its content. The used measures were supposed to shed light over health, clinical and personal recovery-oriented outcomes as well as activity level. Future research for this target group could also benefit from using a measure of perceived stress and from using a mixed methods design to strengthen the findings. To reduce the risk of bias and ensure the validity and reliability, the study had one member of the research team present as the participants completed the questionnaires to help and to explain the content. All the participants received the same instructions for completing the questionnaires. However, consideration must be taken for the risk that the questionnaires could be experienced as being too extensive for some participants with severe problems, such as exhaustion, which could be a reason for dropping out or the generation of missing data. In order to do justice to the participants' efforts in completing the questionnaires, the missing data were analysed and replaced by multiple imputation, which has shown to be one of the least biased methods of replacing missing data [79].

Conclusion

This novel nature-based program has the potential to be considered a recovery-oriented intervention that could enhance perceived health, recovery, and activity level. It could thus support a process towards living a satisfying life and serve as a stepping stone towards increased participation in society and working life for mental health service users with illness due to longstanding stress, a history of long-term sick leave and a long contact with mental health services. The intervention could thus also be beneficial as a complementary intervention to current psychiatric care.

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