ACADEMIA
MENTAL HEALTH &
WELL-BEING

Research Article
Published: 2024-11-28
https://doi.org/10.20935/MHealthWellB7424

Equine-assisted learning reduces anxiety and increases calmness and social skills in young people

Kezia Sullivan[1], Ann Hemingway[1,*]

Academic Editor: Massimo Pasquini

Abstract

Since the COVID-19 pandemic, referrals to equine-assisted services (EAS) have increased, with a majority of referrals focusing on social, mental, and emotional health, and anxiety frequently included as a referral reason. Early intervention could help prevent ongoing health concerns from untreated anxiety disorders; this quantitative before and after measures study evaluates an equine-assisted learning program involved in developing positive social and coping skills in participants with anxiety. Participants with anxiety aged between 8 and 18 were referred to the program (n = 166), and referrers rated their skills on eight attributes at referral and at a 2-month follow-up after the program, which consisted of 5 × 2 h sessions of learning natural horsemanship groundwork. Significant improvements across all eight attributes at post-test, as well as the total score for all attributes combined ($p < 0.001$), were observed. The eight attributes were assertiveness, focus, responsibility, empathy, calmness, planning, communication, and engagement in learning. There was a significant interaction between Time and Age for Planning and Empathy attributes, suggesting that early adolescence (ages 11–14) is a key period for providing early interventions for skill development, which may help reduce anxiety in other contexts.

Keywords: *equine assisted, anxiety, calmness, social skills, young people, adolescents, equine-assisted learning (EAL), equine facilitated services, mental health*

Citation: Sullivan K, Hemingway A. Equine-assisted learning reduces anxiety and increases calmness and social skills in young people. *Academia Mental Health and Well-Being* 2024;1. https://doi.org/10.20935/MHealthWellB7424

1. Introduction

1.1. Context

The prevalence of poor mental health in young people has increased in recent years, in part due to the COVID-19 crisis [1, 2], with some studies reporting that males aged 11–15 were particularly affected [1]. Although a wide range of mental health issues in young people have increased because of the COVID-19 pandemic, including depression, post-traumatic stress disorder (PTSD), and eating disorders [1], the most commonly reported mental health concern was anxiety [3].

Anxiety has a very high prevalence among young people, with research by Zulfiqarova and Dresp-Langley [4] finding that in a sample of students at a French university, 60% met the criteria for moderate, severe, or very severe generalized anxiety disorder (GAD). Several contributory factors have been suggested, including the rise of social media [5], reduced time spent in nature set against humankind's inherent biophilia [6, 7], social isolation [8], and overexposure to digital media [9].

Among many features that contribute to the efficacy of equine-assisted services (EAS) for improving the mental health of young people, EAS are typically delivered in natural outdoor environments, often with a focus on developing embodied emotional skills through experiential learning [10]. This may, therefore, provide a contrast to hyper-digital urban environments where young people may feel isolated, stressed, and anxious and to typical educational settings that tend not to favor kinesthetic learning.

1.2. Anxiety in adolescents

The high prevalence of anxiety disorders in young people highlights the necessity for developing interventions that support young people's mental health. Anxiety can have debilitating effects, with far-ranging impacts such as increased risk of physical disease [11] and contributing to comorbid mental health disorders, particularly when anxiety is chronic or has an early age of onset. Davies et al. [12] found that major depressive disorders that developed following anxiety disorders were likely to have younger ages of onset, as well as greater clinical complexity and significance. Early intervention to reduce the development of anxiety disorders is, therefore, critical, with Altamura et al. [13] suggesting that longer periods of untreated illness can lead to reduced responsiveness to treatment.

Adolescence is likely a key time for providing early interventions to prevent the development and maintenance of anxiety, as it falls within a primary developmental window for several anxiety disorders [14]. Campbell et al. [15] found that earlier-onset anxiety

[1]Department of Medical Science & Public Health, Bournemouth University, Poole, Dorset BH12 5BB, UK.
*email: ahemingway@bournemouth.ac.uk

was associated with increased severity, likelihood of comorbidity, and emotional disorders. Lim et al. [16] found that earlier-onset anxiety was associated with greater behavioral inhibitions. A study among young children found that participants with greater attentional shifting skills were less likely to have anxiety symptoms at a later assessment, whereas those with higher inhibitory control were more likely to have anxiety symptoms. It is suggested that this is due to fear-motivated tendency to try to overcontrol, leading to an increased experience of anxiety [17]. Adolescence is a time of extensive change to an individual's physical and social context [18], which requires great flexibility to navigate successfully; excess behavioral inhibition and rigidity could lead to exacerbation of anxiety in adolescents.

Research by Troller-Renfree et al. [19, 20] found that behavioral inhibition alone does not increase the risk of developing anxiety disorders in children, but that it may be moderated by excess inhibitory control. Equine-assisted programs such as the one under study here may offer participants the chance to break out of excess inhibitory control as horses respond quickly to environmental changes and cues, requiring intuitive choices to be made as participants experience inter-affectivity and close attunement with the movements of the horses [21]. This could support participants to reduce their reliance on an excess of fear-based control, instead developing positive coping skills toward a more relaxed and responsive mode of social engagement. This is supported by the finding that neurological precursors to excess inhibitory control can be observed prior to the diagnosis of anxiety. A machine learning study by Chavanne et al. [22] found that the development of clinical anxiety by ages 18–23 can be predicted from volumes of gray matter in certain brain regions at the age of 14, as shown by a functional magnetic resonance imaging (fMRI). These regions include higher volumes of the caudate nucleus, a region associated with executive function and impulse control [23], and the pallidum, which is associated with intentional movement and proprioception [24]. The equine-assisted service under study here offers a chance to practice these skills in a relaxed way through interactions with the horses, delivering feedback around effective communication via the responses of the horse in the moment. This could help participants calibrate their impulse control to a degree that is helpful for social interactions, rather than exacerbating anxiety [25].

Research by Siddaway et al. [26] identified that both state and trait anxiety range along continuums from high calmness to high anxiety, indicating that the development of calmness as a skill is mutually exclusive with anxiety. Furthermore, Siddaway et al. [26] found that the degree of calmness or anxiety experienced is related to other psychiatric conditions such as depression and substance abuse, with higher anxiety typically associated with increased risks of other psychiatric conditions. This indicates that interventions that support participants to develop positive coping skills which lead to increased calmness are likely to be preventative against a range of psychiatric conditions, some of which may be related to underlying anxiety.

1.3. Equine-assisted learning and anxiety

Research by Bui et al. [27] highlighted the need for innovative anxiety treatments, following limited developments in pharmacological interventions across the past 30 years. In recent years, EAS have grown in popularity, often working with participants who are unable or unwilling to participate in talk-based therapies. Many equine-assisted learning programs have seen increased referrals since the COVID-19 pandemic, the largest proportion of which are associated with social, mental, and emotional health [28].

There are a wide range of EAS available in the United Kingdom, including hippotherapy, equine-assisted therapy (EAT), and equine-assisted learning (EAL). These terms are frequently conflated as there are currently no set standards within the EAS industry [29]. Therefore, EAL is defined as activities carried out around horses, donkeys, or mules (such as basic horse care and a range of activities with the horse), which contribute to learning transferrable skills for use outside an equine setting. EAL is usually delivered by facilitators with good horsemanship skills, but they are not required to be mental health professionals. This study will focus on research pertaining to EAL, to start to develop distinctions between these frequently conflated fields of practice. This is important to clarify the evidence base around each type of EAS, developing the understanding of how various types of services support participants, and which participant needs each service might be effective for.

A variety of outcomes are beginning to be recognized within EAL, leading to a broad range of referrals to programs. Pendry and Roeter [30] found that an EAL program increased social competence, supporting the development of social connections that could lead to reduced anxiety. Furthermore, Osbourn [31] found a significant impact of an EAL program for adolescents with anxiety, while a study by Davies and Stanton [32] also found that anxiety was significantly reduced in rural young people following a 6-week EAL program. Participants learned several topics around anxiety reduction alongside the activities with the horses such as mindfulness techniques, journalling, and breathing exercises, with the horses described as the key motivation for attending the sessions. There were seven participants in the study by Davies and Stanton [32], yielding qualitative insights around anxiety and self-efficacy, as well as finding a statistically significant improvement on the GAD-7 scale, indicating a large effect size of the EAL program, although this is a very small sample size.

These emerging effects may be due to the emotional safety experienced by participants in EAL settings as they are able to feel safe, respected, and connected [33]. Participants were interviewed following an EAL program, describing feeling calm and trusting the horses, contributing to the perception of emotional safety. Veale et al. [34] described emotional safety as essential for meeting the needs of those with mental health issues; the program under study was instrumental in developing skills essential for emotional safety to support participants in behaving in emotionally safe ways, both internally and in their relationships with other people. These skills include assertiveness and boundary setting [35], as well as communication and empathy [36]. These skills can improve social relationships [37], which can in turn prevent isolation which contributes to an increased risk of anxiety [38].

EAL programs are usually undertaken over a medium term of around 6–12 weeks as they are often integrated with school terms. However, the program under study here offers participants an intensive course of 5 × 2-hour sessions over the course of a week. Green [39] suggests that within an equine context, changes can be achieved in a single session due to the embodied nature of the experience, where participants learn to communicate with the horses through body language, resulting in rapid embodied learning [25].

Research into the effects of EAL suggests that social competence and anxiety may be improved via EAL; this is reinforced by the

findings that many referrals relate to these topics, suggesting wider acceptance of EAL as effective in these areas with the referrer's local teams or organizations. These include social workers (local authorities), teachers (local schools), and CAMHS (Child and Adolescent Mental Health Services, NHS) teams. This study will examine whether a short course of EAL will support participants with anxiety to develop improved skills such as calmness, empathy, and planning, which are aimed at contributing to reducing anxiety outside of the program through improved social connections and improved calibration of inhibitory control.

1.4. The intervention

The intervention works with principles of natural horsemanship, focusing on developing partnerships and harmonious communication through body language, as well as recognizing and responding to the experiences of the horses during tasks. The tasks are linked to the behaviors to be developed from the Skills Star (see **Figure S1**, Supplementary materials)—for example, fetching hay for a horse as part of perspective-taking and empathy, and leading the horse at liberty (without a lead-rope, using only body language) to demonstrate and develop focus.

The tasks are designed to increase harmony between the participant and the horse by developing the necessary skills for each participant. For example, excessively shy participants might learn assertiveness by practicing leading on the outside of a turn, which requires them to hold their own personal space in order to maintain harmony. Each session focuses on a series of tasks that are chosen according to the development needs of the participant, as well as taking into account the experience of the horse on the day. Activities are built up over the course of the 5 days, so that the participants are supported in being successful at each stage.

1.5. Current study setting

The setting and EAL program for this study are the same as the setting described in Hemingway and Sullivan [29]. Therefore, it is not fully reproduced here. However, welfare and ethics are critical to the safe and ethical practice of EAL, and hence, they are described in the following.

1.6. Equine welfare, handling, and selection

Each horse involved in the course is provided with access to a natural environment including trees, hedges, and other horses. The horses primarily live outdoors, with free movement between barns and fields according to their choice. Each horse has a light workload, which is logged in line with the charities welfare policy and averages approximately 5 hours per week. The horses are consistently handled and trained using natural horsemanship by facilitators trained in natural horsemanship, as informed by the charities' welfare policies. The center also holds a local authority welfare license. All horses are vet-checked and receive routine farriery and dental care. Rescue horses are also retrained before taking part in the program and then are rehomed as appropriate through the charities registered rescue charity.

1.7. Ethics

The researchers employing universities ethics panel (REF, 8750) granted ethical approval for this study. The data were accessed via the charity through a data-sharing agreement, and all data were anonymized prior to being shared with the researchers. All anonymized data were stored on a password-protected university computer in compliance with UK data management and storage Data Protection Law. The registered charity under study here carries out risk assessments for all participants, and participants are always accompanied when around the horses. The ethical review included welfare implications for the horses during the program, ensuring their well-being and humane treatment throughout. The "ethogram" of horse behavior [40] was used to observe the horses throughout the course for possible stress/distress. All activities would cease immediately if any distress was observed. Horses are highly sensitive and are easily stressed, and therefore, their welfare must be prioritized in EAL interventions.

2. Materials and methods

This before and after measures study uses quantitative data collected by an EAL intervention to explore whether the 5-day EAL course improves the social skills of participants referred to the course with anxiety. The course teaches the participants to communicate with horses using their body language to play games and lead and move with the horses on a long rope and the participant on the ground. The anxiety category for all participants was recorded on the written referral forms for the intervention. The Skills Star measures were completed by the referrer to the program—normally a social worker, teacher, or CAMHS team member at referral and at a 2-month follow-up to generate a score for each skill, ranging between 0 ("Stuck") and 4 ("Independent, needs little—no support").

The measures were a modified mental health recovery star with eight attributes ([41, 42], see **Figure S1**, Supplementary materials), in line with the standard practice of the intervention and the observational design of this study. The degree of participant anxiety was inversely assessed via "Calmness" scores on the modified mental health recovery star.

2.1. Participants

The study was a before and after measures study, including anonymized data from a total of 166 participants aged between 8 and 18 years with an average age of 12.8 years, who were referred with anxiety. Of these, 113 participants were female and 53 participants were male. For the analyses, participants were grouped into four age categories, which corresponded to education Key Stage levels in the United Kingdom. The categories were as follows: 8–10 years old, 11–12 years old, 13–14 years old, and 15–18 years old; see **Table 1** for full participant details.

Table 1 • Participant Genders and Age Groups

	8–10 Years old	11–12 Years old	13–14 Years old	15–18 Years old	Total
Female	19	24	32	38	**113**
Male	15	12	15	11	**53**
Total	**34**	**36**	**47**	**49**	**166**

The inclusion criteria for the study were as follows: participants aged 8–18 years at the time of referral, participants referred with anxiety, and participants with complete data available at both referral and 2-month follow-up.

The exclusion criteria for the study were as follows: participants without a complete dataset, participants with inconsistent data across the time period, and participants who did not complete the program.

Participants were, therefore, an opportunity sample of young people referred to the intervention over a 5-year period.

2.2. Materials

Outcomes were determined by comparing pre- and post-intervention scores, with increases in scores indicating a positive effect of the intervention across skills including calmness, assertiveness, empathy, communication, perseverance, taking responsibility, planning, and engagement as a learner.

The analysis includes 166 participants aged between 8 and 18 years with an average age of 12.8 years, who were referred with anxiety. Of these, 113 participants were female and 53 participants were male. For the analysis, participants were grouped into four age categories, which corresponded to education Key Stage levels in the United Kingdom. The categories are as follows: 8–10 years old, 11–12 years old, 13–14 years old, and 15–18 years old.

2.3. Procedure

Mixed-measures analyses of variance (ANOVAs) were used to show the effects of Time, Gender, and Age Group on the Total Skills Star scores, as well as each of the Skills Star Attribute scores. The Total Skills Star scores and scores for each of the eight Skills Star attributes were, therefore, dependent variables. Gender and Age Groups were between-participant independent variables, and Time was a within-participant independent variable.

3. Results

3.1. Total Skills Star scores

A mixed-measures ANOVA was carried out, with Time as a within-participant independent variable, while Age and Gender were between-participant independent variables. The dependent variables were the scores on the Skills Star before and after the intervention. Neither Levene's test for homogeneity of variances nor Box's test of equality of covariance was significant. See **Table 2** for full ANOVA results for Total Skills Star scores.

3.1.1. Within-participants effects

There was a significant main effect of Time ($F(1, 158) = 178.066$, $p < 0.001$, $\eta_p^2 = 0.53$), with participants scoring higher at post-test ($M = 18.4$, SD = 6.7) compared with pretest ($M = 11.4$, SD = 5.7), as well as a significant interaction between Time and Age Group (($F(3, 158) = 4.158$, $p = 0.007$, $\eta_p^2 = 0.07$), shown in **Figure 1**. However, there were no significant interactions between Time and Gender or among Time, Gender, and Age ($p > 0.05$).

3.1.2. Between-participants effects

There was no significant main effect of Gender nor Age Group, though there was a significant interaction between Gender and Age Group ($F(3, 158) = 3.924$, $p = 0.010$, $\eta_p^2 = 0.069$).

3.2. Skills Star attributes

A mixed-measures ANOVA was carried out for each of the Skills Star Attribute Scores. For each, Time was a within-participants independent variable, while Age and Gender were between-participants independent variables. The dependent variables were the scores on the Skills Star attributes before and after the intervention. Findings relevant to reducing anxiety in adolescents via calmness, empathy, and planning are summarized in **Table 3**. For the full results of mixed-measures ANOVAs carried out on the additional attributes, see **Table S1** in Supplementary materials.

Table 2 • Results of a mixed-measures ANOVA for Total Skills Star scores

ANOVA results								
Source	**Type III SS**	***df***	**Mean square**	***F***	***p***	η_p^2	**Noncent. parameter**	**Observed power[a]**
Within-participants effects on Total Skills Star scores								
Time	3,467.189	1	3,467.189	178.066	0.000	0.530	178.066	1.000
Time * Gender	27.620	1	27.620	1.418	0.235	0.009	1.418	0.220
Time * Age Group	242.896	3	80.965	4.158	0.007	0.073	12.475	0.846
Time * Gender * Age Group	30.762	3	10.254	0.527	0.665	0.010	1.580	0.156
Error (Time)	3,076.479	158	19.471					
Between-participants effects on Total Skills Star scores								
Intercept	59,583.167	1	59,583.167	1,126.184	0.000	0.877	1,126.184	1.000
Gender	187.244	1	187.244	3.539	0.062	0.022	3.539	0.464
Age Group	34.070	3	11.357	0.215	0.886	0.004	0.644	0.090
Gender * Age Group	622.848	3	207.616	3.924	0.010	0.069	11.772	0.822
Error	8,359.331	158	52.907					

[a] Computed using alpha = 0.05. *Interaction between independent variables.

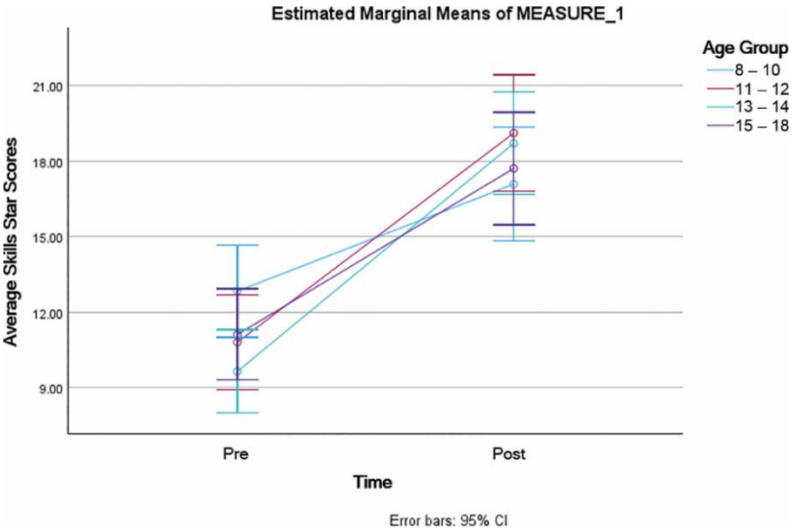

Figure 1 • Interaction between Time and Age Group on Total Skills Star scores.

Table 3 • Results of mixed-measures analysis of variance for Skills Star attributes related to anxiety

ANOVA results for attributes related to anxiety								
Source	**Type III SS**	***df***	**Mean square**	***F***	***p***	η_p^2	**Noncent. parameter**	**Observed power[a]**
Within-participants effects on calmness scores								
Time	78.869	1	78.869	106.741	0.000	0.403	106.741	1.000
Time * Gender	0.148	1	0.148	0.200	0.655	0.001	0.200	0.073
Time * Age Group	4.636	3	1.545	2.091	0.104	0.038	6.274	0.527
Time * Gender * Age Group	0.665	3	0.222	0.300	0.825	0.006	0.900	0.107
Error (Time)	116.744	158	0.739					
Between-participants effects on calmness scores								
Intercept	835.606	1	835.606	552.529	0.000	0.778	552.529	1.000
Gender	1.722	1	1.722	1.139	0.288	0.007	1.139	0.186
Age Group	3.800	3	1.267	0.838	0.475	0.016	2.513	0.229
Gender * Age Group	8.742	3	2.914	1.927	0.127	0.035	5.780	0.491
Error	238.948	158	1.512					
Within-participants effects on empathy scores								
Time	37.850	1	37.850	57.905	0.000	0.268	57.905	1.000
Time * Gender	2.109	1	2.109	3.226	0.074	0.020	3.226	0.431
Time * Age Group	7.038	3	2.346	3.589	0.015	0.064	10.766	0.783
Time * Gender * Age Group	1.891	3	0.630	0.964	0.411	0.018	2.892	0.260
Error (Time)	103.278	158	0.654					
Between-participants effects on empathy scores								
Intercept	1,090.338	1	1,090.338	703.838	0.000	0.817	703.838	1.000
Gender	11.162	1	11.162	7.206	0.008	0.044	7.206	0.761
Age Group	0.130	3	0.043	0.028	0.994	0.001	0.084	0.055
Gender * Age Group	10.296	3	3.432	2.216	0.088	0.040	6.647	0.554
Error	244.763	158	1.549					
Within-participants effects on planning								
Time	49.119	1	49.119	80.887	0.000	0.339	80.887	1.000
Time * Gender	0.225	1	0.225	0.370	0.544	0.002	0.370	0.093
Time * Age Group	4.876	3	1.625	2.676	0.049	0.048	8.029	0.644
Time * Gender * Age Group	1.406	3	0.469	0.772	0.511	0.014	2.315	0.213
Error (Time)	95.946	158	0.607					

Between-participants effects on planning								
Intercept	870.828	1	870.828	925.478	0.000	0.854	925.478	1.000
Gender	1.367	1	1.367	1.453	0.230	0.009	1.453	0.224
Age Group	1.196	3	0.399	0.424	0.736	0.008	1.271	0.133
Gender * Age Group	9.419	3	3.140	3.337	0.021	0.060	10.010	0.750
Error	148.670	158	0.941					

[a] Computed using alpha = 0.05. *Interaction between independent variables.

3.2.1. Calmness

Box's test of covariance was not significant, and nor was Levene's test for the homogeneity of variances.

Within-participants effects

There was a significant main effect of Time on Calmness scores ($F(1, 158) = 106.741$, $p < 0.001$, $\eta_p^2 = 0.403$), with post-test scores ($M = 2.3$, SD = 1.0) higher than pretest scores ($M = 1.2$, SD = 1.1), though there were no significant interactions between Time and Age Group, Time and Gender or Time, and Gender and Age ($p > 0.05$).

Between-participants effects

There was no significant main effect of Gender or Age Group on Calmness scores, nor was there a significant interaction between Gender and Age Group ($p > 0.05$).

3.2.2. Empathy

Box's test of covariance was not significant, and nor was Levene's test for homogeneity of variances.

Within-participants effects

There was a significant main effect of Time on Empathy scores ($F(1, 158) = 57.905$, $p < 0.001$, $\eta_p^2 = 0.268$), with scores at post-test ($M = 2.4$, SD = 1.0) higher than those at pretest ($M = 1.7$, SD = 1.1), as well as a significant interaction between Time and Age Group ($F(3, 158) = 3.589$, $p = 0.015$, $\eta_p^2 = 0.064$), shown in **Figure 2**. However, there were no significant interactions between Time and Gender or Time, Gender, and Age ($p > 0.05$).

Between-participants effects

There was a significant main effect of Gender on Empathy scores ($F(1, 158) = 7.206$, $p < 0.008$, $\eta_p^2 = 0.044$), with female participants scoring significantly higher ($M = 2.2$, SE = 0.9) than male participants ($M = 1.8$, SE = 0.1). However, there was no significant main effect of Age Group on Empathy scores ($p > 0.05$). There was also no significant interaction between Gender and Age Group ($p > 0.05$).

3.2.3. Planning

Box's test for equality of covariances was significant ($F(21, 27435) = 2.011$, $p = 0.004$). Therefore, Pillai's trace values were used. Levene's test for homogeneity of variances was significant for pre-scores ($F(7, 158) = 2.297$, $p = 0.030$), but not for post-scores ($F(7, 158) = 0.228$, $p = 0.978$).

Within-participants effects

There was a significant main effect of Time on Planning scores ($F(1, 158) = 80.887$, $p < 0.001$, $\eta_p^2 = 0.339$), with participants scoring higher at post-test ($M = 2.2$, SD =0.89) compared with pretest ($M = 1.4$, SD = 0.90). There was also a significant interaction between Time and Age Group, shown in **Figure 3** ($F(3, 158) = 2.676$, $p = 0.049$, $\eta_p^2 = 0.048$). However, there were no significant interactions between Time and Gender or Time, Gender, and Age ($p > 0.05$).

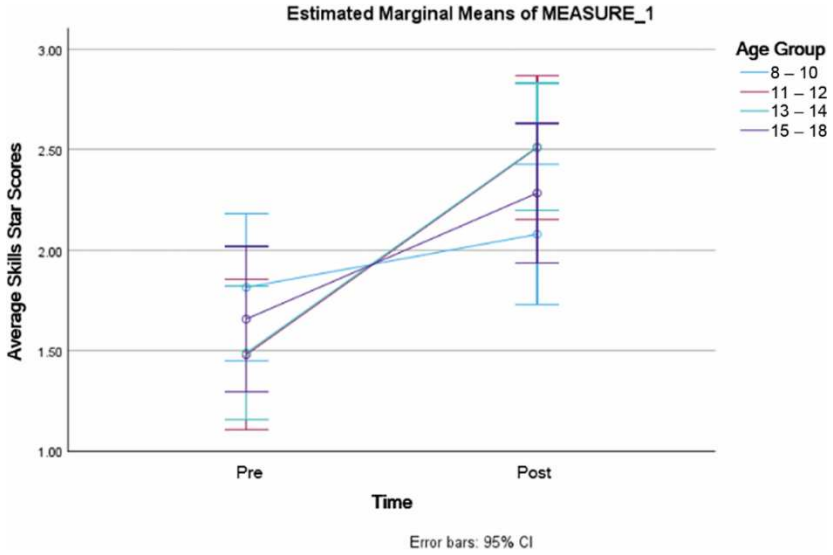

Figure 2 • Interaction between Time and Age Group on Empathy scores.

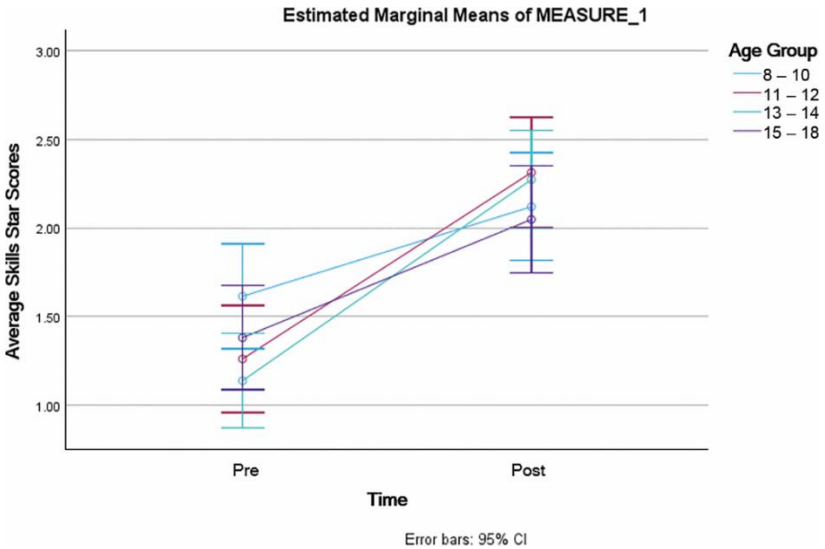

Figure 3 • Interaction between Time and Age Group on Planning scores.

Between-participants effects
There was no significant main effect of Gender or Age Group on Planning scores (>0.05), although there was a significant interaction between Gender and Age Group ($F(3, 158) = 3.337$, $p = 0.021$, $\eta_p^2 = 0.060$).

4. Discussion

The results of this study indicate a positive impact of the EAL program across each of the eight attributes measured, the development of which mitigates the impact of anxiety disorders via the development of specific skills such as calmness, empathy, and planning. There was also a significant improvement in the Total Skills Star scores, indicating a generalized sociocognitive improvement for participants referred with anxiety. This could underpin reductions in behavioral patterns, which may contribute to anxiety in participant's lives, such as struggling to maintain healthy boundaries or to act calmly.

There was a significant interaction between Time and Age across the Total Skills Star scores, revealing that participants in their early teens (aged 11–12 and 13–14) tended to enter the program with lower scores across the Total Star, and then leave with higher scores than those aged 8–10 or 15–18 years. The transition from primary school to secondary school and the onset of puberty could be critical periods for early interventions to support young people who are identified as at-risk for developing anxiety disorders, with short-term experiential programs offering a chance to reflect and develop skills during this vital period.

Blum et al. [18] argued that early adolescence (ages 10–14) is one of the most critical developmental periods for understanding long-term health outcomes due to the extent of the rapid biological and contextual changes. Health outcomes are driven by several factors relating to anxiety, which are developed throughout adolescence, such as impulse control, response to stress, and emotional well-being [43–46]. Programs that support healthy patterns of adolescent development across these areas could improve long-term health outcomes, as well as reduce anxiety. This is likely to function as a virtuous cycle. Raknes et al. [47] found that adolescent anxiety is related to poor health-related quality of life, while poor health can also be a significant driver of anxiety [48].

This period of increased sensitivity to the effects of the intervention for participants in early adolescence was also shown for scores on Empathy, whereby participants in early adolescence (aged 11–12 and 13–14) showed lower scores than younger (aged 8–10) or older (aged 15–18) participants at pretest and higher scores following the intervention. In line with our results, Van der Graaf et al. [49] found that girls tended to score higher on empathy than boys, with a differential development trajectory of perspective-taking during adolescence across genders; perspective-taking in girls tended to be higher and increased faster compared with that of boys. However, no significant interaction between gender and time was found in our study, suggesting the presence of key stages during adolescence during which interventions can be particularly effective for supporting the development of empathy across genders.

There was also a period of higher sensitivity to the intervention effects for participants aged 11–12 and 13–14 years found for Planning. This may, therefore, be an area that requires specific support in early adolescence for young people suffering with anxiety. A longitudinal study by Troller-Renfree et al. [19, 20] found that for children with high behavioral inhibition as toddlers, increased proactive cognitive control (i.e., tendency to plan, rather than react) is associated with lower anxiety at age 13. This implies that interventions such as EAL, which improve proactive planning and alleviate excess inhibitory control, could help reduce anxiety in early adolescence.

There may be a more complex relationship between the development of empathy and reduction of anxiety. Gambin and Sharp [50] found a positive correlation between empathy and anxiety for adolescent participants at an inpatient unit, suggesting that high empathy could result in overwhelming feelings or maladaptive states (e.g., guilt), thereby contributing to the development of anxiety. However, Klimecki et al. [51] found that training in compassion improved positive impact and reversed the potential negative impact of developing increased empathy, which was also conducted via training. This highlights an important nuance that should be considered in the development of interventions for sociocognitive skills; the benefits of compassion; sharing the emotional experience of another with the desire to alleviate distress, compared with empathy; the sharing of emotional experiences with another [52]. In the EAL program under study, the attribute

of "Empathy" is defined as "sees the needs of others, offers care and support, feels closely connected." It is, therefore, likely that the program may be developing compassion within participants, as referenced by actively offering care and support to others—rather than simply experiencing shared emotions. The development of compassion as a skill could represent a critical turning point for participants with anxiety driven by maladaptive or limited empathy as they learn to take action to help where possible or/and limit the extent to which the emotions of others are able to affect them.

The results of the current study indicate that an EAL program focusing on embodied communication may significantly improve the calmness of young people within a relatively short 10-hour intervention, although more research is needed to substantiate. Traditional anxiety treatments such as cognitive behavioral therapy often have over 20 hours of contact time spread across several weeks [53] as well as high dropout rates of around 26.2% during treatment [54]. The program under study here has a completion rate of 94% [55], indicating that participants not only improve their sociocognitive skills via the program but also enjoy attending.

The efficiency of the program may be partially attributable to the embodied approach of the EAL program, supporting embodied learning in a short time, as described by Green [39]. The program offers young people the opportunity to experiment with ways of managing their internal state; the success of which is indicated through the behavior of the horse in the manner of biofeedback. As herd animals, horses have evolved to psychophysiologically synchronize with others in the herd to flee from predators with greater efficiency. This synchronization could be termed biofeedback for participants and has been demonstrated between horses and their handlers; Lie [56] found that horses show emotional contagion with their handlers, and a study by Merkies et al. [57] found that therapy horses had increased heart rates around people with PTSD compared with people without trauma. A systematic review by Alneyadi et al. [58] found that biofeedback is a useful inclusion for programs that aim to treat anxiety in young people; the psychophysiological synchronization of the horse to the human could be helping participants better understand and reflect on their emotional states, although more research is needed in this area.

The availability of biofeedback via interactions with the horses is specific to EAS which make active use of this connection between horses and humans. Other popular animal-assisted therapies such as canine-assisted therapies provide support to participants with therapy dogs working in the role as "Man's best friend" [59]. In contrast, horses choose how to engage based on the behavior of the participants—highlighting areas where personal growth would support more positive interactions for participants, both with horses and in other contexts. Furthermore, communication with horses is nonverbal, reinforcing embodied learning for participants [25], which can lead to significant changes in a short period of time [39] as people learn to identify and manage different feelings. This type of detailed embodied communication is not necessary in animal-assisted therapies with smaller animals, such as cats or guinea pigs—representing a key therapeutic advantage of EAS.

4.1. Limitations

The current study investigated outcomes related to anxiety, such as calmness [26], but did not examine the impact of the program using a validated anxiety measure. This was largely due to the pragmatic design of the study, as the data were collected by the charity as part of their usual operations. Therefore, participants were not contacted or asked to fill out additional anxiety-specific measures. Instead, data from participants referred with anxiety were analyzed across the eight sociocognitive attributes and at the total level. Future research could include measures of anxiety to more directly understand the impact of EAL programs on the degree of anxiety experienced or whether diagnoses of anxiety were removed further to the intervention.

The generalizability of the study findings may also be limited as there was no randomization or control group. The study explored the scores of young people across a range of ages at two time points: pre- and post-intervention. To further investigate the potential for early intervention and to identify and validate critical time periods during adolescent development where additional support is most beneficial, larger-scale randomized studies may be beneficial. However, it is important to note that of the young people referred to this EAL, almost a third are not engaging with CAMHS or other services; therefore, finding an appropriate comparison or control group is currently problematic.

5. Conclusions

This study has found a significant impact of a 5-day EAL program on eight sociocognitive skills. The development of these skills is likely to reduce anxiety in children and adolescents by supporting them to adopt adaptive strategies such as developing calmness and improving communication and assertiveness. Although anxiety can often be related to external circumstances, rather than stemming directly from impairment across these skills, development of sociocognitive skills could contribute to improved relationships and functioning in daily life, which could indirectly reduce the frequency or severity of anxiety. Further research could investigate the direct impact of the EAL program on anxiety using a targeted anxiety measure to validate these findings.

Acknowledgments

The authors thank the Equine-Assisted Charity involved with this study. A special thanks to Harriet Laurie MBE who is the CEO, and to all the horses who contributed to this intervention.

Funding

The authors declare no financial support for the research, authorship, or publication of this article.

Author contributions

Conceptualization, A.H.; methodology, K.S. and A.H.; formal analysis, K.S.; investigation, A.H. and K.S.; data curation, K.S.; writing—original draft preparation, K.S.; writing—review and editing, A.H.; visualization, K.S.; supervision, A.H.; project administration, A.H.; project funding, A.H. Both authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

Data availability statement

Data supporting these findings are available within the article, at https://doi.org/10.20935/MHealthWellB7424, or upon request.

Institutional review board statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of Bournemouth University UK (REF, 51113, approved on February 10, 2023).

Informed consent statement

Informed consent was obtained from all subjects involved in the study, and this study utilized secondary data analysis of anonymized data only.

Supplementary materials

The supplementary materials are available at https://doi.org/10.20935/MHealthWellB7424.

Additional information

Received: 2024-08-14

Accepted: 2024-11-08

Published: 2024-11-28

Academia Mental Health and Well-Being papers should be cited as *Academia Mental Health and Well-Being 2024*, ISSN 2997-9196, https://doi.org/10.20935/MHealthWellB7424. The journal's official abbreviation is *Acad. Ment. Health WellB.*

Publisher's note

Copyright

References

1. Bevilacqua L, Fox-Smith L, Lewins A, Jetha P, Sideri A, Barton G, et al. Impact of COVID-19 on the mental health of children and young people: an umbrella review. J Epidemiol Community Health. 2023;77(11):704–9. doi: 10.1136/jech-2022-220259
2. Ludwig-Walz H, Dannheim I, Pfadenhauer LM, Fegert JM, Bujard M. Anxiety increased among children and adolescents during pandemic-related school closures in Europe: a systematic review and meta-analysis. Child Adolesc Psychiatry Ment Health. 2023;17(1):74. doi: 10.1186/s13034-023-00612-z
3. Theberath M, Bauer D, Chen W, Salinas M, Mohabbat AB, Yang J, et al. Effects of COVID-19 pandemic on mental health of children and adolescents: a systematic review of survey studies. SAGE Open Med. 2022;10:20503121221086712. doi: 10.1177/20503121221086712
4. Zulfiqarova U, Dresp-Langley B. Student anxiety in the wake of the COVID-19 pandemic. Acad Ment Health Well-Being. 2024;1(2). doi: 10.20935/MHealthWellB7294
5. Keles B, McCrae N, Grealish A. A systematic review: the influence of social media on depression, anxiety and psychological distress in adolescents. Int J Adolesc Youth. 2020;25(1):79–93. doi: 10.1080/02673843.2019.1590851
6. Bray I, Reece R, Sinnett D, Martin, F, Hayward R. Exploring the role of exposure to green and blue spaces in preventing anxiety and depression among young people aged 14–24 years living in urban settings: a systematic review and conceptual framework. Environ Res. 2022;214:114081. doi: 10.1016/j.envres.2022.114081
7. Schiebel T, Gallinat J, Kühn S. Testing the Biophilia theory: automatic approach tendencies towards nature. J Environ Psychol. 2022;79:101725. doi: 10.1016/j.jenvp.2021.101725
8. Hards E, Loades ME, Higson-Sweeney N, Shafran R, Serafimova T, Brigden A, et al. Loneliness and mental health in children and adolescents with pre-existing mental health problems: a rapid systematic review. Br J Clin Psychol. 2022;61(2):313–34. doi: 10.1111/bjc.12331
9. Dresp-Langley B. Children's health in the digital age. Int J Environ Res Public Health. 2020;17(9):3240. doi: 10.3390/ijerph17093240
10. Sullivan SK, Hemingway A. Perspective chapter: mind the gap–young people's mental health and equine assisted interventions; 2023. Intech Open. doi: 10.5772/intechopen.1003135
11. Bowen RC, Senthilselvan A, Barale A. Physical illness as an outcome of chronic anxiety disorders. Can J Psychiatry. 2000;45(5):459–64. doi: 10.1177/070674370004500506
12. Davies MR, Glen K, Mundy J, Ter Kuile AR, Adey BN, Armour C, et al. Factors associated with anxiety disorder comorbidity. J Affect Disord. 2023;323:280–91. doi: 10.1016/j.jad.2022.11.051
13. Altamura AC, Santini A, Salvadori D, Mundo E. Duration of untreated illness in panic disorder: a poor outcome risk factor? Neuropsychiatr Dis Treat. 2005;1(4):345–7.
14. De Lijster J, Dierckx B, Utens E, Verhulst F, Zieldorff C, Dieleman G, et al. The age of onset of anxiety disorders in samples from the general population: a meta-analysis. Eur Psychiatry. 2016;33(S1):S56–7.

15. Campbell LA, Brown TA, Grisham JR. The relevance of age of onset to the psychopathology of generalized anxiety disorder. Behav Ther. 2003;34:31–48. doi: 10.1016/s0005-7894(03)80020-5

16. Lim SW, Ha J, Shin YC, Shin DW, Bae SM, Oh KS. Clinical differences between early-and late-onset social anxiety disorders. Early Interv Psychiatry. 2013;7(1):44–50. doi: 10.1111/j.1751-7893.2012.00341.x

17. White LK, McDermott JM, Degnan KA, Henderson HA, Fox NA. Behavioral inhibition and anxiety: the moderating roles of inhibitory control and attention shifting. J Abnorm Child Psychol. 2011;39:735–47. doi: 10.1007/s10802-012-9688-6

18. Blum RW, Astone NM, Decker MR, Mouli VC. A conceptual framework for early adolescence: a platform for research. Int J Adolesc Med Health. 2014;26(3):321–31. doi: 10.1515/ijamh-2013-0327

19. Troller-Renfree SV, Buzzell GA, Bowers ME, Salo VC, Forman-Alberti A, Smith E, et al. Development of inhibitory control during childhood and its relations to early temperament and later social anxiety: unique insights provided by latent growth modelling and signal detection theory. J Child Psychol Psychiatry. 2019;60(6):622–9. doi: 10.1111/jcpp.13025

20. Troller-Renfree SV, Buzzell GA, Pine DS, Henderson HA, Fox NA. Consequences of not planning ahead: reduced proactive control moderates' longitudinal relations between behavioural inhibition and anxiety. J Am Acad Child Adolesc Psychiatry. 2019;58(8):768–75. doi: 10.1016/j.jaac.2018.06.040

21. Smith SJ. Bringing up life with horses. Indo-Pac J Phenomenol. 2018;18(2):179–89. doi: 10.1080/20797222.2018.1499266

22. Chavanne AV, Paillère Martinot ML, Penttilä J, Grimmer Y, Conrod P, Stringaris A, et al. Anxiety onset in adolescents: a machine-learning prediction. Mol Psychiatry. 2023;28(2):639–46. doi: 10.1038/s41380-022-01840-z

23. Driscoll ME, Bollu PC, Tadi P. Neuroanatomy, nucleus caudate. 2023 Jul 24. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024

24. Javed N, Cascella M. Neuroanatomy, globus pallidus 2023. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024. PMID: 32491687.

25. Hemingway A, Carter S, Callaway A, Kavanagh E, Ellis S. An exploration of the mechanism of action of an equine-assisted intervention. Animals. 2019;9(6). doi: 10.3390/ani9060303

26. Siddaway AP, Taylor PJ, Wood AM. Reconceptualizing anxiety as a continuum that ranges from high calmness to high anxiety: the joint importance of reducing distress and increasing well-being. J Pers Soc Psychol. 2018;114(2):e1. doi: 10.1037/pspp0000128

27. Bui E, King F, Melaragno A. Pharmacotherapy of anxiety disorders in the 21st century: a call for novel approaches. Gen Psychiatry. 2019;32(6):e100136. doi: 10.1136/gpsych-2019-100136. PMID: 31922087; PMCID: PMC6936967.

28. Horseworld. Discovery program; 2022 [cited 2024 Aug 5]. Available from: https://www.horseworld.org.uk/our-impact/discovery-programme/

29. Hemingway A, Sullivan K. Reducing the incidence of domestic violence: an observational study of an equineassisted intervention. Fam Process. 2022;61(2):549–70. doi: 10.1111/famp.12768

30. Pendry P, Roeter S. Experimental trial demonstrates positive effects of equine facilitated learning on child social competence. Hum Anim Interact Bull. 2013;1:1–19. doi: 10.1079/hai.2013.0004

31. Osbourn AM. Making the connections: equine-assisted learning for adolescents struggling with anxiety. Prescott (AZ): Prescott College; 2019.

32. Davis L, Stanton CR. Fight, flight, or freeze?: equine-assisted learning as a means to explore anxiety, self-efficacy, and agency in rural youth during COVID-19. J Exp Educ. 2024;47(1):158–76. doi: 10.1177/10538259231174877

33. Cagle-Holtcamp K, Nicodemus MC, Parker J, Dunlap MH. Does equine assisted learning create emotionally safe learning environments for at-risk youth? J Youth Dev. 2019;14(4):232–52. doi: 10.5195/jyd.2019.727

34. Veale D, Robins E, Thomson AB, Gilbert P. No safety without emotional safety. Lancet Psychiatry. 2023;10(1):65–70. doi: 10.1016/S2215-0366(22)00373-X

35. Shean M, Mander D. Building emotional safety for students in school environments: challenges and opportunities. In: Midford R, Nutton G, Hyndman B, Silburn S, editors. Health and education interdependence: thriving from birth to adulthood. Singapore: Springer; 2020. p. 225–48.

36. Kirmayer LJ. Embracing uncertainty as a path to competence: cultural safety, empathy, and alterity in clinical training. Cult Med Psychiatry. 2013;37:365–72. doi: 10.1007/s11013-013-9314-2

37. Hair EC, Jager J, Garrett SB. Helping teens develop healthy social skills and relationships: what the research shows about navigating adolescence. Trends in Child Research Brief; 2002 [cited 2024 Aug 12]. Available from: https://cms.childtrends.org/wp-content/uploads/2002/07/Child_Trends-2002_07_01_RB_TeenSocialSkills.pdf

38. Wickramaratne PJ, Yangchen T, Lepow L, Patra BG, Glicksburg B, Talati A, et al. Social connectedness as a determinant of mental health: a scoping review. PLoS One. 2022;17(10):e0275004. doi: 10.1371/journal.pone.0275004

39. Green S. Horse sense: equine assisted single session consultations. Capturing the moment: single session therapy and walk-in services. Bancyfelin: Crown House Publishing; 2014. p. 425–40.

40. Young T, Creighton E, Smith T, Hosie C. A novel scale of behavioural indicators of stress for use with domestic horses. Appl Anim Behav Sci. 2012;140(1–2):33–43. doi: 10.1016/j.applanim.2012.05.008

41. Mental Health Providers Forum. Recovery-star-user-guide; 2008 [cited 2024 Oct 17]. Available from: https://mnpmind.org.uk/wp-content/uploads/2021/09/Recovery-STAR-User-Guide.pdf

42. THC. The skills star chart; 2014 [cited 2024 Aug 5]. Available from: https://www.thehorsecourse.org/images/pdfs/Star-12.pdf

43. Edmunds GW, Bogg T, Roberts BW. Are personality and behavioural measures of impulse control convergent or distinct predictors of health behaviours? J Res Pers. 2009;43(5):806–14.

44. Meeus W, Vollebergh W, Branje S, Crocetti E, Ormel J, van de Schoot R, et al. On imbalance of impulse control and sensation seeking and adolescent risk: an intra-individual developmental test of the dual systems and maturational imbalance models. J Youth Adolesc. 2021;50:827–40. doi: 10.1007/s10964-021-01419-x

45. Turner AI, Smyth N, Hall SJ, Torres SJ, Hussein M, Jayasinghe SU, et al. Psychological stress reactivity and future health and disease outcomes: a systematic review of prospective evidence. Psychoneuroendocrinology. 2020;114:104599. doi: 10.1016/j.psyneuen.2020.104599

46. Sisk LM, Gee DG. Stress and adolescence: vulnerability and opportunity during a sensitive window of development. Curr Opin Psychol. 2022;44:286–92. doi: 10.1016/j.copsyc.2021.10.005

47. Raknes S, Pallesen S, Himle JA, Bjaastad JF, Wergeland GJ, Hoffart A, et al. Quality of life in anxious adolescents. Child Adolesc Psychiatry Ment Health. 2017;11:1–11. doi: 10.1186/s13034-017-0173-4

48. Cobham VE, Hickling A, Kimball H, Thomas HJ, Scott JG, Middeldorp CM. Systematic review: anxiety in children and adolescents with chronic medical conditions. J Am Acad Child Adolesc Psychiatry. 2020;59(5):595–618. doi: 10.1016/j.jaac.2019.10.010

49. Van der Graaff J, Branje S, De Wied M, Hawk S, Van Lier P, Meeus W. Perspective taking and empathic concern in adolescence: gender differences in developmental changes. Dev Psychol. 2014;50(3):881. doi: 10.1037/a0034325

50. Gambin M, Sharp C. Relations between empathy and anxiety dimensions in inpatient adolescents. Anxiety Stress Coping. 2018;31(4):447–58. doi: 10.1080/10615806.2018.1475868

51. Klimecki OM, Leiberg S, Ricard M, Singer T. Differential pattern of functional brain plasticity after compassion and empathy training. Soc Cogn Affect Neurosci. 2014;9(6):873–9. doi: 10.1093/scan/nst060

52. Merriam-Webster. Compassion definition & meaning; 2024 [cited 2024 Oct 17]. Available from: https://www.merriam-webster.com/dictionary/compassion

53. James AC, Reardon T, Soler A, James G, Creswell C. Cognitive behavioural therapy for anxiety disorders in children and adolescents. Cochrane Database Syst Rev. 2020;11(11):CD013162. doi: 10.1002/14651858.CD013162.pub2. PMCID: PMC8092480.

54. Fernandez E, Salem D, Swift JK, Ramtahal N. Meta-analysis of dropout from cognitive behavioral therapy: magnitude, timing, and moderators. J Consult Clin Psychol. 2015;83(6):1108.

55. Hemingway A. A study exploring the implementation of an equine assisted intervention for young people with mental health and behavioural issues. J. 2019;2(2):236–46.

56. Lie MR. Emotional contagion and mimicry of behavior between horses and their handlers [Master's thesis]. Ås: Norwegian University of Life Sciences; 2017.

57. Merkies K, McKechnie MJ, Zakrajsek E. Behavioural and physiological responses of therapy horses to mentally traumatized humans. Appl Anim Behav Sci. 2018;205:61–7. doi: 10.1016/j.applanim.2018.05.019

58. Alneyadi M, Drissi N, Almeqbaali M, Ouhbi S. Biofeedback-based connected mental health interventions for anxiety: systematic literature review. JMIR mHealth uHealth. 2021;9(4):e26038. doi: 10.2196/26038

59. Narvekar HN, Narvekar HN. Canine-assisted therapy in neurodevelopmental disorders: a scoping review. Eur J Integr Med. 2022;50:102112. doi: 10.1016/j.eujim.2022.102112