



Equine Assisted Activities Have Positive Effects on Children with Autism Spectrum Disorder and Family Functioning

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ABSTRACT Equine-assisted activities (EAA) have emerged as a new method of treatment for children diagnosed with autism spectrum disorder (ASD) in recent years. This study aimed to evaluate the effectiveness of EAA in the areas of social functioning, autistic behaviours, family functioning, and clinical severity for children diagnosed with ASD. The participants were 24 children (4-12 years old) diagnosed with ASD and their mothers. Subjects were randomized into two groups, and the programme consisted of eight sessions of EAA. A social communication questionnaire and clinical global impression scale were used to evaluate the severity of autistic behaviours, and family assessment device was used for family functioning, while the Beck Depression Inventory was used to evaluate the severity of maternal depression. The results suggested that the severity of ASD decreases and improvements in maternal mental health and family functioning were observed in the experimental group, while no significant results were observed in the control group. This study provided preliminary evidence that an eight-week EAA can provide significant improvements in terms of both family and child functioning for children diagnosed with ASD. Further studies in larger samples are needed to investigate these effects.

KEY WORDS autism spectrum disorder, equine-assisted activity, maternal mental health



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EQUINE ASSISTED ACTIVITIES FOR CHILDREN WITH ASD

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Introduction

The presence of restricted, repetitive patterns of behaviour, interests, or activities are key factors in diagnosing Autism Spectrum Disorder (ASD; American Psychiatric Association, 2013). ASD comprises persistent issues with social communication and interaction throughout many situations. Those situations, particularly, can be seen in social reciprocity, non-verbal communicative behaviours used for social interaction, and the ability to develop, maintain, and understand interpersonal relationships.

Animals have been used to increase socialization among patients in mental institutions from as early as the 18th century, and such therapeutic activities have been referred to as animal-assisted intervention (AAI) (Serpell, 2006). Researchers have observed positive treatment outcomes of utilizing AAI in some clinical populations, specifically with children who have conduct attention-deficit hyperactivity disorder (Katcher & Wilkins, 1998) as well as schizophrenia (Barak et al., 2001). AAI has also been applied to children diagnosed with ASD, and its beneficial effects for those children have been observed, such as an increase in social engagement (Esposito et al., 2011). The positive results of such therapies can be related to human-animal interaction theory, which posits that many people seek contact with animals due to their calming nature and ability to act as a non-judgmental source of support and facilitator of social interaction (Dingman, 2008; Kruger & Serpell, 2010).

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Equine-assisted activities (EAA) are specific subgroup activities of AAI, which include therapeutic horseback riding, vaulting, carriage driving and other non-riding activities with animals. Recent studies suggest that children with ASD who participated in EAA experienced significant increases in social interaction, improved sensory processing and decreased severity of the symptoms associated with ASD (Ward et al., 2011; Ward et al., 2013). In Bass et al. (2009), children with ASD who participated in a 12-week therapeutic riding programme experienced improved social functioning. Therapeutic riding programmes are also responsible for increases in sensory-seeking behaviours, social motivation, and focus on tasks (Bass et al., 2009). Similar results were reported in the study of Gabriels et al. (2012), which consisted of 10 weeks of therapeutic riding programmes. Children with ASD who participated in that study had better self-regulation behaviours following the programme. Rothe et al. (2005) found that child-horse interaction causes increases in socialization and self-esteem. Furthermore, equine-assisted therapy was found to be beneficial for behavioural and mental health problems among children with ASD (Schultz et al., 2007).

ASD is usually diagnosed in childhood, and patients with ASD commonly require lifelong support (Seltzer et al., 2004). As such, parents undertaking the responsibility of being the primary caregivers of children with ASD have been found to experience increased stress, health problems, and a greater sense of restriction compared to parents who do not have disabled children (Beresford, 1994; Flynt et al., 1992; Kornblatt & Henrich, 1985; Roach et al., 1999; Seligman & Darling, 1997). Mothers specifically experience a heavy sense of guilt and a decrease in their wellbeing, which can lead to depression. The stressful situations these families face can result in issues within family life and family functioning. Interventions for children may also benefit parents and family functioning.

The number of scientific studies examining the changes caused by the relationship of animals with children with autism and their families is very low. Wright et al. (2015) stated that with the presence of a pet dog living with the family, family functioning increases and the anxiety level of children with autism in the family decreases. The researchers attributed their results to the fact that the presence of an animal at home lowers the level of domestic stress, thereby strengthening family ties and increasing family functioning. They emphasized that activities such as games, dog walking and grooming could be effective in reducing the stress level.

To our knowledge, there was no information about the effectiveness of EAA on maternal mental health and family functioning in the current literature. Thus, in the present study, we aimed to evaluate the effectiveness of EAA in the areas of social functioning, autistic behaviours, family functioning, and clinical severity for children diagnosed with ASD.

Methods

Participants

Twenty-four children (4-12yo, Mage = 6.77±1.3) diagnosed with ASD who appealed to Nevşehir State Hospital for treatment participated in the study. None of the children had genetic syndromes, epilepsy, or mild or moderate intellectual disability. All children had taken special education classes for at least one year and had no previous experience with equine-assisted activities. In addition, none of them used psychotropic drugs. Those 24 children, as well as their mothers, accepted the invitation to participate in the study. The participants were randomly assigned to two groups, experimental group (4 female and 8 male, Mage=6.75±0.7) and control group (3 female and 9 male, Mage=6.7±0.64). Participants from both groups continued their regular treatments and special educations during the eight-week period. The clinicians and educators were blinded to the study. The experimental programme consisted of eight sessions of equine-assisted activities. Parents signed the informed consent form to allow their children to participate in this study. The consent form was in accordance with the Declaration of Helsinki as amended by the World Medical Association Declaration of Helsinki (World Medical Association, 2013) and was approved by the Ethics Committee of Nevşehir Hacı Bektaş Veli University.

Assessments

To test global functioning, the Children's Global Assessment Scale (CGAS; Shaffer et al., 1985) was used. This scale is a widely used measure of overall severity of child disturbance, providing a clinician-rated index of functioning. Scores range from 0 to 100, with higher scores indicating higher levels of functioning and lower scores indicating greater functional impairments.

The McMaster Family Assessment Device (FAD) was used for family functioning. FAD was developed by Epstein, Bolwin, and Bishop (1983). FAD was administered to the parents to evaluate family functioning and to outline the problematic dimensions of family functioning (Epstein et al., 1983). It includes 60 items that are divided into problem-solving, communication, roles, affective responsiveness, affective involvement, behaviour control, and general function areas. Scores for scales range between 1.00 (healthy) and 4.00 (non-healthy). The reliability and validity of the Turkish version of FAD have previously been evaluated by Bulut (1990) with acceptable test-retest reliability of between .62 and .90.

The Social Communication Questionnaire (SCQ) was used to test social functioning. The SCQ is a 40-item parent report that measures behavioural characteristics of autism spectrum disorders, including communication skills and social functioning for children over four years old. The reliability and validity study of the Turkish version was conducted by Avcil et al. (2015).

The Beck Depression Inventory (BDI) was developed to detect depression in mental healthcare settings and consists of 21 queries. Responses are on a scale of 0 to 3 in reference to the previous fortnight (total score range 0–63) with higher scores indicating greater severity (Beck, 1960). The reliability and validity study of the Turkish version was conducted by Hisli (1988).

Equine-Assisted Activity Procedure

The risks that may be encountered during the sessions, the content of the sessions, and the protocol to be followed were presented to the families of the participants by the informed consent form. An occupational therapist, a physical therapist, a therapeutic riding instructor, a speech and language therapists and a paediatrician were present in all sessions of the eight-week EAA programme. The Professional Association of Therapeutic Horsemanship International guidelines were administered, which means that a trained volunteer was leading the horse and two volunteers walking along either side of the horse (side-walkers) to ensure the rider's safety in all sessions. A certified instructor with specialized training in therapeutic horsemanship chose the horses for each rider, taking into consideration the size and ability of the riders and supervised all sessions.

A one-hour session was implemented for the participants each week, and two participants have attended a session at the same time. Sessions consisted of easy-to-apply and fun activities for the participants, such as grooming and feeding, mounting and dismounting, horsemanship activities, exercises to improve riding skills, mounted games, walking together with the horse, riding. Toys, balls, boxes, circles, cones and such materials were used as exercise materials. The content of the sessions was organized in a way that activities met participant's goals and objectives considering their disabilities. When a participant progressed in skills and or tasks (physical, cognitive, etc.), new ones were presented after an expression of appreciation and encouragement. For unsuccessful attempts, participants were motivated to redo the task. Eye contact between the participant and other people present was encouraged but not forced during the communication.

The sessions included preparation, warm-up, mounting, main session, and finishing. Preparation activities included wearing a security vest and equestrian helmet, preparation of supplementary materials and the field, and taking precautions about environmental safety. Warm-up included performing basic movements on a walking horse in an average of 5-8 minutes. Starting with head rotation to the right and left; horizontal, vertical, circular movements of the arms; forward, backward, downward stretches and reaches, upper body right and left rotations, front and back bending, moving legs sideways and back and forth, pulling up the knees. The participant mounts the horse with specialist support on the mounting platform using a related technique. The main session included the implementation of appropriate physical-mental-sensory exercises for 15-20 minutes. In finishing, movements and behaviours were applied with the retention of the main skills of the session in a game-like situation.

Data Analysis

Three different instruments were used to determine family functioning, communication skills and social functioning, and depression. Prior to the main analyses, parametric test assumptions (normality, skewness and kurtosis) were tested, and it was decided to use two-way mixed-model ANOVA in line with the test results. The group (experimental and control) was treated as a between factor, and the measurement (pre- and post-tests) was treated as a within factor. Please note that the average value of both the Children's Global Assessment Scale and Social Communication Questionnaire was included in the analysis. However, separate statistical analyses were conducted for each subscale of the McMaster Family Assessment Device. The statistical significance level was set as $p < .05$.

Results

Global Functioning

Figure 1 presents the average value of The Children's Global Assessment Scale (CGAS). There is a substantial increase from pre- to post-test in the experimental group, control group scores stayed the same. A 2-way mixed-model ANOVA with measurement (pre- and post-tests) as within-subject factors, and group (experimental and control) as between-subject factors revealed a significant main effect of measurement, $F(1,22)=16.31$, $p=.0005$, $\eta^2=.59$. This main effect revealed that CGAS scores significantly increased from pre- ($M=56.41$ and $SD=8.8$) to post-test ($M=58.8$ and $SD=10.8$). Moreover, measurement*group interaction was also found to be significant: $F(1,22)=17.47$, $p=.0004$, $\eta^2=.61$. Post-hoc analysis revealed that the scores for the experimental group significantly increased from pre- ($M=57$ and $SD=9.24$) to post-test ($M=61.83$ and $SD=11.47$).

The McMaster Family Assessment Device (FAD)

As stated earlier, FAD has seven subscales, and statistical analyses were conducted separately for each scale. Figure 2 shows the average scores of FAD for each subscale. For the problem-solving subscale, mixed-model ANOVA revealed no main effects for measurement ($p>.05$) and group ($p>.05$) and measurement*group interaction ($p>.05$).

Mixed-model ANOVA for communication subscale revealed only a significant measurement*group interaction, $F(1,22)=13.83$, $p=.001$, $\eta^2=.44$. Post-hoc analysis revealed that the scores for the experimental group significantly decreased from pre- ($M=2.5$ and $SD=0.52$) to post-test ($M=2.2$ and $SD=0.59$).

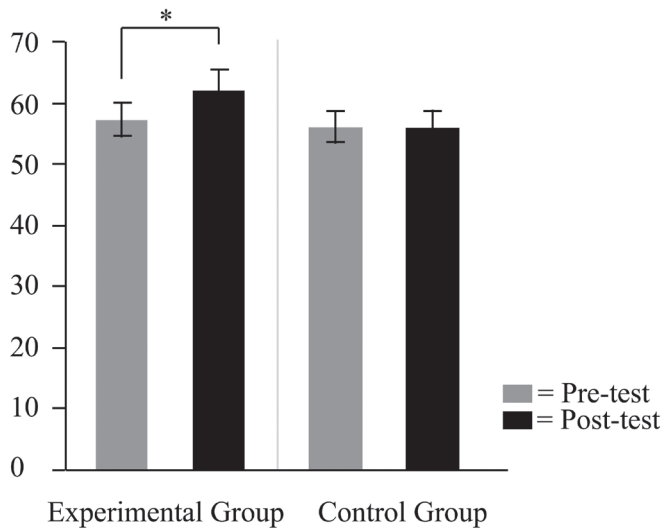


FIGURE 1. The average value of the Children's Global Assessment Scale between experimental and control groups within pre- to post-tests

Statistical analysis for the Roles subscale displayed a significant main effect of measurement, $F(1,22)=5.55$, $p=.02, \eta^2=.11$. This main effect revealed that scores significantly decreased from pre- ($M=2.3$ and $SD=0.54$) to post-test ($M=2.14$ and $SD=0.53$). Moreover, measurement*group interaction was also found to be significant, $F(1,22)=16.73$, $p=.0005, \eta^2=.60$. Post-hoc analysis revealed that the scores for the experimental group significantly decreased from pre- ($M=2.31$ and $SD=0.59$) to post-test ($M=1.88$ and $SD=0.38$). There was no change in the control group's scores.

For the Affective Responsiveness subscale, statistical analysis revealed no main effects for measurement ($p>.05$) and group ($p>.05$) and measurement*group interaction ($p>.05$).

Statistical analysis for the Affective Involvement subscale showed only a significant measurement*group interaction, $F(1,22)=6.97$, $p=.01$, $\eta^2=.12$. Post-hoc analysis revealed that the scores for the experimental group significantly decreased from pre- ($M=2.38$ and $SD=0.58$) to post-test ($M=1.93$ and $SD=0.59$). Moreover, the experimental group post-test score ($M=1.93$ and $SD=0.59$) was significantly lower than the control group post-test score ($M=2.42$ and $SD=0.56$).

Mixed-model ANOVA for the Behavioural Control subscale revealed only a significant measurement*group interaction, $F(1,22)=6.41$, $p=.01$, $\eta^2=.11$. Post-hoc analysis revealed that the scores for the experimental group significantly decreased from pre- ($M=2.23$ and $SD=0.55$) to post-test ($M=1.93$ and $SD=0.38$). Moreover, the experimental group post-test score ($M=1.93$ and $SD=0.38$) was significantly lower than the control group post-test score ($M=2.35$ and $SD=0.47$).

For the General Functions subscale, statistical analysis revealed no main effects for measurement ($p>.05$) and group ($p>.05$) and measurement*group interaction ($p>.05$).

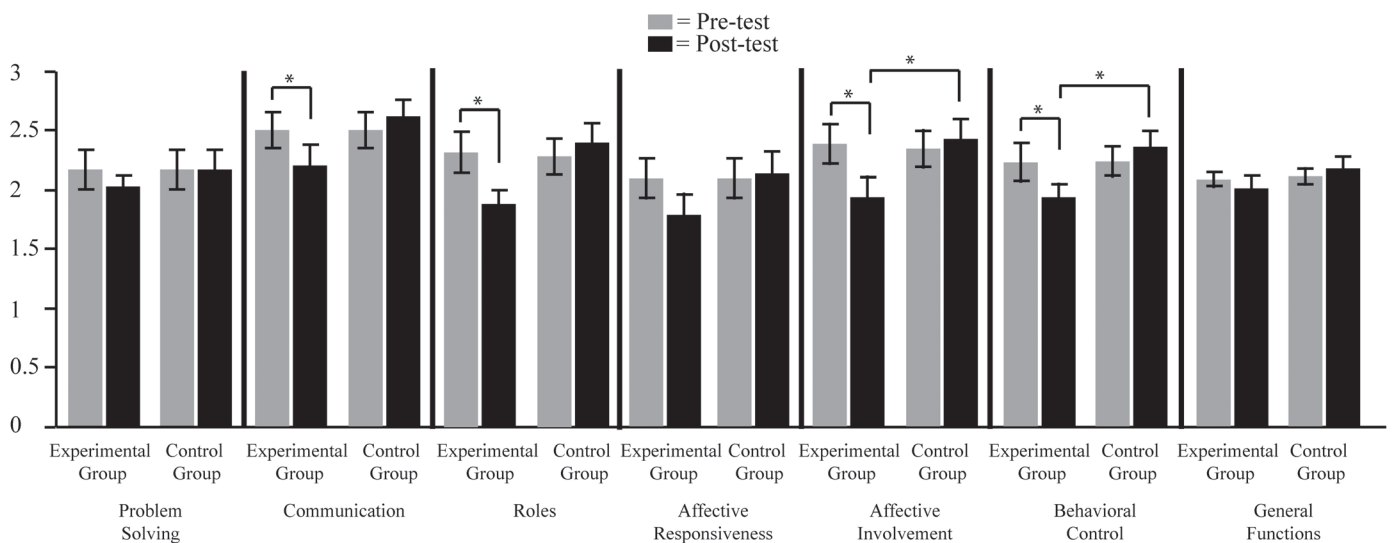


FIGURE 2. The average scores of the McMaster Family Assessment Device between experimental and control groups within pre- to post-tests among the subscales.

Overall, out of seven subscales of FAD, a significant decrease was found among four different subscales from pre- to post-test for the experimental group.

Social Communication Questionnaire (SCQ)

Figure 3 shows the average scores of SCQ. The statistical analysis for SCQ revealed a significant main effect of measurement, $F(1,22)=12.20$, $p=.002$, $\eta^2=.41$. This main effect revealed that scores significantly decreased from pre- ($M=20.16$ and $SD=4.02$) to post-test ($M=19.08$ and $SD=3.97$). Moreover, measurement*group interaction was also found to be significant, $F(1,22)=18.23$, $p=.0003$, $\eta^2=.62$. Post-hoc analysis revealed that the scores for the experimental group significantly decreased from pre- ($M=19.92$ and $SD=4.12$) to post-test ($M=18.25$ and $SD=3.70$). There was no change in the control group's scores.

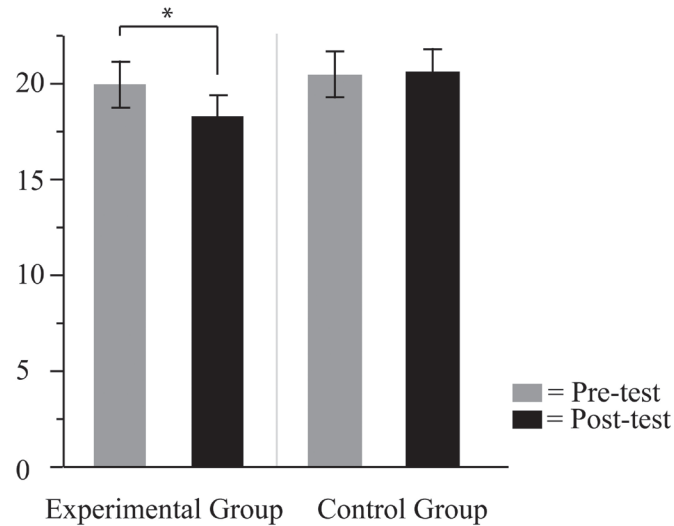


FIGURE 3. The Average value of Social Communication Questionnaire between experimental and control groups within pre- to post-tests.

Beck Depression Inventory (BDI)

Figure 4 shows the average scores of BDI. Similar to SCQ, the statistical analysis for BDI displayed a significant main effect of measurement, $F(1,22)=22.06$, $p=.0001$, $\eta^2=.68$. This main effect revealed that scores significantly decreased from pre- ($M=18.37$ and $SD=5.65$) to post-test ($M=17$ and $SD=5.06$). Moreover, measurement*group interaction was also found to be significant, $F(1,22)=8.93$, $p=.006$, $\eta^2=.15$. Post-hoc analysis revealed that the scores for the experimental group significantly decreased from pre- ($M=18.5$ and $SD=6.31$) to post-test ($M=16.25$ and $SD=5.46$). There was no change in the control group's scores.

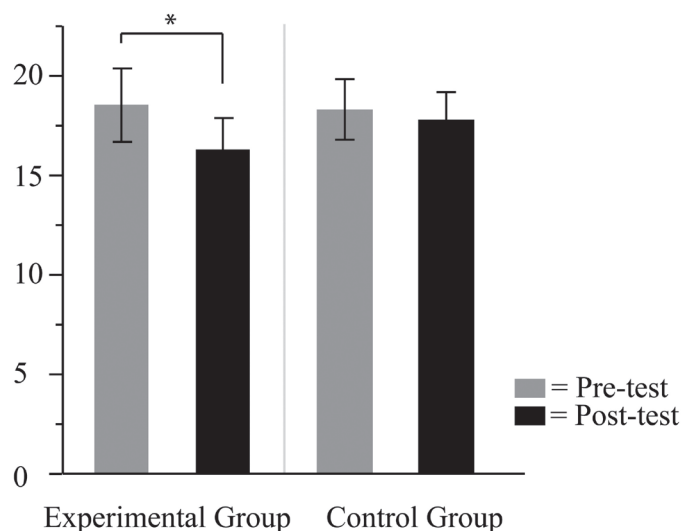


FIGURE 4. The average value of Beck Depression Inventory between experimental and control groups within pre- to post-tests.

Discussion

The current study, to our knowledge, was the first to investigate the effects of EAA on family functioning and maternal depression. This study provided preliminary evidence that an eight-week EAA with children diagnosed with ASD displayed significant improvements in terms of both family and child functioning. The results of the present study showed a decrease in the severity of ASD with the Children's Global Assessment Scale and Social Communication Questionnaire, which is consistent with the current literature (Bass et al.,

2009; Lanning et al., 2014). Although Jenkins and DiGennaro Reed (2013) reported no influence of EAA on the behaviour of children with ASD, others found substantial decreases in ASD severity after subjects experienced EAA and no decreases in subjects in control groups (Bass et al., 2009; Kern et al., 2011). In fact, with such a range of measures, it is not surprising to see inconsistent results of research on the influence of EAA, which could also be related to the fact that the participants' different levels of skills and functioning and the content of the lessons could have been different. Thus, the result for the effect of therapeutic riding for children diagnosed with ASD in our study is consistent with the current literature.

Therapeutic riding sessions include the interaction between the horse and child; during this interaction, children can develop positive social behaviours and improve self-confidence, self-regulation, and self-respect. In particular, the feeling of riding a horse by themselves can positively improve the self-confidence of children diagnosed with ASD. As the children accomplish the riding task by themselves, they become motivated. For example, when a non-verbal child is asked to communicate with the horse by imitating the word "go" to initiate movement in riding, the horse starts walking, even if the vocal attempt is approximate. This may continue for similar trials, such as "Oo" or "Gg" to initiate movement. This procedure may increase with the self-confidence of the child's behaviours (Grundtvig project, 2014). All of those attempts can reduce ASD severity, which was found in the current study.

Improvements in the mental health of children also affect maternal mental health and family functioning. The results for these factors showed positive improvements in many areas, specifically the depression levels of mothers, from the pre- to post-test for the experimental group. Similar to depression levels, family functions were also improved in the experimental group in the current study. Among the seven subscales of FAD, roles, communication, behavioural control, and affective involvement subscales were found to be enhanced in the mothers who were in the experimental group.

Studies about the general population suggest that family cohesion and adaptability are positively associated with parent wellbeing (Uruk et al., 2007; Vandeleur et al., 2009). Stressors that occur with taking care of a family member with ASD or any developmental disorder can have a significant negative effect on families, and in some cases, cause crises (Weiss & Lunskey, 2011), which may mix the roles of members in the family, and one important result of our study is the effectiveness of EAA on the roles of family functioning. The communication of families is increased after EAA, which is related to the social involvement of children and their parents. This may also be related to decreases in maternal depression.

In Weiss and Lunskey's (2011) study, the Brief Family Distress Scale (BFDS) is used to quantify levels of stress and functioning in families that include children with ASD; the BFDS scores correlate positively with problematic coping mechanisms and outcomes and correlate negatively with effective coping mechanisms and positive adjustment. Problematic coping strategies also result in depression; thus, decreasing maternal depression and modulating family functioning may provide suitable effective involvement and behaviour control for mothers. Therefore, family functioning and maternal wellbeing must be targeted in the treatment of the children with ASD. Less is known about which treatments affect family functioning and parental wellbeing positively. However, the present study investigated the effectiveness of EAA on maternal wellbeing and family functioning and found the beneficial effect of EAA on both mothers and their children who are diagnosed with ASD. There was no interaction between horses and families during the activity stage of the study. Therefore, it is possible to say that the change observed in the family functioning occurred due to the positive change in children with autism. As stated in the study by Wright, we attribute positive changes in family functions to the reflection of the changes that occur as a result of the connection of children with autism with animals with high interaction.

In conclusion, the current study found the positive effect of therapeutic riding on children who are diagnosed with ASD and, in turn, this also led to improvements in maternal mental health and family functioning. The main aim of the treatments is to create respectful relationships that teach children diagnosed with ASD appropriate social skills, have enjoyable cognitive development and increase important personality traits like self-confidence and self-esteem.

The generalization of the current study is limited by the small sample size. However, it is still conceivable that the sample size of this study is similar to the ones in the literature. Even though the McMaster Family Assessment Device, Social Communication Questionnaire, and Beck Depression Inventory were filled out by mothers and this may introduce bias into the results for those measurements, it has also previously been stated that parental evaluation is an effective method of evaluation and has been widely used in research in this area (Limbers et al., 2009). One last limitation is the duration of EAA, which was limited to eight weeks due to contextual factors, in our case.

Increasing the number of participants for future studies would improve the generalizability of the study. The duration for EAA could be lengthened in future studies; such lengthening might display additional positive results. By studying this factor, we can observe or decide the optimal time for the EAA for this treatment group. Future studies should focus on whether EAA can also be beneficial for motor abilities. In the treatment of EAA, different therapeutic centres could be used to determine whether greater variation motivates and socializes both the children and parents. We would also suggest that further studies be conducted to determine whether all proven ASD therapies for children also have positive effects on maternal wellbeing and family

functioning or whether EAA is a unique therapy in terms of these additional benefits. Anecdotal verbal reports from all parents whose children had undergone EAA indicated positive improvements in their child's behaviours and socialization, and those parents eagerly wanted to have their children continue to engage in EAA. Thus, governments should support the existing therapeutic horseback riding centres.

Acknowledgement

All procedures performed in the present study were in accordance with the ethical standards of Nevsehir Haci Bektas Veli University Ethics Committee and with the 1964 Helsinki declaration and its later amendments.

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