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FAMILY PROCESS

ORIGINAL ARTICLE

Reducing the incidence of domestic violence: An observational study of an equine-assisted intervention

Ann Hemingway | **Kezia Sullivan**

Department of Medical Science & Public Health, Bournemouth University, Bournemouth, UK

Correspondence
Ann Hemingway, Department of Medical Science & Public Health, Bournemouth University, Bournemouth Gateway Building, Bournemouth, Dorset BH1 3LT, UK.
Email: ahemingway@bournemouth.ac.uk

Abstract

This paper is presenting results from an observational study which has measured the impact of an equine-assisted education (EAE) intervention on the future occurrence of domestic violence within the family over 1 year following completion of the intervention as part of the troubled families program. The data analyzed were collected by the local authority troubled family's team from the different agencies involved including crime, health, and social care data. The data were analyzed and compared across four groups, those families on the troubled families program who had a key worker with a member or members who had attended and completed the equine-assisted intervention (n = 268); those families who were on the troubled families program but no support had been offered (n = 10,569), those families who were on the program and were being supported by a key worker only (n = 2119), and those families on the program who were being supported by a key worker and had received further support, not from the equine-assisted intervention (N = 1119). Significant reductions in domestic violence and child in need status were found for those families who had a member or members attend and complete the equine-assisted intervention under study. Those families referred to the equine-assisted intervention also had significantly more

Ann Hemingway and Kezia Sullivan contributed equally to this work.

complex needs than those in the other groups. Referrals to this intervention are normally for those families for whom talk-based interventions such as parenting, or education-based interventions are not working.

KEYWORDS
domestic violence, equine assisted, troubled family's program

BACKGROUND TO THE TROUBLED FAMILIES PROGRAM IN ENGLAND

This paper is presenting results from an observational study which has measured the impact of an equine-assisted learning (EAE) intervention on the future occurrence of domestic violence (DV) within the family over 1 year following completion of the intervention as part of the troubled families (TF) program.

The TF program was launched in England in 2012 and is now in its second iteration (2015–2020 and 2021/2022) having been developed further following an initial evaluation (MHCLG, 2020).

The program focuses on supporting families with multiple problems. Each family must include dependent children and/or expectant parents and have at least two of the following problems. Crime and antisocial behavior, education, poor life chances, poor living standards, domestic abuse, domestic violence, mental/physical health issues (and in the county under study here at least one child in need, CiN). This program is run from the Ministry of Housing, Communities and Local Government (MHCLG, 2002) and is managed by upper tier local authorities in England. This EAE intervention is used as one possible intervention on the TF program in a county in Southern England and is run by a charity which now has five centers across Southern England. The intervention is an equine-assisted education (EAE) intervention which is referred individuals and families who are experiencing mental health and behavioral issues when talk-based options such as educational or parenting skills/talk-based therapy or group therapy services are not being attended or having a positive impact. Individuals or families referred to the charity have often been referred to multiple services without impact prior to attending the EAE intervention. This paper focuses on the charities work with families referred to them by the local TF program specifically focusing on the impact of the charities intervention on DV and Child in Need (CiN) status.

The second iteration (2020–2021; MHCLG, 2020) of the TF program has the following aims: For local services to transform the way that public services work with families with multiple problems to take an integrated, 'whole family approach' and help reduce demand for reactive services. To demonstrate that this way of working results in lower costs and to make work an ambition for all troubled families, whole family working on the TF program is facilitated by a keyworker who agrees a single plan with the family across local services. The intention is to increase resilience by offering support with parenting, mental health issues, household budgeting, and inter-parental relationships. Services or interventions offered to families are organized around needs rather than around agency boundaries. This includes joint commissioning, shared data systems and a common referrals procedure.

It is important to note that the TF program has been criticized due to its approach to labelling families and its focus on reducing worklessness in families rather than looking at the context within which they live, including, for instance, local poverty, lack of opportunity, and access to support services overall but particularly in relation to mental health and drug and alcohol issues (Hayden & Jenkins, 2014). This is an important and relevant critique of this policy initiative, it is, however, not the focus of this paper.

The Crime Survey for England and Wales (CSEW, 2018) estimates of domestic violence/abuse are based on a broad definition covering male and female victims of partner or family non-physical and physical abuse, threats, force, sexual assault, or stalking. The statistics in 2018 showed that: 7.5% of women and 4.4% of men were estimated to have experienced domestic abuse in 2016/2017, equivalent to an estimated 1.2 million female and 713,000 male victims. Overall, 26% of women and 15% of men aged 16–59 had experienced some form of domestic abuse since the age of 16. These figures were equivalent to an estimated 4.3 million female and 2.4 million male victims.

However, following the first COVID-19 lockdown in March 2020, an increase in DV was captured by the Office for National Statistics (ONS 2021; House of Commons Library, 2021). In mid-May 2020, there was a 12% increase in DV cases referred to victim support services. Between April and June 2020, there was a 65% increase in calls to the national DV helpline in comparison with the first 3 months of 2020. DV remains an important increasing crime in England which can result in serious injury and murder and this situation has only worsened during the COVID-19 pandemic. The long-term impacts on whole families of DV are extensive and enduring including mental health and emotional issues. These may include post-traumatic stress, flashbacks, nightmares, anxiety, and depression and may impact on children's behavior and educational/developmental trajectories (House of Commons Library, 2021). This highlights the importance of the TF program in England.

Background to equine-assisted services (EASs)

Equine-assisted services (EASs) are an umbrella term including programs with leisure (equine activities), educational (Equine-Assisted Education, EAE), or therapeutic (Equine-Assisted Therapy, EAT) goals. EASs are often offered by a multidisciplinary team depending on the needs of the participants involved. This paper will focus on Equine-Assisted Education (EAE). The UK EAE landscape has been growing rapidly over the past decade, gaining media coverage particularly in relation to young people's mental health during and recovering from the COVID 19 pandemic (Strength & Learning Through Horses, 2020) and growing support from councils (Equilore Equine Therapy & Learning, 2021; South Downs Equine Therapy, 2020) alongside Equine Facilitated Therapy (EFT). There is currently no universally agreed industry standard, and these terms are often conflated. However, as a rule, EFT includes a qualified therapist, whereas EAE can be facilitated by anyone and tends not to include riding (Horses Teaching & Healing, 2021). This broad distribution of activities and qualifications which can be considered relevant to EAE means that the gold standard for the industry is yet to be set. The intervention under study here falls under EAE.

Qualitative research has captured the communication skills, calmness, and pride which young people experienced through attending an EAE program (Dell et al., 2011). In addition, an EAE program provided in a young offender's institution was studied by Hemingway et al. (2015) who gathered both qualitative and quantitative data on the impacts of the program which included enhanced feelings of calmness and a greater ability to engage with education. Prison guards also reported improvements in behavior for the young men who attended the program, while a qualitative study undertaken in Guatemala with an EAE program which taught participants natural horsemanship skills with the aim of reducing violent behavior recorded positive reflections from participants in relation to enhanced calmness (Gibbons et al., 2015).

A waiting list randomized controlled trial has been published (Pendry & Roeter, 2013) which evaluated the effect of an EAE program teaching natural horsemanship skills to enhance children's social competence. The findings show significant positive changes (moderate effect size) in 5th to 8th grade children in the USA. In 2014, a study using a waiting list crossover design (Hauge et al., 2014) was published which explored the effect of an EAE with adolescents aged

12–15. The study found that the intervention group achieved a significant increase in their perceived social support following the EAE program in comparison with the control group. In 2015 (Boshoff et al.), an experimental study was published which had collected data on the effect of an EAE on subjective well-being, problem-focused coping, and emotion-focused coping. The results of this research showed significant positive changes in young men in a custodial school in South Africa.

In 2019, a qualitative study was published (Watson, 2019) which explored the experiences of children and parents attending the intervention under study here. The analysis generated four overall themes emerging from their experiences; 'change as a journey', 'seeing is believing; 'a chance to shine', and 'making connections'. Quotes from the participants included in the paper showed that parents felt they had tried all they could at home in relation to helping the young people change their feelings and behavior. When these youngsters participated in this intervention, however, and the parents were able to witness the changes in their children from observing the intervention and the reflective discussions; this really helped with the change process for parents and children. In addition, as parents are normally present during the intervention, they too had their own experience of what they had seen and what they had witnessed their child do. Parents described a significance in seeing something that enabled belief in the possibility of change for the family.

A recent systematic review suggested a need in future for studies to offer more precise details of the EAE interventions being researched and where appropriate to use validated measurement tools in addition to in-depth qualitative evaluation (May et al., 2016).

Overall research to date therefore has found that the interaction between humans and horses may have an impact on behavior, quality of life, and well-being; however, small sample sizes and wide variations in approaches to equine-assisted interventions make the evidence base limited. There are currently few studies focused on the theory of change in relation to how these interventions may work and further randomized studies to test their effectiveness are lacking from the literature.

Summary of published EAE literature relevant to DV

The extent to which EAEs have been investigated for reducing DV and CiN using controlled randomized trials is limited, although there are some insights from previous studies which used convenience samples. A study published in 2007 by Schultz et al., used a before and after measurement of global assessment of functioning (GAF) in 63 children who had experienced intra-family violence. The children were engaged with an EAE intervention for promoting mental health and showed significant improvements in the short term.

In 2016, a meta-analysis of quantitative research focused on assessing the impact of domestic violence interventions was published to determine the overall effectiveness of the programs included in the analysis (Hackett et al.,). The 17 research papers that met the inclusion criteria for the study yielded findings indicating that the DV interventions included had a large effect size, which decreases to a medium effect size when compared to control groups. Interestingly, in relation to the EAE intervention under study here, the areas of focus for the interventions included advocacy, empowerment, parent–child relationships, play therapy, and cognitive behavioral approaches. No animal-assisted interventions were included.

Other published research on DV indicates that interventions to support victims do not necessarily have a significant effect on reoccurrence of violence (DePrince et al., 2012; Stover, 2005). Previous research on EAE interventions has highlighted that improvements in anger management and violent behavior may be occurring, although the studies are not methodologically robust and are exploratory in nature (Boshoff et al., 2015; Gibbons et al., 2015; Hemingway et al., 2015). Improvements in relationships have also been reported in

exploratory studies on EAE interventions although not specifically relating to DV or CiN issues (Hemingway et al., 2019).

A model by Sullivan (2018) describes domestic violence as strongly linked to resource loss—whether interpersonal or economic. According to Hobfoll (2001), changes to resources can be viewed as spirals, in which one gain is likely to lead to another, whilst losses are often precursors to other losses. This demonstrates an opportunity for interventions to create gains, for example, by teaching skills around responsibility, communication, and assertiveness. Bybee and Sullivan (2002) found that these strengths-based interventions for victims of DV prevented further abuse.

CURRENT STUDY

This study is a quantitative observational study which has statistically analyzed data from the TF program in order to understand any possible association between family members attending the EAE under study here and reductions in DV in the family in the year after attendance. This analysis has never been published before on TF data and as such offers unique initial insights into a potential intervention to reduce DV.

Setting

The intervention under study here is offered by a charity which operates in the South of England and is referred over 150 people every year by Schools & Pupil Referral Units, Children's Services, National Health Service (NHS, UK), Mental Health Services (including Child & Adolescent Mental Health CAMHS) UK, Troubled Families, Offender Services, and other specialist agencies such as charities working with Domestic Violence or Drug and Alcohol Services. Those referred are typically disengaged from talk-based support and engaged with multiple local services.

The intervention uses the principles of Natural Horsemanship as its philosophical underpinning and structure (PNH, 2019). This approach is based on learning calmness, co-operation, and partnership development through developing horsemanship skills. At this introductory level, this involves 'playing' with specially trained horses inviting them to respond to requests with the person on the ground and the horse on a loose rope or at liberty. The 'team' involved in each session comprises the equine, the participant, and the course facilitator. The facilitators are high level accredited natural horsemanship practitioners and have all undertaken further training provided by this charity focused on preparing them to facilitate this EAE intervention.

These games help to establish a simple, comprehensive communication system between horses and humans. However, to be a 'partner' the human needs to use clear, phased assertive communication and control their body language and energy in a non-aggressive way. The participant is coached to success with the horses by a facilitator and the students are taught how to play seven 'games' (PNH, 2019) with the horse. The course takes place in an indoor arena with a soft sand floor over 10 h in five 2-h sessions over the course of a week and costs £950 per participant. Each session is structured according to the needs of the participant, focused on building their ability to communicate with the horse using their bodies, achieving success through playing the seven games.

The games taught are as follows:

1. *The Friendly game* (creating relaxation through touch, grooming, hanging out).
2. *The Porcupine game* (moving the horse's feet through using steady pressure, touching the horse).

3. *The Driving game* (moving the horse's feet through rhythmic pressure, not touching the horse).
4. *The Yo-yo game* (moving the horse backwards and forwards).
5. *The Circling game* (asking the horse to travel around you on the circle).
6. *The Sideways game* (asking the horse to move sideways).
7. *The Squeeze game* (asking the horse to go through, under or over something), (PNH, 2019).

The charity tries to involve as many family members as possible in the experience of attending the EAE intervention. Normally a parent attends to watch sessions and be involved in discussions, feedback, and reflections on what has been learnt. This is normally the mother, the inclusive model, however, means that fathers, grandparent's, and guardians are also invited to be involved.

Equine husbandry, selection, training and handling

All the horses who engage in these courses with young people are kept outside in a natural environment (hedges, trees, other horses) in friendship groups with access to shelter if they want it. The workload for each horse is logged and kept light in line with the charities welfare policy. All horse training, handling, and husbandry use natural horsemanship methods and underpinning philosophies and is informed by the charities welfare policy. The horses taking part in this intervention are trained using natural horsemanship by course facilitators. In addition, rescue horses are retrained, take part in the intervention, and are then rehomed as appropriate through their registered rescue charity.

Ethics

Ethical permission was gained from the researchers employing universities ethics panel (BU REF, 15373) for this study. All data analyzed by the researchers were accessed through the local authority via a data sharing agreement and 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 undertakes risk assessments for all participants who are never left unsupervised with the horses. This ethical review included consideration of the horse's well-being and humane treatment during their involvement with the intervention under study here. The horses are all observed for possible stress/distress throughout the course informed by the 'ethogram' of horse behavior (Young et al., 2012) all activities would cease immediately if any observations of this were made. In EAE interventions, it is important to also prioritize the welfare of the horses involved. Horses are sensitive and susceptible to stress particularly relating to physical and behavioral constraints placed upon them while with human beings.

METHOD

A quantitative observational study was undertaken, using statistical analysis to explore any association between family members attending the EAE under study here and reductions in DV and CiN status in the family in the year after attendance. Data were collected by the Local Authority (LA) Troubled Families (TF) team from local services, including police crime data, and health services and social worker data. The data for all the comparison group participants were collected a year apart in 2017 and 2018, whereas due to practical restrictions on the number of participants who can take the EAE intervention in a year, data were collected immediately prior to, and 1 year after the course for participants undertaking the equine intervention between 2016 and 2018.

The anonymized data were analyzed and compared across four groups by two independent researchers. The four groups are as follows: Those families on the troubled family's program who had a key worker with a member or members who had attended and completed the EAE intervention; those families who were on the troubled family's program but no support had been offered; those families who were on the program and were being supported by a key worker only and, those families on the program who were being supported by a key worker and had received further support, not from the EAE intervention.

Participants

The domestic violence (DV) data relate to a young person or adult who has experienced, is experiencing, or is at risk of DV. Flags (recorded on the data sets) are triggered by: Available MARAC dates (Multi-Agency Risk Assessment Conference), DV crime/incidents from the police database, or disclosure to a lead professional. The score is refreshed every 3 months; for the purposes of this study, scores were extracted before the intervention and 1 year after.

The CiN data relate to the child in need plan which is a peer-reviewed social worker decision. The score is refreshed every 3 months; scores for the purposes of this study were extracted before the intervention and 1 year after. The overall number of DV and CiN flagged participants included in the data analysis are shown in Table 1.

The inclusion criteria for the study were as follows:

All families who fell within the four groups outlined here for more than one full calendar year.

All families where complete consistent data were available over the prescribed period.

The exclusion criteria for the study were as follows:

Incomplete data available.

Any inconsistencies in recorded data over the required period.

Families falling within the four groups outlined here for less than one full calendar year.

The participants comprised an opportunity sample of people engaged with the TF program. Therefore, the study size was established according to the number of people involved in the program with data available as outlined in the inclusion and exclusion criteria over the years outlined here previously.

Materials

The capture of outcomes across agencies by the TF team at the local authority has enabled this research study to use data collected by agencies other than the charity under study to inform an observational study comparing outcomes for four groups through the use of a data sharing agreement. The decision as to which families sit within each of these group's rests with the social services and TF team in the LA who decide based on need which group families fall within when they join the TF program. Please see Table 2 for a description of each group.

TABLE 1 Numbers of CiN and DV flagged participants included in data analysis

Criteria	Participants	Number of participants
Child in need	Participants under the age of 18	8477
Domestic violence	All participants	13,947

TABLE 2 Description of each group

Group	Description	Total participants			
		All	Male	Female	Unknown
EAE	Families who were within the TF program with support from their key worker and at least one family member who attended the EAE intervention under study	268	119	149	0
TF plus	Families who were within the TF program and in receipt of key worker support and additional interventions such as play therapy or counselling	1119	525	586	8
TF active	Families who were within the TF program and in receipt of key worker support only	2119	989	1112	18
TF identified	Families who were within the TF program but not in receipt of any key worker support or additional interventions	10,567	4928	5542	97
Total	All participants	14,073	6561	7389	123

Note: All data taken from Pre for each group as should be matched pairs.

The outcome of the interventions was determined using the DV and CiN flags. Reductions in the numbers of DV or CiN flags of a group at one year's follow-up indicate a positive effect with an increase indicating a negative effect.

The sample for the EAE intervention under study was made up of 268 individuals who were from 62 family groups. Each family group had a minimum of one individual who attended and completed the intervention. This sample comprised 119 male participants and 149 female participants, all of whom were aged between 0 and 63 prior to the intervention, with an average age of 22.4 years old. The average size of each family group was 4.32 members. Across these 62 families, 84 participants actively took part in the intervention (as in learned to play with the horse under the supervision of the facilitator) rather than watching or/and taking part in reflective discussions or not attending the intervention at all. The overall distribution of attendees at the intervention under study within families was in 43 families one member of the family completed the intervention, in 17 families two members completed, in one family three members completed, and in one family four participants completed. There were six families in which only an adult attended, 13 families in which both adult(s) and child(ren) attended, and 43 families in which only children attended the EAE; therefore, adults officially attended in 30.6% of cases. For families with DV flags at pre-test, the proportion with official adult attendees was higher at 47.4%.

The total number of TF comparison group individuals across all three comparison groups who had no members attend the EAE intervention was $N = 13{,}805$.

In the TF identified group (where no TF support was offered), 10,569 participants had been identified by the TF program: 4928 of whom were male, 5542 of whom were female, and 97 of whom were of unknown gender (gender not stated on data set). This group had a mean age of 20.0 years.

In the TF active group (having a key worker only = TF active), 2119 participants had been identified and engaged with their key worker, including 989 male participants, 1112 female participants, and 18 participants of unknown gender. The TF active group had a mean age of 21.2 years.

In the TF Plus group, 1119 participants had been engaged with the TF program as well as having funding allocated for other services (key worker plus other interventions, primarily

Children				Adults				Number of intervention attendees		Number of families
All	Male	Female	Unknown	All	Male	Female	Unknown	Children	Adults	
145	67	78	0	119	49	70	0	63	20	62
645	341	301	3	470	182	283	5	N/A	N/A	263
1165	614	541	11	952	374	570	8	N/A	N/A	N/A
6519	3376	3079	66	4024	1540	2451	33	N/A	N/A	N/A
8474	4398	3999	80	5565	2145	3374	46	N/A	N/A	N/A

parenting support or play therapy = TF plus). These participants comprised 525 males, 586 females, and 8 participants of unknown gender. There were 263 families included from the TF Plus group, with an average size of 4.26 members. The TF plus group had a mean age of 20.2 years.

Within this study, there are included, therefore, four comparison groups one of which received no support but was known to the TF program classified in the paper as TF identified. In the second group, all participants were receiving support from the TF key worker only, in the third group TF plus the participants may have received parenting support which by definition will engage with the adults in that group. The number of 'active participants' for the equine-assisted intervention is included above.

Procedure

For the DV and CiN data, a mixed-measures ANCOVA analysis was undertaken to identify differing effects of intervention group, time, and gender, as well as covariance with age.

Each dependent variable was initially investigated separately; therefore, separate mixed-measures ANCOVAs were run for both DV and CiN. As such, group and gender were included as independent variables, whilst age was included as a covariate.

RESULTS

Domestic violence

A mixed-measures ANCOVA was carried out, with presence of DV included as a dependent variable, time as a within-subject independent variable, group and gender as between participant's independent variables, and age as a covariate. The dependent variable was a binary measure of DV at pre- and post-test and of CiN status at pre- and post-intervention. Box's test of equality of covariance was significant. Please see Table 3.

TABLE 3 ANCOVA results

Source	Type III sum of squares	*df*	Mean square	*F*	*p*	η_p^2	Noncent. parameter	Observed power[a]
Within participants effects on domestic violence flags								
Time	1.545	1	1.545	35.264	0.000	0.003	35.264	1.000
Time × Age	16.162	1	16.162	368.911	0.000	0.026	368.911	1.000
Time × Gender	0.138	2	0.069	1.572	0.208	0.000	3.144	0.335
Time × Group	0.731	3	0.244	5.564	0.001	0.001	16.693	0.944
Time × Gender × Group	0.347	5	0.069	1.582	0.161	0.001	7.910	0.559
Error (time)	0.619	14,061	0.044					
Between participants effects on domestic violence flags								
Intercept	5.757	1	5.757	48.193	0.000	0.003	48.193	1.000
Age	9.013	1	9.013	75.447	0.000	0.005	75.447	1.000
Gender	0.733	2	0.367	3.068	0.046	0.000	6.136	0.594
Group	0.623	3	0.208	1.738	0.156	0.000	5.214	0.457
Gender × Group	1.361	5	0.272	2.279	0.044	0.001	11.396	0.743
Error	1679.829	14,061	0.119					
Within participants effects on child in need flags								
Time	0.289	1	0.289	3.315	0.069	0.000	3.315	0.445
Time × Age	0.450	1	0.450	5.166	0.023	0.001	5.166	0.623
Time × Gender	0.548	2	0.274	3.146	0.043	0.001	6.291	0.606
Time × Group	1.167	3	0.389	4.464	0.004	0.002	13.392	0.881
Time × Gender × Group	2.039	5	0.408	4.678	0.000	0.003	23.391	0.978
Error(Time)	737.684	8462	0.087					
Between participants effects on child in need flags								
Intercept	32.724	1	32.724	215.303	0.000	0.025	215.303	1.000
Age	0.841	1	0.841	5.530	0.019	0.001	5.530	0.652
Gender	0.349	2	0.174	1.148	0.317	0.000	2.295	0.254

TABLE 3 (Continued)

Source	Type III sum of squares	*df*	Mean square	*F*	*p*	η_p^2	Noncent. parameter	Observed power[a]
Group	40.642	3	13.547	89.132	0.000	0.031	267.396	1.000
Gender × Group	1.216	5	0.243	1.600	0.156	0.001	8.002	0.564
Error	1286.162	8462	0.152					

[a]Computed using alpha = 0.05.

Interaction between group and time

The overall interaction among time, group, and gender was not significant, $F(5, 14{,}061) = 1.58$, $p = 0.161$, although there was a significant main effect of time, $F(1, 14{,}061) = 35.26$, $p < 0.001$. The interaction between group and time is shown in Figure 1 and was significant as $F(3, 14{,}061) = 5.56$, $p = 0.001$. The interaction between gender and time was not found to be significant, $F(2, 14{,}061) = 1.57$, $p = 0.208$, although there was a significant impact of age as a covariate, $F(1, 14{,}061) = 368.91$, $p < 0.001$.

Interaction between gender and group

There was found to be a significant main effect of gender, $F(2, 14{,}061) = 3.07$, $p = 0.047$. There was no significant main effect of group, $F(3, 14{,}061) = 1.74$, $p = 0.156$, though there was a significant interaction between gender and group, $F(5, 14{,}061) = 2.28$, $p = 0.044$, demonstrated in Figures 2–5.

Higher risk of DV flags

Post-hoc analyses were carried out with a Bonferroni correction applied. These showed that female participants were not significantly ($p = 0.056$) more likely to have DV flags (M = 0.134) than male participants (M = 0.117) or participants of unknown gender ($p = 0.061$), and that male participants were not significantly ($p = 0.061$) more likely to have DV flags than participants of unknown gender (M = 0.067).

Post-hoc comparisons to compare groups also found that there was no significant difference between any groups ($p > 0.05$) except for between the EAE intervention and TF identified, where the intervention was found to have participants at significantly higher risk of DV flags (M = 0.134) than TF identified (M = 0.079) across the time periods ($p = 0.007$). DFM Plus (M = 0.115) and TF Active (M = 0.119) also had lower likelihoods of DV flags than intervention participants, although these differences were not found to be significant.

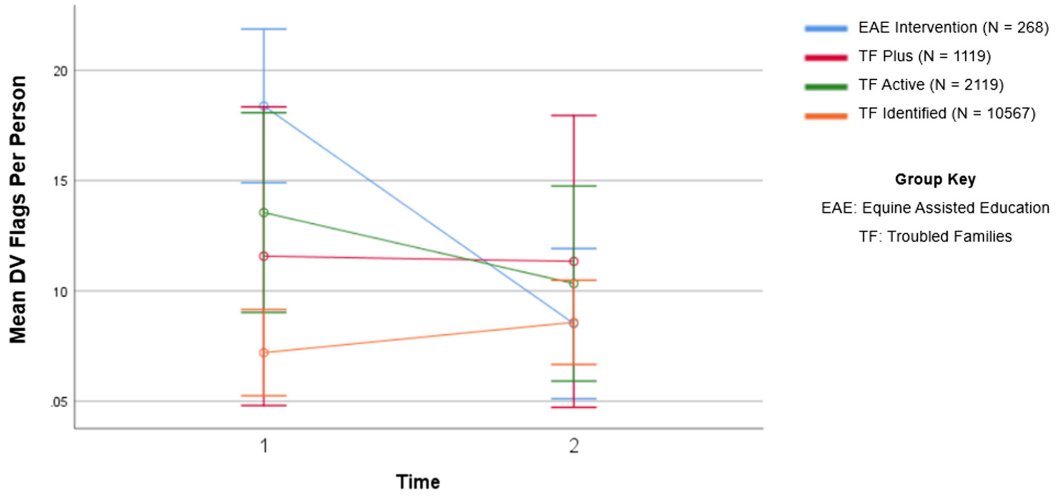

FIGURE 1 Interaction between time and group for DV flags. Covariates appearing in the model are evaluated at the following values: Age = 20.2845. Error bars: 95% CI

Gender and time

Time alone was also not found to have a significant effect, as the difference between pre-test (M = 0.122) and post-test (M = 0.098) was not significant ($p = 0.057$).

Child in need

A mixed-measures ANCOVA was carried out, with the presence of Child in Need (CiN) flags included as a dependent variable, time as a within-subject independent variable (see Figure 6), group and gender as between participants independent variables, and age as a covariate.

Group gender and time

As demonstrated in Figures 6–9 (for Figures 7–9), a significant overall interaction among time, group, and gender was found, $F(5, 8462) = 4.68$, $p = 0.000$, although the main effect of time was not significant, $F(1, 8462) = 3.32$, $p = 0.069$. The interaction between group and time is shown in Figure 10 and was found to be significant, $F(3, 8462) = 4.46$, $p = 0.004$. The interaction between gender and time was also found to be significant, $F(2, 8462) = 3.15$, $p = 0.043$, as was the impact of age as a covariate, $F(1, 8462) = 5.12$, $p = 0.023$.

No significant main effect of gender was found, $F(2, 8462) = 1.15$, $p = 0.317$, although there was a significant main effect of age, $F(1, 8462) = 5.53$, $p = 0.019$.

Post-hoc analyses with a Bonferroni correction applied found that male participants (M = 0.320) are significantly more likely to have CiN flags than participants of unknown gender (M = 0.155, $p = 0.025$) as are female participants (M = 0.330, $p = 0.015$), although male and female participants showed no significant differences ($p = 1.0$). Please see Table 4 for details of this post-hoc analysis.

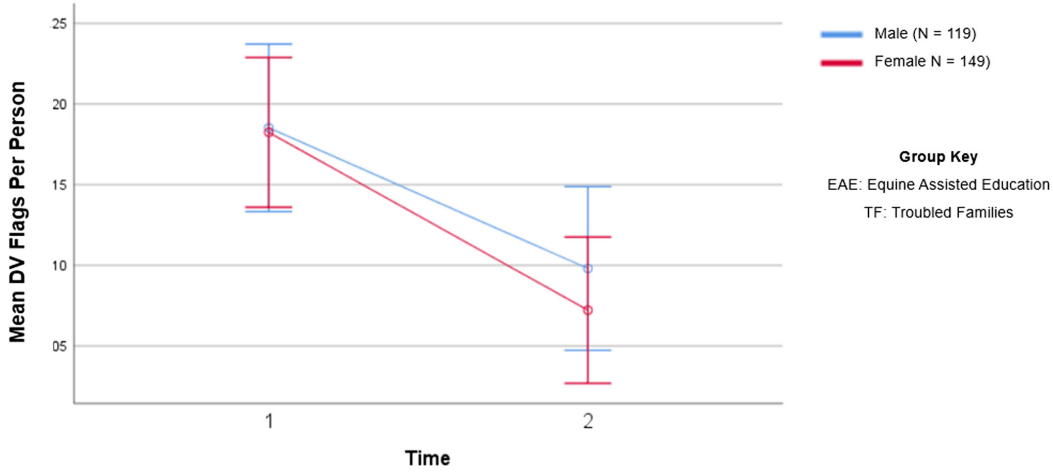

FIGURE 2 Interaction between gender and time for EAE group participants. Covariates appearing in the model are evaluated at the following values: Age = 20.2845. Non-estimable means are not plotted

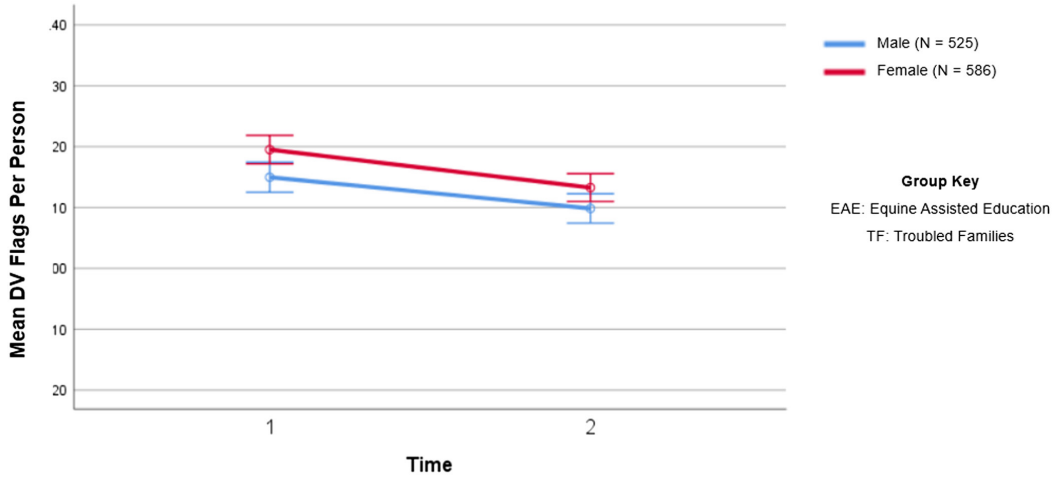

FIGURE 3 Interaction between gender and time for TF plus participants. Covariates appearing in the model are evaluated at the following values: Age = 20.2845. Error bars: 95% CI

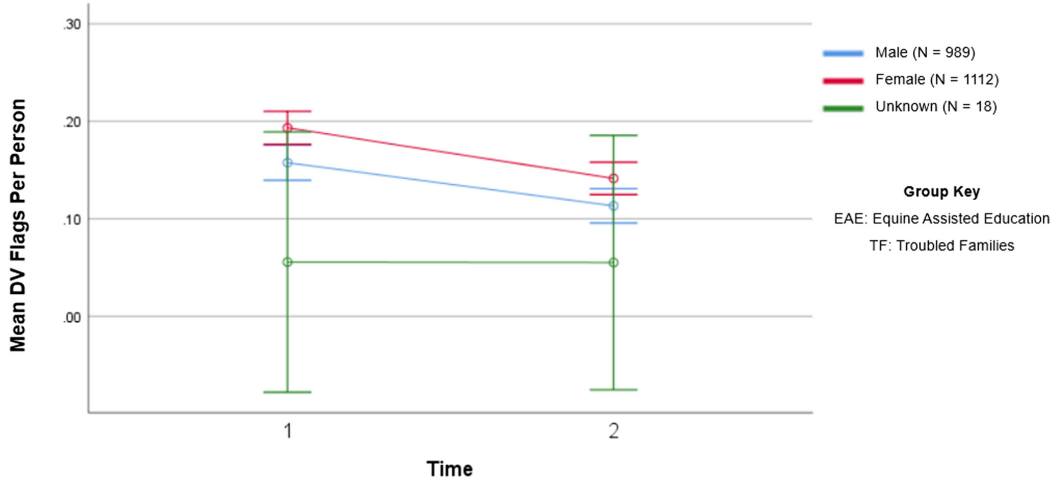

FIGURE 4 Interaction between gender and time for TF active participants. Covariates appearing in the model are evaluated at the following values: Age = 20.2845. Error bars: 95% CI

Higher risk of CiN

It was also found that EAE intervention participants (M = 0.592) are significantly more likely to have CiN flags than participants in any of the other groups ($p < 0.001$ for all). TF Plus (M = 0.245) was not significantly more likely to have CiN flags than participants who were in the TF Identified group (M = 0.107, $p = 0.070$), or less likely to have CiN flags than those in the TF Active group ($p = 1.0$). However, TF Active (M = 0.275) were significantly more likely to have CiN flags than those in the TF Identified group ($p < 0.001$). Time 1 vs time 2 were not found to be significantly different in terms of the number of CiN flags across all groups ($p = 0.142$). Please see Table 5 for post hoc comparison.

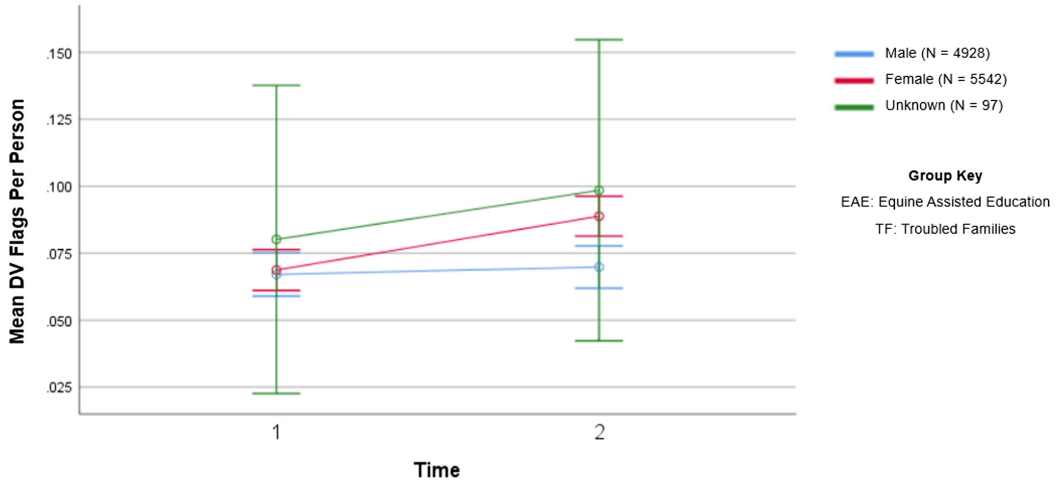

FIGURE 5 Interaction between gender and time for TF identified participants. Covariates appearing in the model are evaluated at the following values: Age = 20.2845. Error bars: 95% CI

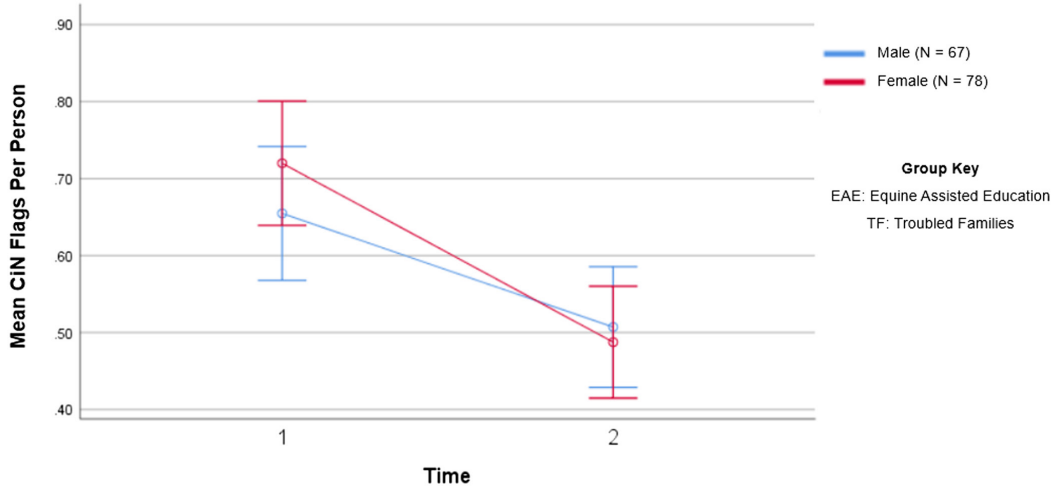

FIGURE 6 Interaction between gender and time for EAE group participants. Covariates appearing in the model are evaluated at the following values: Age = 9.6990. Non-estimable means are not plotted

DISCUSSION

Skills covered by this intervention include developing calmness, assertiveness, and communication (Hemingway, 2019), which helps participants to learn how to manage their feelings. A study by Katz and Windecker-Nelson (2006) found that coaching, particularly around fear and anger, may help families affected by DV. Therefore, the skills covered by this intervention, which includes learning how to be calm in a practical setting (Bybee & Sullivan, 2002) could help to improve participant's abilities to cope in potentially challenging domestic situations. (Evans,2014) suggest in their paper on prevention of violence abuse and neglect in early childhood that interventions need to utilize each person's optimal ways to engage in learning and be skills oriented. Can the use of practical skills based EAE interventions help enable young people and families to learn different ways of 'being' together?

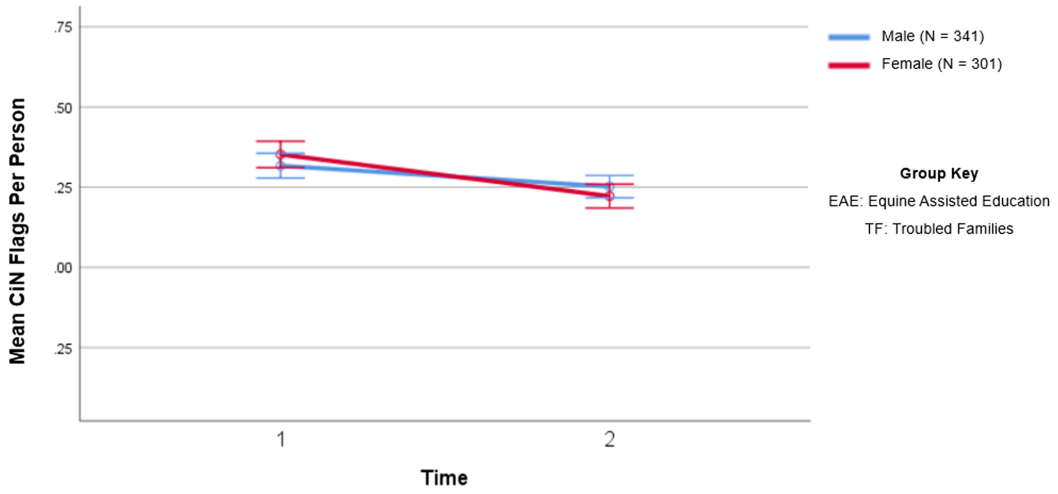

FIGURE 7 Interaction between gender and time for TF plus participants. Covariates appearing in the model are evaluated at the following values: Age = 9.6990. Error bars: 95% CI

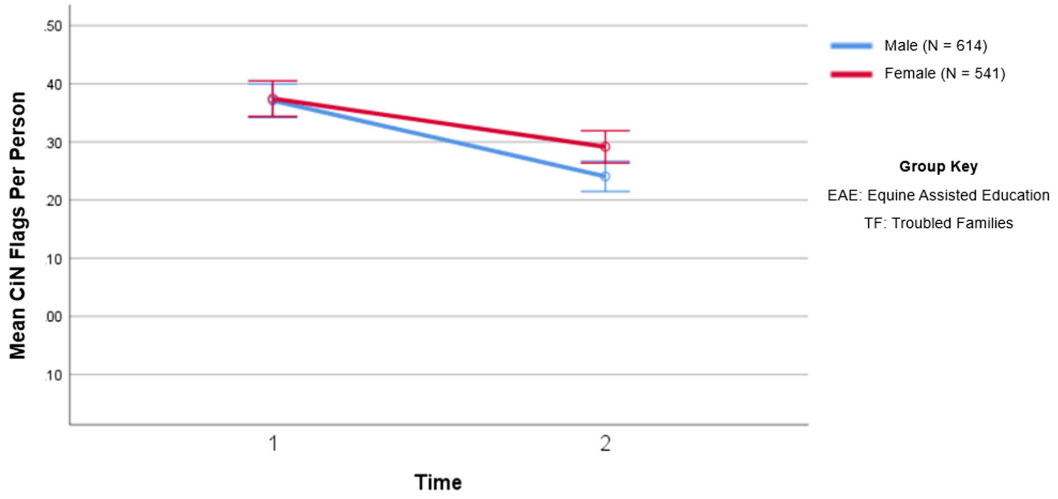

FIGURE 8 Interaction between gender and time for TF active participants. Covariates appearing in the model are evaluated at the following values: Age = 9.6990. Error bars: 95% CI

As already discussed in this paper, the EAE intervention under study here tries to involve as many family members as possible in the experience of attending the equine intervention. The charities model is based on empowerment, assertiveness, and calmness building this for the attendee and those other family members who are involved. A qualitative study has been undertaken with participants on this intervention which is mentioned here in the literature review (Watson, 2019). Parents attending the intervention described a significance in seeing something that enabled belief in the possibility of change for the family. While another qualitative study undertaken on this intervention when it was initially developed within a young offender's institute found that inmates described an increased sense of calmness and ability to see another's point of view which reduced recorded incidents in prison (Hemingway et al., 2015).

Although this is a convenience sample of participants from the TF cohort in this area, the numbers are large enough to see significant differences in two areas DV and CiN across the

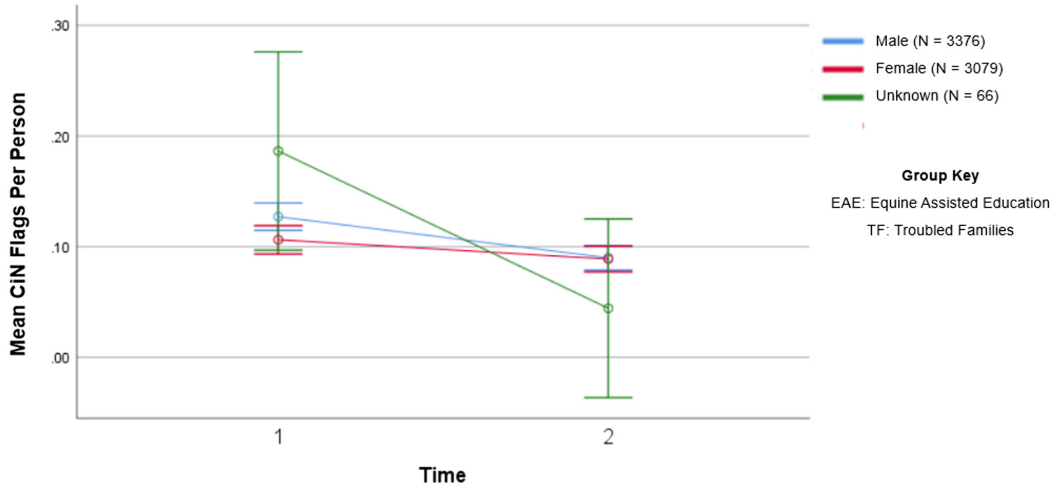

FIGURE 9 Interaction between gender and time for TF identified participants. Covariates appearing in the model are evaluated at the following values: Age = 9.6990. Error bars: 95% CI

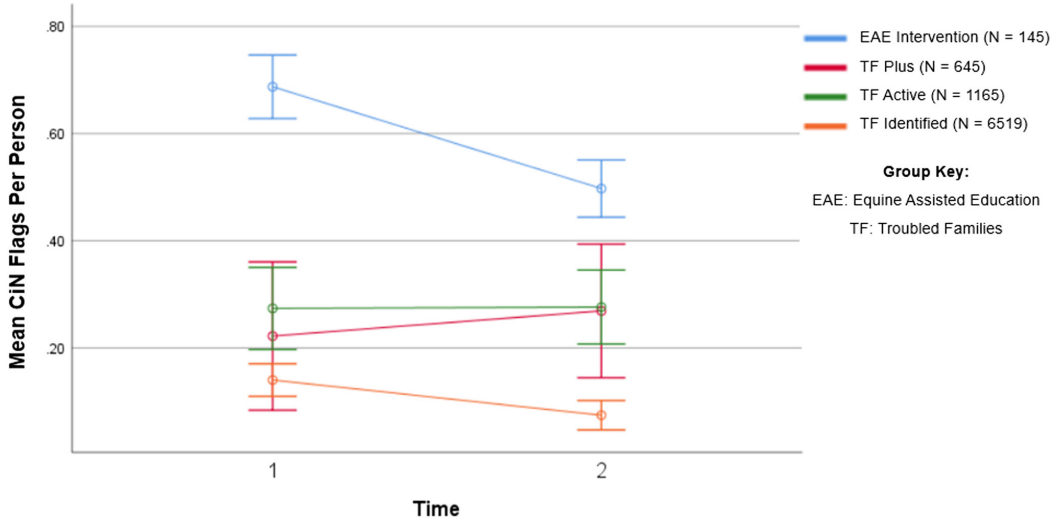

FIGURE 10 Interaction between time and group for CiN flags. Covariates appearing in the model are evaluated at the following values: Age = 9.6990. Error bars: 95% CI

groups studied. Those families with at least one member who attended the intervention under study here had significantly higher levels of both DV and CiN on referral than other groups in this study. This highlights the impact of the intervention on this vulnerable group of individuals and families over time. This intervention is generally referred individuals and families when other options such as talking therapies and educational/parenting, or counselling opportunities are not working or have not been attended. The TF referral cohort makes up around a third of the referrals to the EAE intervention overall each year.

Age was found to be a significant covariant across the groups with increases in age suggesting increased likelihood of flags for DV and CiN. However, the effect of age was not specifically considered as a factor in this study but may have implications for further research.

TABLE 4 ANCOVA results: Post-hoc pairwise comparisons

Measure: Domestic violence flags

		Mean difference (I–J)	Std. error	p.[c,d]	95% confidence interval for difference[c]	
					Lower Bound	Upper Bound
Gender						
Male	Female	−0.017	0.009	0.056	−0.034	0.000
	Unknown	0.051[a]	0.036	0.162	−0.020	0.122
Female	Male	0.017	0.009	0.056	0.000	0.034
	Unknown	0.068[a]	0.036	0.061	−0.003	0.138
Unknown	Male	−0.051[b]	0.036	0.162	−0.122	0.020
	Female	−0.068[b]	0.036	0.061	−0.138	0.003
Intervention group						
EAE	TF plus	0.020[a]	0.033	0.544	−0.044	0.084
	TF active	0.015[a]	0.025	0.54	−0.033	0.063
	TF identified	0.056[a,*]	0.017	0.001	0.022	0.089
TF plus	THC	−0.020[c]	0.033	0.544	−0.084	0.044
	TF active	−0.005	0.035	0.89	−0.074	0.064
	TF identified	0.036	0.030	0.24	−0.024	0.095
TF active	THC	−0.015[c]	0.025	0.54	−0.063	0.033
	TF plus	0.005	0.035	0.89	−0.064	0.074
	TF identified	0.041	0.021	0.057	−0.001	0.082
TF identified	THC	−0.056*[,c]	0.017	0.001	−0.089	−0.022
	TF plus	−0.036	0.030	0.24	−0.095	0.024
	TF active	−0.041	0.021	0.057	−0.082	0.001
Time						
1	2	0.024[a]	0.012	0.057	−0.001	0.048
2	1	−0.024[a]	0.012	0.057	−0.048	0.001

Note: Based on estimated marginal means a: An estimate of the modified population marginal mean (J); b: An estimate of the modified population marginal mean (I); c: Computed using alpha = 0.05; d: Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Over the last 5 years, 94% of those individuals who commence the EAE intervention completed the course (Hemingway, 2019) which suggests that the experience as a whole is a positive and engaging one. Previous studies have shown that the practical, hands-on nature of being with the horses helps people to engage and enjoy building a connection with another 'being' during the course (Watson, 2019). During the intervention under study here participants are responded to in the same way as horses by the facilitator, in response to their body language primarily rather than the spoken word. Participants learn to understand the point of view of the horse as a prey animal to be effective when communicating with them through their bodies. These qualities of learning to see another's point of view were highlighted by (Prior & Mason 2010) when considering the evidence so far on what works to engage young people.

The generalizability of this study may be limited due to the lack of randomization of this sample and because this intervention is being used in conjunction with the TF initiative which is not always implemented consistently across counties/regions and is an English policy

initiative. Previous studies on this intervention have identified that calmness and assertiveness are outcomes of being involved as a participant (Hemingway, 2019); however, further investigation of the impact on parents of attending to observe and be included in discussions and reflections with participants is needed.

This study has only offered insights into reported DV (to the police or a health or social care professional) and this is an important limitation of the findings, as much DV does go unreported (ONS, 2021). In addition, the families under study here are part of a particular government policy program (TF) once again this may influence the findings of the study. However, as an observational study, some associations between the EAE intervention and a reduction in DV have been detected through the data analysis which need further exploration through a randomized study to explore any causative link.

Two pilot studies have suggested what the physiological mechanism of action of EAE interventions may be with a particular focus on cortisol levels and fMRI scanning to help to identify which parts of the brain are used during interaction with horses. One pilot study

TABLE 5 ANCOVA results: post-hoc pairwise comparisons

Measure: child in need flags						
		Mean difference (I–J)	Std. error	*p.*[cd]	95% Confidence interval for difference[c]	
					Lower bound	Upper bound
Gender						
Male	Female	−0.010	0.013	0.439	−0.037	0.016
	Unknown	0.165*[,b]	0.062	0.008	0.042	0.287
Female	Male	0.010	0.013	0.439	−0.016	0.037
	Unknown	0.175*[,b]	0.062	0.005	0.053	0.297
Unknown	Male	−0.165*[,c]	0.062	0.008	−0.287	−0.042
	Female	−0.175*[,c]	0.062	0.005	−0.297	−0.053
Intervention group						
EAE	TF plus	0.347*[,b]	0.058	0.000	0.233	0.461
	TF active	0.317*[,b]	0.038	0.000	0.244	0.391
	TF identified	0.485*[,b]	0.026	0.000	0.435	0.536
TF plus	THC	−0.347*[,c]	0.058	0.000	−0.461	−0.233
	TF active	−0.029	0.012	0.631	−0.149	0.091
	TF identified	0.138*	0.055	0.000	0.031	0.246
TF active	THC	−0.317*[,c]	0.038	0.000	−0.391	−0.244
	TF plus	0.029	0.061	0.631	−0.091	0.149
	TF identified	0.168*	0.032	0.000	0.105	0.230
TF identified	THC	−0.485*[,c]	0.026	0.000	−0.536	−0.435
	TF plus	−0.138*	0.055	0.012	−0.246	−0.031
	TF active	−0.168*	0.032	0.000	−0.230	−0.105
Time						
1	2	0.039[a]	0.027	0.142	−0.013	0.091
2	1	−0.039[a]	0.027	0.142	−0.091	0.013

Note: Based on estimated marginal means a: An estimate of the modified population marginal mean (J); b: An estimate of the modified population marginal mean (I); c: Computed using alpha = 0.05; d: Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

was undertaken looking at the effects of EAE interventions on resting brain state function in attention-deficit/hyperactivity disorder (Yoo et al., 2016). This study found that the intervention was associated with short-range functional connectivity in the regions of the brain related to the behavioral inhibition system, which are associated with symptom improvement. In addition, a recent pilot study (Nuber et al., 2019) also reported on heart rate, heart rate variability, and salivary cortisol measurements in both humans and horses and reported reductions in cortisol for human participant's post-intervention. Both these findings would suggest that increased calmness may occur through these interventions either through reducing stress or activating parts of the brain related to behavior inhibition, although the evidence base on this area is minimal and these are both small pilot studies. Indeed, this intervention would benefit from further research to explore more specifically why significant reductions in DV and CiN may be occurring. Overall, this observational study has provided some interesting findings; however, it has substantial limitations which will be covered in the next section of this paper.

Limitations

This study used a convenience sample from data routinely collected by the LA in the area in which the TF program refers to the EAE intervention under study here. A data sharing agreement was required to put together the data from different agencies, crime, health, and social care. No manipulation of the sample groups including randomization of participants was undertaken in the allocation into different groups and no attempt was made to match the characteristics of the comparison groups. The groups studied here were defined by the local TF program criteria as presented earlier.

The four groups compared here are all part of the TF program in relation to the TF identified and the TF active groups and no information was available in relation to family size and membership. This information was only available for the TF plus and EAE intervention groups (as presented in Table 2 earlier). In addition, the interventions offered to the TF plus group were parenting support through education courses or play-based interventions. In the EAE intervention group, the equine intervention was successfully completed by at least one family member. Both the TF plus and EAE intervention groups were also benefitting in all families from TF case worker support, which may have influenced the outcomes of the analysis.

This study has only allowed analysis of DV which has been reported through the police, health services, or social services, as we know that much DV remains unreported (HMIC, 2015) this is a substantial limitation of this study. Therefore, the study findings are only relevant in relation to reported DV.

The generalizability of this study may be limited due to the lack of randomization of this sample and because this intervention is being used in conjunction with the TF initiative which is not always implemented consistently across counties/regions and is an English policy initiative.

CONCLUSION

In conclusion, the ability to analyze across cohorts in relation to this intervention has yielded interesting results suggesting that there may be an effect of a family member attending the intervention under study relating to reductions in future DV and the removal of CiN status in the families under study, although randomized studies are still needed to further explore the issue of causality. Of further interest is that this charity is normally referred those for whom other talk-based or education-based options are not working or are

not being attended. This study would suggest, however, that even in this group the intervention under study may be having a positive impact in comparison with other types of support offered through the TF program.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest. No funding was received for this research.

ORCID

Ann Hemingway https://orcid.org/0000-0002-0920-3897

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