RESEARCH-ARTICLE

"You Can Fool Me, You Can't Fool Her!": Autoethnographic Insights from Equine-Assisted Interventions to Inform Therapeutic Robot Design

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Abstract

Equine-Assisted Interventions (EAIs) aim to improve participant health and well-being through the development of a therapeutic relationship with a trained horse. These interventions leverage the horse's ability to provide emotional feedback, as it responds to negative non-verbal cues with reciprocal negativity, thereby encouraging participants to regulate their emotions and achieve attunement with the horse. Despite their benefits, EAIs face significant challenges, including logistical, financial, and resource constraints, which hinder their widespread adoption and accessibility. To address these issues, we conducted an autoethnographic study of the lead researcher's engagement in an EAI to investigate the underlying mechanisms and explore potential technological alternatives. Our findings suggest that the reciprocal and responsive non-verbal communication, combined with the horse's considerable physical presence, supports the potential of an embodied robotic system as a viable alternative. Such a system could offer a scalable and sustainable solution to the current limitations of EAIs.

CCS Concepts

• **Human-centered computing** → **Empirical studies in HCI**; **Empirical studies in collaborative and social computing**.

Keywords

Equine-Assisted Interventions, Robot Design, Autoethnography, Human-Animal Interaction

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1 Introduction

Over the last 6,000 years of domestication, humans and horses have developed various forms of relationships, evolving from a working partnership to one based on companionship [33]. This bond has also extended, especially over the last 70 years, into therapeutic settings [129]. Equine-assisted interventions (EAIs), *"interventions that involve a live horse, for humans of any age, and for any therapeutic purpose"*, aim to improve the mental and physical well-being of participants through the development of a human-horse relationship over time [128]. This umbrella-term, *'EAIs'*, includes equine-assisted activities [128], equine-assisted therapy [12], equine-facilitated therapy [141], and equine-facilitated psychotherapy [79].

Figure 1: Equine-Assisted Interventions (EAIs) aim to improve participant health and well-being through the development of a therapeutic relationship with a trained horse. In this paper we learn from these encounters to leverage insights for the design of technological counterparts.

Horses, as prey animals [26], have evolved highly sensitive mechanisms for attuning to the energy of others [72]. Within the context of EAIs, participants will learn to utilise their body language and internal emotions [58] to non-verbally communicate with horses. However, the horses will only respond positively to participants once participants learn to positively regulate these non-verbal cues [58, 72]. This encourages participants to recognise how their non-verbal cues influence others, and develop critical emotional regulatory abilities [58, 72]. In the context of animal-assisted therapeutic interventions, horses are therefore extremely intuitive partners, functioning as *"living, breathing biofeedback machines because they externally reveal internal processes in real time"* [80].

Participants are often referred to EAIs when other traditional, talk-based, therapies are deemed "ineffective" [54]. Those who struggle with emotional articulation, and past traumatic experiences [19, 138, 151], are associated with a development of effective emotional regulation and communication abilities from EAIs [124]

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whilst talking therapies are insufficient at aligning with the complexity and severity of their cases [48]. In addition to their potential ineffectiveness, the challenge of accessing talking-based services—evident in a 24.5% increase in referrals in the UK in 2022 [92], with only two-thirds of these accessing the services—demonstrates the need for alternative therapeutic approaches.

However, while EAIs provide substantial therapeutic benefits, they are not without drawbacks. The logistical, financial, and resource-intensive demands of EAIs [104] pose a significant barrier to the maintenance and expansion of these interventions. Moreover, the limited number of EAI centres currently available (at least in the UK) is inadequate to meet the growing demand for such therapeutic services, raising serious concerns about accessibility. The process for accessing these interventions is often slow, with many prospective participants facing long waiting times for referral. Additionally, the scarcity of centres may require participants to travel considerable distances, creating further barriers for those residing in rural or under-served areas [135].

Resource scarcity is a larger issue that must be addressed, but technological interventions based on the mechanisms underlying EAIs may assist in alleviating the pressure on, and potentially widening, the sustained availability and efficacy of these therapies. There is, however, a lack of clarity on the mechanisms that drive the formation of the human-horse 'dance', which is central to the successful interaction in therapeutic EAIs [4, 54, 127], and why this dyadic relationship fosters emotional regulation and empathy in participants [56, 57, 131].

Our objective for this study was therefore to provide a clearer understanding of the factors contributing to the reported development of psychosocial skills in EAI participants, to inform the optimal design of alternative therapeutic technologies to elicit the same beneficial outcomes for participants.

To achieve this, we conducted an autoethnography [63] while participating in an EAI. A variety of data collection methods were utilised—audio recordings, written narratives and notes made by the autoethnographer and intervention facilitator—allowing for a nuanced understanding of both the external and internal, private mechanisms at work, which are crucial for developing not only emotional regulation skills but also a dyadic human-animal partnership. The subjective nature of this first-person research method, with the autoethnographer also acting as the participant, not only encouraged introspective thinking but also fostered an empathetic perspective towards other participants [27].

This study identified several key mechanisms within Equine-Assisted Interventions (EAIs) that are crucial for achieving beneficial psychosocial outcomes, with important implications for technological design. We emphasise that the reciprocal, responsive, non-verbal communication between participant and horse, combined with the immense, overbearing physical scale of the horse, is particularly suited to an embodied presence such as a robot. The handler of the horse, the intervention's facilitator, also played a vital role in helping the autoethnographer understand their influence on the horse and adjust their communication accordingly, which again can be incorporated within robot-human interactions. A finding that presents a barrier to implementation within a robot, was the importance of empathy towards the horse—understanding its thoughts and feelings in relation to the participant's actions—as was the ability to balance this empathy with effective leadership during the interactions.

The primary contribution of this study lies in its identification of critical factors that facilitate effective attunement and interaction in EAIs, offering significant implications for the field of Human-Robot Interaction. By drawing on the previously hypothesised parallels between human-horse and human-robot interactions [68], this research provides novel insights into the design of robotic systems within *therapeutic* contexts. Specifically, it underscores how robotic systems have the potential to embody the large-scale, physical presence and responsive behaviour necessary to create a tangible and reciprocal therapeutic experience, thereby fostering a meaningful therapeutic connection and enhancing the participant's overall experience.

2 Related work

This section reviews the theoretical foundations underpinning animal-assisted interactions, and the qualities horses present for therapies. We also outline how these zoomorphic qualities are currently integrated into the design of therapeutic robots to replicate the emotional and social benefits observed in human-animal interactions.

2.1 Animal-assisted interventions

Emotional regulation is a critical skill for well-being across the lifespan [21]. An infant's ability to emotionally regulate their behaviour is influenced by the reciprocal bonds formed with their caregiver [1, 100, 103]. Research suggests that infants learn to associate their emotional and behavioural states with those of the caregiver [44] and align these over time, achieving affective synchrony [154]. By constructing optimal states of being, the caregiver helps to formulate the infant's ability to emotionally self-regulate [4, 133]. This is a bi-directional process, known as 'co-regulation', *"the dynamic balancing act by which a smooth social performance is created out of the continuous mutual adjustment of action between partners"* [41], where infants also influence emotional stability in the caregiver [20, 154]. A mismatch within this *"interactive dance"* leads to less attuned physiological and emotional states, and potentially withdrawal [8].

This synchrony is evident in humans across all life stages, with humans inherently striving toward the formation of dyadic partnerships [133, 146]. A dyadic partnership will only occur when *"intimate, face-to-face relations have persisted over a length of time sufficient for the establishment of a discernible pattern of interacting personalities"* [7], leading to the partners to unconsciously synchronise [147] or attune. This *attunement*, referring to the idea of *"feeling felt, or deeply understood by another, involves sensitivity and the ability to align with another's state via non-verbal and verbal signals"* [31, 136], increases the connection [147], cooperation [125], and likeability [62] between partners.

Dyadic therapy enables clients to gain insight into their own behaviours and beliefs, to understand the origins of these patterns, whilst developing healthier methods of interacting with others [100]. Animals, in particular, are referred to as a 'social lubricant' for therapy [40]. The non-verbal nature of animals does not just provide a safe avenue for clients to project their own feelings onto

the animal [77, 158], but also requires them to consider what the animal is thinking [142]. Clients must introspectively analyse and regulate how their actions influence the animal's body language, and consequently their well-being.

As the client becomes more aware of how their actions influence the animal, both the client and the animal become increasingly attuned to each other's behaviours and emotional states [75, 100, 147]. This mutually, fully-embodied, attunement between two autonomous, living beings—or, *enactive anthrozoology* [150]—further deepens the relationship between the two, enhancing the security a client may feel when expressing adverse feelings or behaviours [3], fostering a more secure attachment style [13], as well as emotional co-regulatory abilities [133, 139, 157].

2.2 Equine-assisted interventions

Horses are capable of 'reading' humans' internal and external, non-verbal expressions of emotion and energy [97, 110], including their body language, referential gestures [15], facial expressions [50], and emotional odours [121].

Particularly successful EAI programs are those based on 'Parelli Natural Horsemanship' (PNH), with a reported completion rate of over 94 percent among participants [54]. Participants are taught to practice *"calm, assertive, focused and clear communication"* [78], inviting trained horses to play 'games' with them [58], communicating through internal energy and body language rather than verbal language or physical force. Participants in these interventions must therefore be constantly aware of themselves, their surroundings, and the horse; with the horses continually assessing them for any potential threat [31]. Horses for EAIs have been trained to clearly set boundaries when they feel uncomfortable [78], prompting participants to attune to these signals and regulate their internal energy, feelings, and external actions [45, 46, 156].

EAI participants tend to feel apprehensive when entering a therapeutic relationship [71] with the horse. The sheer size of a horse can introduce a sense of danger for an already traumatised or inexperienced participant, especially given the *"high level of body-to-body contact"* [15]. This increases the necessity for self-awareness and attunement. Overcoming the fear this may cause, through completing tasks or receiving validation from the facilitator [18], has been shown to increase participants' self-efficacy and confidence [31]. A horse's ability to attune to and mirror a participant underscores its capacity to serve as "*a supplemental attachment figure, the sheer solidity of a 2000 pound but trustworthy animal can provide palpable reassurance unmatched by any human*" [137].

This process enables participants to develop their emotional regulation skills, leading to cooperation and the formation of a dyadic partnership with the unmounted horse [54]. Through this partnership, they *"co-create a system of language—a language of their own—through the medium of the body"* [15].

We have decided in this paper to focus on the potential improvements to psycho-social wellbeing associated with equine-assisted intervention participation, with the horses in the studied intervention remaining unmounted. EAIs have been associated with enhanced self-empowerment and an increased overall perceived quality of life [113, 143] for participants. Long-term impacts have also been reported post-intervention, particularly in the teaching of mindfulness and self-efficacy [31], which relate to the ability to focus on positive self-awareness and transcend self-focus [31, 84]. Specific demographics, such as individuals with PTSD [19, 156], 'at-risk' children and young people (CYP) [4, 79, 138], and CYP with co-morbid mental health conditions [61, 151, 153] have been highlighted as benefiting from EAIs.

Our study examines a well-established Parelli EAI programme supported by a robust evidence base [56, 58, 78, 80, 128], providing a reliable foundation to explore the mechanisms underlying the reported benefits of EAIs for typically under-served populations. However, the substantial resource demands associated with EAIs pose a significant financial barrier to scalability and accessibility [33, 104]. With annual costs ranging from £309,740 to £338,959—driven by the need for specialised training, animal care, and staffing—and a full cost recovery rate of £1200 per participant, these interventions face critical limitations in their ability to be widely implemented. Exploring technological alternatives provides a promising avenue to address these challenges, potentially reducing costs, alleviating animal welfare concerns [33], and significantly enhancing accessibility, all while preserving therapeutic efficacy.

2.3 Zoomorphic influences in Social Robotics

Robots are becoming increasingly integrated and accepted within our society for their assistive capabilities across a wide range of settings [118], including the workplace [24], education [82], healthcare [116, 123], and the home [34, 106]. However, their role extends beyond merely providing subservient assistance to humans; they also function as co-workers, collaborating on shared tasks in industrial environments [98], and as social companions, offering opportunities for users to form emotional attachments and engage in social interactions, thereby improving mental wellbeing [76, 107].

Humans have a tendency to anthropomorphise and attribute a *"pro-social status"* to robots when interpreting their behaviour [90]. This phenomenon is associated with an increased desire to interact and bond with their new 'social companion' [32]. Many developers of therapeutic, socially-interactive robots have incorporated anthropomorphism into their designs, often steering away from humanoid robots [59]—which can be met with an over-estimation of their abilities by users, or a general sense of uneasiness [99]—and instead draw inspiration from zoomorphic, or animal-inspired, forms [90].

This zoomorphic influence is evident in the design of many social robots, physically modelled on a range of animals, including cats [132], dogs [53], or seals [95, 134], with the aim of creating a social *companion* for users. Beneficial *social* characteristics associated with domesticated animals are also being incorporated, such as companionship [99], attachment, and responsiveness to training [43, 145], fostering the development of a relationship. However, people have been found to react negatively to these robots when compared to real animals [74], being aware that they are interacting with an artefact [42]. Despite this, therapeutic benefits have been associated [96, 134, 140], with links to improvements in loneliness, work-induced fatigue, and dementia [6, 76, 140], and with a reduction in *"negative emotions and behavioural symptoms, improved social engagement, and promotion of positive mood and quality of care"* [65].

Research on human-robot interactions is still in its infancy and is inherently interdisciplinary, requiring a translational approach to advance understanding in this underdeveloped field. Jain and Gardner-McCune's seminal work [68] proposed a compelling hypothesis that a parallel can be drawn between human-robot and human-horse interactions to study the initial stages of relationship development within these dyadic pairings over time. This innovative conceptual framework, even suggested horses might be considered the "holy grail" for co-bots and social robots [68]. Building upon this foundation, we seek to explore this parallel within the therapeutic context of equine-assisted interventions, investigating whether it can illuminate the mechanisms of attachment, co-regulation, and synchrony that define these interactions. It is crucial to further explore and understand the factors specific to achieving positive therapeutic outcomes in EAIs, in order to determine how these insights can influence the design of future robotic systems.

2.4 Summary

Horses, with their non-verbal communication and emotional sensitivity, are instrumental in helping participants develop emotional regulation, empathy, and secure attachment during equine-assisted interventions. Despite these benefits, EAIs face challenges related to accessibility and sustainability, underscoring the need for alternative approaches. There is a pressing need for technological alternatives that could replicate the therapeutic effects of horses. Our study aims to further explore the mechanisms underpinning the therapeutic benefits for EAI participants to inform the design of future technological interventions, ultimately seeking to broaden access to the benefits of EAIs.

3 Method

This study employed the lead researcher's autoethnographic account of their participation in an equine-assisted intervention. The primary aim was to investigate the underlying factors that contribute to the efficacy of these interventions, with a view to leveraging these insights to inform the design of therapeutic robots.

This section outlines the methodology used, the reasons for its selection, the data collection procedures, the analysis process, and the researcher's background.

3.1 Autoethnography

Autoethnography is a qualitative research method that explores how individuals interact with their socio-cultural context [63]. Originating in anthropology [51], this method combines self-revelation and critical reflection on power, privilege, and identity to examine a culture (*ethnography*), with a particular focus on the researcher's own experiences, thereby positioning them as both the subject and investigator (*auto*) [29, 115]. This approach allows the researcher, or autoethnographer, to gain personal insights into a process, producing *"a complex and multilayered account of reality"* [39].

The method has extended beyond its anthropological origins into various disciplines, including Human-Computer Interaction (HCI) [29, 69], where it is employed to critically reflect on the implications of technology for both user experience and interactions [114], to cultivate empathy for users [105], and to *"push the system design in new, perhaps unexpected directions"* [10].

Criticism of autoethnography often focuses on its subjective nature [36]. There is ongoing debate about whether presenting a subjective perspective or personal memory to an external audience can be deemed credible or 'truthful' [38]. Nevertheless, a strict emphasis on objectivity might undermine the rich, personal insights that autoethnography provides [29, 86]. By acknowledging the researcher's biases and cultural background, and by candidly depicting imperfect interactions, autoethnography seeks to reveal experiences that might otherwise remain concealed or unfamiliar [38]. The generalisability of the findings is left to the readers to assess, based on how well the narrative resonates with their own experiences or those of people they know [36].

3.2 Rationale for this Research Method

Autoethnography is particularly well-suited for studying equine-assisted interventions due to its capacity to provide an intimate and nuanced understanding of the participant's experience [38], a perspective that is inherently lacking in current EAI research. Given the vulnerable nature of typical EAI participants, autoethnography offers a participant perspective that is both personal and non-intrusive [63], thereby providing valuable insights that might otherwise remain inaccessible.

EAIs require participants to confront emotional aspects that they may find difficult to regulate, making it essential to capture their raw, immediate experiences. By documenting and reflecting on personal experiences in real-time during the intervention, autoethnography ensures a rich and detailed narrative that emphasises the complex interplay of emotions and personal insights central to EAIs. A range of methodologies are associated with autoethnography, including narrative writing, note-taking, and journals [47]; combining *"memories, self-observations and reflections"* [63], with a cultural element placed at the forefront.

Reflexive engagement with these immediate reflections, using a retrospective and selective account of epiphanies and turning points, enables the autoethnographer to add layers of insight into the intricate dynamics at play, producing a nuanced portrayal of the personal transformation and self-discovery fundamental to understanding the culture [38].

3.3 Autoethnographer Identity and Positionality

We aim to provide clarity on the autoethnographer's background and position regarding the research topic, allowing the reader to evaluate how these factors may have influenced the chosen methodology and the findings reported [112, 152].

The lead researcher has a personal history of anxiety issues, and has undergone cognitive behavioural therapy, but experienced limited improvement in their internal regulatory skills. This background, however, motivated them to explore alternative therapeutic interventions. During the equine-assisted intervention, the assigned facilitator also noted several aspects of the researcher's emotional competencies: their ability to articulate thoughts and feelings, a higher tolerance for emotional distress, and a capacity for self-criticism. These observations led the researcher to recognise a

potential difference between their own experiences and those of a typical EAI participant.

The autoethnographer's background does not suggest immunity to the intervention's effects. Their personal motivation, combined with a professional focus on technological interventions in therapeutic settings, complemented their lack of prior horse experience, allowing an open, reflexive approach. This heightened attunement to experiences and emotions offered a detailed, nuanced perspective on the EAI experience.

3.4 EAI selection

The studied equine-assisted intervention is based on the Parelli Natural Horsemanship (PNH) training programme. This referral-only intervention is offered at a centre that annually accommodates over 150 patients from a range of services, including: *"Schools and Pupil Referral Units, Children's Services, NHS Mental Health Services, Troubled Families, Offender Services, and other specialist agencies such as charities working with Domestic Violence or Drug and Alcohol Services"* [56].

Participants are evaluated by referrers on their proficiency in eight skills: *calmness, assertiveness, confidence as a learner, focus and perseverance, empathy, realistic analysis and planning, responsibility for thoughts, emotions, and actions, and communication.* The aim of the intervention is to enhance these skills. The unmounted horse provides real-time physical feedback as the participant guides it. The engaging nature of the horsemanship course and the centre's diverse 20-acre environment are noted as key factors influencing improvements in participants' skills and well-being [78]. The classification of the games that participants 'play' with the horses is detailed in *Table 1*.

The coaching style is distinct: non-conceptual, non-judgemental, direct, and engaging. Facilitators work one-on-one with participants in short bursts of instruction to avoid overwhelming them. Although the process is intrinsically intense—cycling through teaching, rehearsing, and repeating key resilience skills—it differs from talk-based therapy by focusing solely on the present and future, with no discussion of past events. The facilitator observes the participant's 'readiness to learn,' tailoring the programme according to the participant's position on a scale from fear to dominance, as well as their energy level. The site employs five facilitators, all of whom are highly accomplished in Parelli horsemanship.

The horses are specially trained to be 'fussy', feeling empowered to express their reactions to human behaviour, thereby allowing the facilitators to work on how participants attend to and manage their emotions, thoughts, and physical behaviours, as the horses continuously react to whatever they perceive. The horses comply only with calm, assertive, and clear commands from participants, reciprocally expressing their emotions through body language. The site currently utilises 10 working horses and ponies, all of which have been provided by equine rescue charities.

3.5 Data collection

The autoethnographer undertook four two-hour sessions over four consecutive days. A single facilitator provided consistent support throughout the sessions, tailoring the selection of games and horses to meet the researcher's needs. Five different horses were involved, and all prescribed games were completed (see supplementary material for more details on the sequence of games, the specific horses used, and the facilitator's rationale for these choices).

Instead of taking field notes, an audio recording device was attached to the autoethnographer, capturing each session in its entirety (T), allowing them to remain fully immersed in the experience.

Immediately following each session, the researcher composed a first-person narrative (AN), reflecting on their experiences and interactions with each horse. This reflection also included an acknowledgment of personal biases and the provision of alternative, meta-interpretations of the intervention's underlying mechanisms, as well as insights into skill and comfort zone development.

The autoethnographer also crafted a narrative from the horses' perspective after each session, a consideration lacking in EAI research. This aimed to foster an empathetic understanding of how the horses might have experienced the intervention, recognising them as an equal part of the triad comprising of the researcher, horse, and facilitator. This creative and unconventional approach to writing was deemed appropriate within the autoethnographic framework [47], as it aligns with the idea that *"creativity and innovation that inspire change, transformation, and revolution offer multiple ways of seeing the world"* [30].

A comprehensive perspective was developed by also incorporating the views of the facilitator into the autoethnographic account. The facilitator completed reflexive notes (FN) after each session, which were shared with the researcher only upon completion of the intervention, to minimise any potential bias from feedback. These notes detailed the choice of horses and games for each day, the facilitator's role, and any observations regarding the researcher; aiming to provide a complementary, multifaceted perspective on the intervention.

At the end of the intervention, the autoethnographer, like other participants, was video-recorded by the facilitator while performing each game in succession. They also collaborated with the facilitator to complete documents evaluating skill progression and attunement with the horse over the sessions. The autoethnographer also independently addressed each skill point in their daily narrative (AN), allowing for a comparison between personal perceptions of skill development and the facilitator's assessments. This approach facilitated the tracking of development and provided insights into how confidence and competencies evolved throughout the intervention.

All personal information collected during the consent process was treated with strict confidentiality and removed from the dataset at the earliest possible stage. The identities of the lead researcher and facilitator were anonymised, while pseudonyms were assigned to the horses. All data was managed in accordance with the ethical standards and procedures approved by the University of Bristol Research Ethics Committee (16514) and the University of Bristol Animal Welfare and Ethical Review Body, ensuring both confidentiality and anonymity throughout the study.

3.6 Data analysis

Data analysis was conducted in a linear fashion following data collection. The lead researcher carried out the analytical process exclusively, due to their intimate understanding of the context,

Game Classification	Game Description
The Friendly game	*Creating relaxation through touch, grooming, hanging out with the horse.*
The Porcupine game	*Moving the horse's feet through using steady pressure, touching the horse.*
The Driving game	*Moving the horse's feet through rhythmic pressure, not touching the horse.*
The Yo-yo game	*Moving the horse backwards and forwards.*
The Circling game	*Asking the horse to travel around you on the circle.*
The Sideways game	*Asking the horse to move sideways.*
The Squeeze game	*Asking the horse to go through, under or over something.*

Table 1: Game Classification by PNH of ways to "play", or interact, with a horse. It is not applicable to all EAIs. Each game involves different methods and objectives, such as creating relaxation (The Friendly Game), guiding movements through pressure (The Porcupine Game and The Driving Game), or encouraging specific actions (The Yo-Yo Game, Circling Game, Sideways Game, and Squeeze Game). These activities are designed to enhance the participant's skills in leadership, empathy, and communication.

emotions, and subtleties embedded in the data, which were central to the study. The involvement of additional researchers was deliberately avoided to prevent the introduction of external interpretations that could dilute or misrepresent the autoethnographic narrative.

The personal narrative written by the autoethnographer (AN) was initially reviewed and corrected to ensure coherence and accuracy, without altering the content. The narratives written from the horses' perspectives served primarily as a reflective exercise and was not included in the findings, with notable moments instead being integrated into the autoethnographer's personal narrative (AN) to ensure a cohesive analysis. The first phase of analysis of these narratives involved open coding to identify preliminary themes and patterns.

The audio recordings were transcribed separately from the narratives to preserve the integrity of the original accounts. These transcriptions (T) underwent coding, aiming to compare the subjective perceptions of the intervention with the objective recordings. Similarly, the facilitator's notes (FN) were coded separately.

To ensure scientific rigour, a portion of the coded data was shared with other researchers for feedback [144]. Their input highlighted the need for a more nuanced and in-depth coding approach, particularly given the autoethnographic nature of the data. Consequently, the coding strategy was revised to better capture the complexities within the data. At this stage, longer, more nuanced descriptions were preferred over simple categorisation, due to the latter's tendency to oversimplify the data and impose predefined categories.

A timeline was then constructed from the coded transcripts (T), facilitator's notes (FN), and narratives (AN). This approach facilitated the generation of more nuanced themes by combining data sources, rather than treating them as separate [108]. It also highlighted areas of agreement or divergence between the subjective accounts of the autoethnographer (AN) and facilitator (FN) and the objective audio recordings (T). This iterative and reflexive process enabled a deeper understanding of the data, ensuring that the autoethnographic elements were comprehensively captured and accurately represented.

4 Results and Discussion

Our results are structured around several themes: (1) *Initial Barriers to the Human-Horse Connection*, (2) *The Non-verbal Nature of the Horse*, (3) *Leading the Horse towards Mutual Attunement*, and (4) *Facilitator Guidance in Enhancing Participant Empathy*. Although the findings have been distinctly categorised, it is important to note that these themes are deeply interconnected, reflecting the complex nature of EAI participation, reflected within *Figure 2*.

The horse's inherent characteristics—its size, strength, and potential danger—combined with the participant's inexperience, often provoke fear [78]. This initial barrier to forming a positive human-horse relationship immediately impedes the connection, resulting in a misalignment of energy and a lack of attunement between the two parties [15, 71]. The facilitator plays a central role in overcoming this barrier by helping participants become more empathetically aware and better attuned to the horse's emotional state and body language [5, 17]. To improve this alignment, the horse must be assertively guided through interactions, which in turn increases the horse's willingness and ability to rely on the participant. As both the horse and the participant become increasingly attuned to each other's non-verbal communication, mutual trust is established, leading to more successful interactions. This process fosters a cycle in which both the participant and the horse gain confidence, thereby enhancing their overall attunement [78].

The findings in this paper are synthesised from narratives, transcripts, notes, and documents from both the lead researcher and the intervention facilitator, with all quotes directly extracted from these sources. To ensure clarity, the source of each quote is specified using the following abbreviations: (FT) for facilitator quotes during session transcripts, (AT) for autoethnographer transcripts, (FN) for facilitator notes, and (AN) for autoethnographer narratives.

The paper will next shift to a first-person perspective, presenting the lead researcher's viewpoint.

4.1 Initial Barriers to the Human-Horse Connection

Seemingly counterproductive factors, such as overthinking, nervousness, and ineffective human-horse interactions in the early stages of the intervention, may appear detrimental to form a connection with the horse [15, 71]; however, through this study I found that they are in fact pivotal in setting the stage for meaningful growth. By confronting and addressing these issues, participants

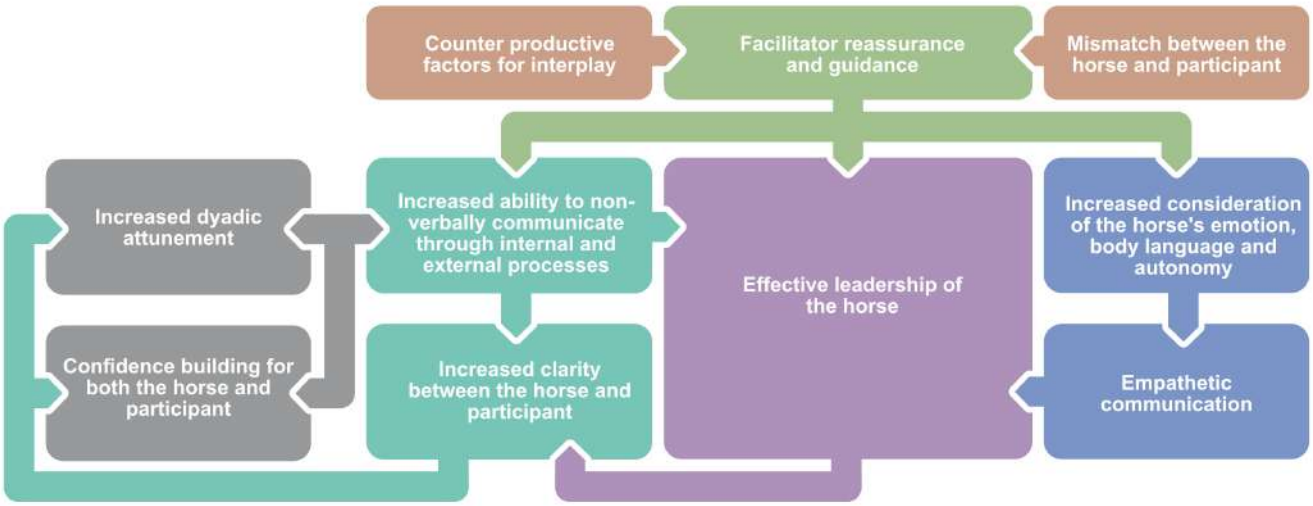

Figure 2: Factors Influencing Attunement Between Participants and Horses in Equine-Assisted Interventions. This diagram presents the thematic elements identified in the autoethnographic study conducted by the lead researcher. The flowchart starts with the brown boxes at the top, representing the counterproductive factors and mismatches between the participant and the horse, labelled as *Initial Barriers to the Human-Horse Connection*. At the top centre, the green box highlights the role of the facilitator in providing *Guidance in Enhancing Participant Empathy*. On the right side, the blue boxes illustrate the facilitator's guidance on understanding the *Non-verbal Nature of the Horse*, shown in turquoise boxes. The purple box depicts the participant's capacity to lead the horse, which, combined with the facilitator's input, clarifies communication. This process fosters greater confidence and facilitates mutual attunement between the horse and participant, as illustrated by the grey boxes. The cycle concludes with the participant successfully *Leading the Horse towards Mutual Attunement*.

are compelled to adapt their behaviour, leading to enhanced self-awareness and improved attunement with the horse.

My issues with anxiety influenced my experience of the intervention even before it began. As I noted in my narrative the day before my first session, *"I am feeling extremely apprehensive about tomorrow... What if I focus on the wrong aspect? What if I'm not asking the correct research questions? Or what if I am, but I'm not investigating them in the right manner?" (AN)*. Intrinsically, I differ to other participants of this programme in many ways: I had been to the facility before, observed a few sessions, and extensively researched the evidence base surrounding EAIs. Yet, my anxiety remained a constant companion; I knew I was placing myself in a difficult, potentially indescribable, position through this research—attempting to coherently convey the deeply personal and emotionally taxing experience of this therapeutic intervention through mere words, whilst also allowing it to be scrutinised by my peers.

When the first horse arrived, I immediately began to panic internally. The facilitator prompted me to assess the horse's body language and determine its emotional state, comparing it with my own internal emotions. With 'one' representing complete serenity and 'ten' indicating absolute fear, I rated both myself and the horse at 'six', admitting to the facilitator that *"I've been quite nervous to come here today" (AT)*. The discomfort felt by both parties—the horse and myself—was very clear, forcing me to confront and adjust my own behaviours, which led to greater self-awareness and improved attunement.

Nervousness may initially seem a wholly counterproductive factor when attempting to create a connection with another; however, this merely reflects the participant's experience at the beginning of the intervention. In fact, it serves as a crucial starting point for participants to become aware of their growth. The facilitator emphasised this, stating, *"if we [the intervention] don't make you go through an uncomfortable space, it's hard to see how that changes, like when it becomes less uncomfortable" (FT)*.

I was eager to impress the facilitator and bond with the horse from the outset. However, I quickly realised each horse's temperament, sensitivity, and boundaries varied, requiring flexibility. Hazel, the first horse I interacted with, was highly sensitive to loud noises, often stopping when the wind blew. Initially, my communication with Hazel was mismatched; her blank stare in response to my requests led to me becoming frustrated. I initially blamed her temperament, stating, *"the horse being nervous didn't help, she couldn't even walk past a gate because of the wind" (AN)*. Over time, I saw that her lack of responsiveness was due to my own lack of confidence and experience. It's easy to stereotype a horse's character, equating confidence with assertiveness and sensitivity with weakness. The facilitator advised against this, warning that *"you don't want to make the mistake of, like, putting a character on them that stays" (FT)*, emphasising that misinterpreting signals can limit connection and the horse's comfort.

Equine-assisted interventions are characterised by a zero acquaintance context, where participants are required to interact

with an unfamiliar entity—a horse. Humans, as a species, are predisposed to form first impressions almost instantly, assessing the potential threat posed by a new agent upon first meeting [109]. My lack of familiarity with horses, combined with the potential danger they pose, given their size, strength, and inherent autonomy, necessitated a healthy level of fear to ensure safety. Several precautionary measures were advised to minimise the risk of injury, such as avoiding standing between the wall and the horse or entering the 'kick zone' behind the animal. However, as living beings with full autonomy over their actions, horses remain unpredictable; as the facilitator noted, *"I've never seen any of our horses kick, but they all can" (FT)*. This caution was further emphasised with the advice, *"the only reason they do it is if you sort of pop up in their blind spot" (FT)*, underscoring the importance of maintaining self-awareness in their presence. This phenomenon has been referred to as the *'Human-Horse Trust Paradigm'* within the literature [70], highlighting this delicate balance: participants need to trust the horse during interactions while recognising that the animal may behave unpredictably and *"act like a horse"* [111], thereby ensuring safety.

The carefully selected and trained horses used in this intervention align with established findings that horses can reflect participants' emotional states, offering immediate and honest feedback [55]. Such feedback loops are recognised as crucial for understanding and modifying one's approach, ultimately fostering a deeper and more authentic connection. The findings of this study extend these insights by emphasising how seemingly counterproductive factors in fostering a positive interplay between human and horse—such as variability in horse temperaments, power, and responses—necessitate heightened participant flexibility and sensitivity. These fluid and empathetic traits have been shown to be indispensable in the journey towards achieving true interplay and harmony between human and horse, i.e., attunement [78].

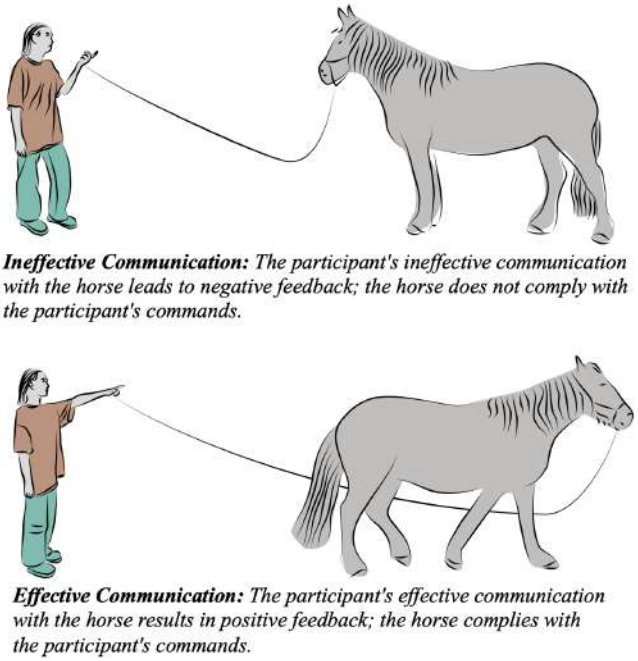

Figure 3: Diagram illustrating the Reflection of Body Language and Internal Energy by the Horse. The top part of the diagram depicts a scenario where the participant does not effectively increase their non-verbal energy, both through their body language and internal focus. As a result, the horse provides negative feedback, refusing to comply with the participant's request to move by remaining immobile. In contrast, the bottom part of the diagram shows a situation where the participant successfully communicates through their body language to move away in the direction indicated by the participant, resulting in compliance of the horse.

4.2 The Non-verbal Nature of the Horse

It is well-established within EAI research that non-verbal communication plays a critical role [110, 127], and was similarly raised as a theme, *'Horse language is body language'*, by Jain & Gardner-McCune in their 2023 work [68]. Since body language is the only way in which horses can communicate with others, we express our intentions towards them in the same manner. Participants must develop an understanding of the reciprocal nature of this communication, with the horse's reactions serving as immediate feedback on the participant's effectiveness [55].

Horses have been highlighted as especially sensitive to energy and non-verbal cues [15, 33, 97]. To communicate with them *"we use body language, because it's the only language that horses understand" (FT)*, explained the facilitator. This intervention required me to play several games with the horses, described in *Table 1*, each with their own method and goal for both the participant and horse. Several of the games required me to send the horse away from me, whether this was for them to walk in a circle, kick a ball, or step onto a pedestal, for example. Initially I had to get the horse's attention, communicating to them that we are about to do something, by raising my energy levels, internally and physically, standing tall and strong but without tension. This idea of 'internal energy' is incredibly difficult to explain. Wishing for the horse to embody your intention with anticipation and excitement, whilst maintaining clarity through focus and calm, is how I understood 'energy'. The energy would then be sent in the direction that I wanted the horse to go. With high energy in the body and the mind I learnt to raise my arm, pointing with purpose in the correct direction.

If I did not sufficiently raise this energy, the horse would remain immobile. The physical difference in effective versus ineffective communication with the horse through body language is shown in *Figure 3*. *"You can fool me, you can't fool her!" (FT)* the facilitator jovially declared, with a cautionary undertone: horses respond to body language and internal energy, and they reflect these influences back to participants, regardless of their intentions, similarly reported in previous EAI studies [54, 78]. This dynamic served as an effective gauge of whether I achieved my desired outcome. Even with calm, focused energy directed towards the task, the horse might not respond if it became disengaged or was unclear about what was being asked.

To provide clarity to the horse, I had tools at my disposal: a rope in one hand, attached to the horse's headgear, and a stick in

the other, establishing a hierarchy of signals. As Jain & Gardner-McCune highlighted, *"the human starts with the gentlest possible signal and escalates the intensity of the signal as needed"* [68]. This principle, was echoed during my experience; for example, instructing the horse to move backwards would begin with pointing the rope hand towards the horse. But this request might require escalation: *"I might wiggle my finger, then I might turn my wrist, and that moves the rope a lot"*, the facilitator suggested *(FT)*. However, according to the facilitator, the intervention's guiding principle was: *"How little can I do whilst getting the job done? How little can I do using my energy, without having to use my tools?" (FT)*. This ethos aligns with Jain & Gardner-McCune's recommendation to *"be as gentle as possible, as firm as necessary"* [68]. For a healthy relationship with the horse, one should strive to communicate through minimal physical exertion and external aids, relying primarily on energy and focus to guide and connect with the animal.

The concept of neutrality, described by the facilitator as being *"completely calm... in the mind as well as the body" (FN)*, is crucial for building a healthy human-horse connection. When a participant reaches this neutral state, it signals to the horse that it can 'quit' the game, ensuring the horse does not feel pressured to continue beyond its comfort zone. Neutrality also conveys an element of *success*, effectively thanking the horse for its attentiveness and understanding. I found that there were many aspects to keep in mind—breathing, relaxing, managing energy, body language, safety, facial expressions, and the various games themselves. So it is easy to *"forget about [the horse] sometimes when we're very directly thinking about the task" (FT)*. It became evident when a horse felt reciprocally comfortable, as it would bow its head, lick its lips, and yawn to release adrenaline. *'The friendly game'*, in which I stroked the horse using both the tools and my hand, was utilised at the beginning of interacting with each horse to achieve this neutral attunement. The facilitator suggested that *"it's a good chance to think about how you breathe, scanning the [horse's] body while you're doing it. You might even do a little bit of mirroring in the breathing [...] the more her head goes down, the more relaxed she looks" (FT)*. Achieving this mutual state of calm has been previously highlighted as deepening the connection between human and horse [37], reinforcing the principles of communication, trust, and respect that are fundamental to a successful partnership.

Negative energy, a busy, stressed mind, rapid breathing, or tension in the body for example, was also effectively reflected by the horses. Jain & Gardner-McCune [68] reinforce this idea, emphasising the importance of avoiding *"mixed signals"* during horse-human interactions, highlighting that horses are highly perceptive to affective states, such as when *"nervous or tired or distracted"*. One game I played, where I tried to stroke the entire length of the horse's leg, was particularly difficult for me mentally, with the horse continually moving away. I noted in my narrative, *"my neutral wasn't truly neutral. I didn't feel nervous butterflies in my stomach—but the horse was clearly able to sense some level of uncertainty and discomfort" (AN)*. I had pushed myself too far outside my comfort zone, also pushing the horse to mirror my negative state.

The non-verbal nature of the horse requires a heightened awareness of oneself, and clarity in communication, aligning with established findings that emphasise horses' sensitivity to human gestures, posture, and internal emotions [64]. This study builds on these insights by demonstrating how reciprocal communication extends beyond simple mirroring. It requires participants to intentionally align their internal energy with their external actions, ensuring consistency and calmness, to create a coherent and understandable message for the horse. This research highlights the nuanced role of emotional regulation and intentionality in achieving true harmony within therapeutic dyads.

4.3 Leading the Horse towards Mutual Attunement

Horses naturally seek direction and guidance. It has been hypothesised that they strive to synchronise with others in order to enhance group cohesion [49, 110]. However, there is ongoing debate regarding the extent to which leader-follower dynamics translate to human-animal contexts [110]. Specifically, uncertainty remains about whether the hierarchical structures characteristic of intraspecies horse interactions can be effectively applied to their interactions with humans [49]. This study instead emphasises that effective leadership, within an EAI context, fosters the horse's respect and confidence in the participant, creating a positive feedback loop that strengthens the relationship and attunement between human and horse. As this mutual attunement develops, the roles of leader and follower become less distinct, resulting in a more harmonious and reciprocal partnership. This is where the "dance" begins between parties—an interplay where roles may shift fluidly between leader and follower. However, for an inexperienced human partner, this dynamic can be challenging; they may struggle to assume the leadership role again if it has been temporarily lost, disrupting the dance and affecting the overall partnership.

Over the course of the intervention, I observed a marked improvement in my assertiveness, a critical skill for fostering mutual confidence and respect between myself and the horses. Initially, the facilitator observed that the horses were highly adept at *"sucking me into their energy" (FT)*, often taking the lead during our interactions. They would guide me towards the pedestal or jumps, or steer me away from corners, depending on where *they* wished to go. This dynamic primarily resulted from my initial lack of confidence in asserting myself effectively.

The most dominant horse I worked with during the intervention was Peach. As the facilitator joked, Peach seemed to suffer from *"evil thoughts" (FT)*, exhibiting a complete lack of impulse control. Initially, he aimed to lead our interactions—chewing my clothes, stopping abruptly whenever we passed other horses, and running away when bored. Jain & Gardner-McCune emphasised in their work that respect within human-horse pairings was cultivated through the establishment of physical boundaries [68]. While I found that setting such boundaries—such as gently pushing Peach's head away when he came uncomfortably close—was relatively straightforward, this alone did not seem to foster genuine trust or respect. Peach would cut every corner in the arena and push me aside with apparent indifference. The facilitator emphasised the importance of consistently asserting my presence and intention: *"make a real effort to go: '[to Peach] Hey! Let's just go right round, right round, right round..!'. If he tried to cut that corner, I'd go: 'no, no, no, no!'" (FT)*—using firm yet non-aggressive cues to reinforce

boundaries and ensure the horse understood and respected the limits being set.

Despite such cues, Peach quickly sensed my lack of confidence and tested the waters with dominant behaviour, probing to see how far he could push me. This was particularly evident during the *'figure of 8'* game—a monotonous exercise involving repeatedly sending the horse around one barrel, bringing him back towards me, and then sending him off in the opposite direction. Peach grew increasingly bored and disgruntled, pulling with all his body weight on the rope attached to his headgear purely out of frustration. Conscious of his size and strength, I became nervous and released the rope when he nearly tripped, inadvertently reinforcing the idea that if he pulled hard enough, he could have his way. The facilitator firmly instructed, *"he's only going to get one attempt at that; after that, don't let him do it" (FT)*. Initially, I adopted a more assertive approach, restarting each time he attempted to pull me off my feet. However, a new technique soon became necessary. I began to positively affirm Peach's actions, moving into a neutral state and 'thanking' him after each successful attempt. Almost immediately, I noticed a marked improvement in the coordination between my requests and his responses. This experience demonstrated that horses, like humans, seek validation from their leaders.

Clarity and focus in both action and intention not only help participants establish themselves as confident leaders, but also enable the horse to feel secure enough to relax into the role of the follower. For instance, Hazel, the first horse I interacted with over the programme, struggled to pass a particular gate that was banging in the wind. The facilitator advised me to *"retreat by going in a little circle... then go back again. If she still can't do it, then you're going to go in another circle, so you're retreating then re-approaching" (FT)*. This approach gradually increased the horse's confidence in me as a leader. *"The more you tell this horse what to do, the more she licks her lips, she's getting more relaxed and connecting with you; the more you tell her what to do, the safer she will feel" (FT)*, noted the facilitator. As the horse felt safer, she listened more attentively, which, in turn, enhanced my own confidence and ability to navigate this delicate balance—a process that formed a continuous cycle of mutual improvement.

A significant turning point in my journey towards developing self-efficacy came when working with a horse called Fudge. Fudge began to move with me even when I was in a truly neutral state. Disconnected, not consciously thinking about anything in particular, and with a relaxed body, I tried to walk a few feet away from her, and she followed. The facilitator suggested, *"she may be so connected to you, and I don't necessarily want to break that" (FT)*. I repeated the action, this time thinking only about my mundane evening plans in an attempt to empty my mind, so the horse could not sense any specific intention. Yet again, Fudge followed, with the facilitator affirming, *"that's the goal, isn't it?" (FT)*.

I documented the growing attunement between myself and Fudge in my final narrative, noting that, *"leading her was also better than yesterday. I felt more in sync; we stopped at a similar time, and she trotted and went backwards when I wanted" (AN)*. I also observed, *"I had to send a bit of energy with the stick in front of her as she would walk slightly ahead and cut corners. But this was probably because I was breathing in a nervous manner and thinking about the next task, rather than focusing on the task at hand" (AN)*. This experience underscores the importance of themes discussed throughout this paper: guiding the horse through assertive actions while maintaining awareness of both my own and the horse's state. My non-verbal cues, such as breathing, directly influenced the horse's behaviour [110], causing her to become nervous, cut corners, and speed up; yet I developed the insight to recognise my responsibility in shaping these interactions.

The dynamic and reciprocal nature of human-horse interactions can be likened to the dynamics observed in the literature on dance, particularly the nuanced interplay of leading and following [22, 89]. In this context, Fudge and I did not simply execute a series of choreographed movements; rather, we engaged in a form of dialogue, where the response of each party actively shaped the progression of the "dance". The role of the participant involves initiating interactions and inviting the horse to engage in a shared game, rather than issuing commands. A key contribution of this study is its exploration of role fluidity and the depth of mutual understanding that are central to equine-assisted interventions. Over time, the distinction between leader and follower becomes less defined, evolving into a more integrated and responsive exchange. Dance literature highlights *"the pain of disconnection and the desire for communication"* and requires the *"closeness of two bodies willing to engage with one another"* [89], a perspective that aligns with the fundamental processes of trust-building and rapport development in equine-assisted interventions.

4.4 Facilitator Guidance in Enhancing Participant Empathy

EAI participants have previously highlighted the importance of receiving immediate feedback from both the horses and facilitators during the sessions [57, 78]. This study however, provides further insight into the relational dynamics at play, underscoring the crucial role of facilitators in fostering a successful human-horse connection. Facilitators go beyond providing instruction; they customise the intervention to address the needs of both the participant and the horse. They skillfully balance encouragement with constructive feedback, provide reassurance during challenging moments, and clarify misconceptions about the horse's behaviour, thereby cultivating a deeper, empathetic understanding.

I summarised my perception of the facilitator's role: *"The facilitator was key during all of this. [They] guided me through the tasks, validated me when it went well (which made me do even better)... clarified what the horses were looking for, and helped me understand their body language" (AN)*. While factual, a comparison with the transcripts reveals that this description understates how much the facilitator exceeded their guiding role, providing deep insights into the factors hindering attunement between myself and the horse.

The following segment demonstrates the multiple elements the facilitator navigated while assisting me in establishing a connection with the horses:

> *Autoethnographer (AT): [whispering to horse] 'Come on' / Facilitator (FT): Try not to be jerky with the stick, more energy in the body, not just going quicker. More like you're going to be running a race [...] Yes, good... He's a very sensitive guy.*
> *FT: If you've asked for it, don't quit til you get it / AT:*

> *Could I maybe do, like, some more energy using the rope? / FT: You've got a bit of this [Facilitator moves body jerkily] going on in the body rather than internally. It's very hard to explain. If you're sure that you're doing that excitement, then you can be a little bit playful: [enacting Autoethnographer, talking to horse] 'Hey! I—', [to Autoethnographer] look at my body energy—, [to horse] 'I said go!'.*

The exchange reported here occurred after several attempts to get Peach to trot solely using my internal energy. After numerous attempts, I found myself practically *pleading* with him to go quicker. The facilitator skilfully balanced guidance on how to increase internal energy with validation when I made progress, while prompting me to encourage the *"very sensitive" (FT)* horse to co-achieve with me. Frustrated, I asked if I could use my stick to speed up the process, overthinking the reasons I was struggling with this exercise. The facilitator did not seem convinced that I was genuinely increasing my internal excitement, and demonstrated how *they* would playfully interact with the horse in my position.

Even before interacting with the horses, the facilitator demonstrated an exceptional ability to cultivate empathy within me. Recognising my lack of experience, they suggested that I first assume the role of the horse myself: *"I'm going to ask you to do something in the same way as I would a new horse when I get them in for training" (FT).* This exercise proved to be incredibly eye-opening, highlighting the difficulty of interpreting someone's intentions without verbal communication. The facilitator was aware of this challenge, noting: *"you're probably going to think, 'I don't know what she wants me to do!'... but it's a puzzle" (FT).* This approach encouraged me to adopt a mindset of *"fascination rather than frustration" (FT)* when things did not go as planned. Jain & Gardner-McCune echoed this perspective, advocating for a *"debugging frame of mind"* in which humans become *"curious about why the horse is responding the way it is rather than resorting to force to dominate or coerce"* [68]. For example, when Fudge stepped off the pedestal earlier than expected, the facilitator advised not to *"make her feel wrong for that, but pop her back on there" (FT)*, ensuring the horse understood the request without feeling punished or discouraged, thereby fostering a positive and trusting interaction.

I began to perceive the facilitator in much the same way I imagined the horse perceived me; while I certainly liked them, I felt a degree of apprehension about making mistakes, driven by a desire to please. At times, I found them somewhat intimidating, as they seemed to sense my stress even when I believed I was concealing it well. This was evident in their notes, which highlighted my tendency to *overthink*, observing that *"[the autoethnographer] got to neutral much better when they began to trust themself and the horse, and did it more unconsciously rather than consciously" (FN).* The facilitator's candour was balanced with reassurance, which was essential in building my confidence throughout the sessions. For instance, the exercise of stroking the entire length of the horse's leg was particularly challenging when I could not reach the bottom, but the facilitator remained gentle and encouraging, reminding me that *"it's not a competition; I don't care how far you go, it's just to start that conversation of how to build confidence… it's not necessarily going to happen today" (FT).* This blend of honesty and support enabled me to embrace vulnerability and cultivate a deeper sense of trust, both in myself and in the process.

Equine-assisted interventions do not merely involve a dyadic relationship between the participant and the horse; rather, they form a triadic relationship where the facilitator plays a crucial role. Existing literature highlights the importance of facilitators in guiding interactions and supporting participants in overcoming challenges [57, 78]. This study expands on these insights, offering an in-depth exploration of the participant's relationship with the facilitator and the foundational role the facilitator plays in navigating the complex dynamics of energy, body language, and empathy, ultimately fostering growth, empathy, and attunement throughout the intervention.

4.5 Triangulating Data Through Facilitator Feedback and Self-Assessment

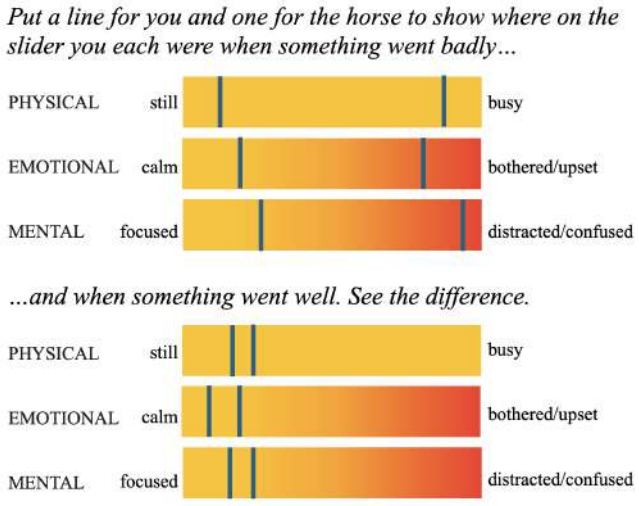

Figure 4: Comfort Zone Chart, undertaken on the final day of the intervention. This chart, as completed by the autoethnographer on the fourth day, displays the self-assessment of comfort levels, as supported by the facilitator, across various domains— physical, emotional, and mental— during the equine-assisted intervention. It illustrates perceived levels of anxiety and ease throughout *'the circling game'*, providing an insight into how the autoethnographer's comfort evolved throughout the game, and how this 'matched' the horse's comfort levels across these domains.

To test the themes identified through my autoethnographic reflections for their reliability, I incorporated feedback from an external source—the facilitator—to provide an objective perspective on my development and interactions with the horse. This external input was instrumental in mapping specific aspects of my experience back to the various themes generated through self-reflection. In alignment with other participants in the intervention, I completed two assessment tools in collaboration with the facilitator: an 8-point skills diagram and a comfort zone chart.

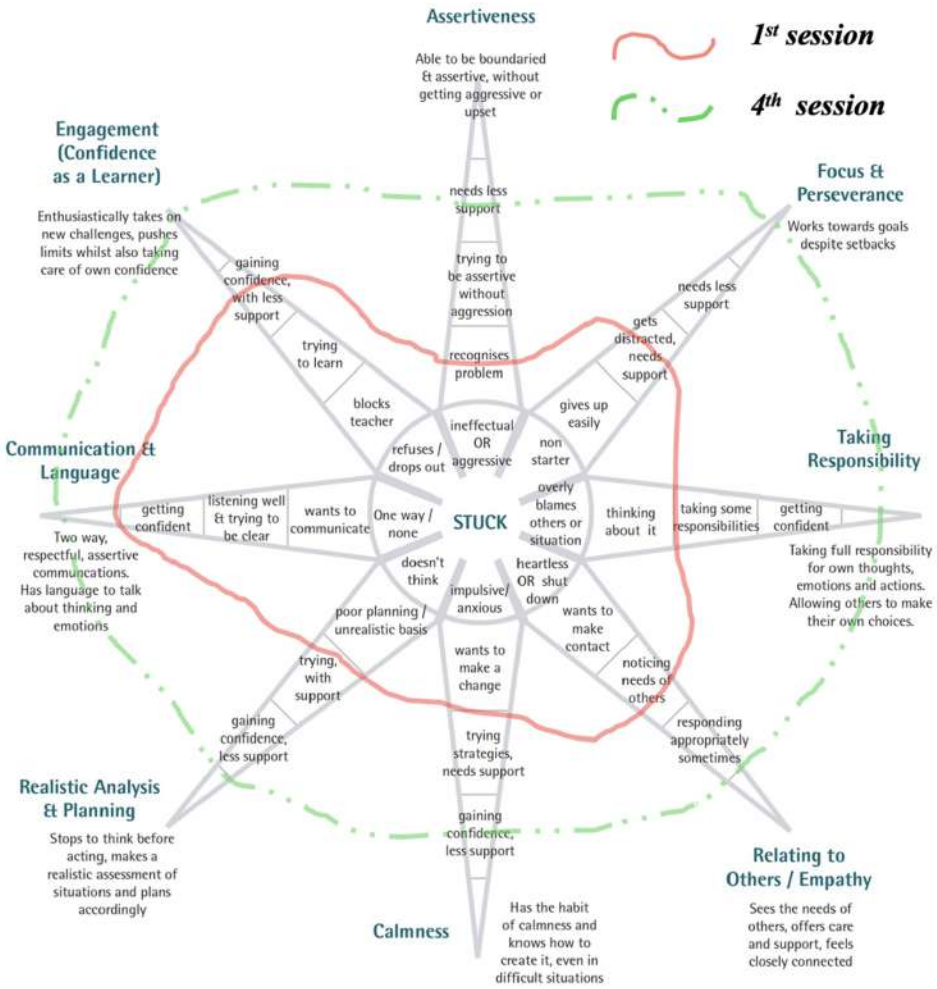

Figure 5: Star Diagram of Skill Development, undertaken on the final day of the intervention. This diagram represents the participant's self-assessed skill levels at the start and conclusion of the equine-assisted intervention, filled in with the support of the facilitator. The diagram highlights areas of growth, including increased assertiveness, focus & perseverance, taking responsibility, empathy, calmness, analysis & planning, communication, and confidence; demonstrating the therapeutic benefits of the intervention over time. The first, solid, red line displays where the autoethnographer and facilitator perceived the skill levels at the beginning of the intervention; with the second, green, dotted line displaying the last session.

The comfort zone chart (*Figure 4*) visually represented the alignment between my internal energy levels and those of the horse during the *"circling game"* with Peach, highlighting a key theme in understanding the dynamic nature of EAIs. The chart illustrated how my initial struggle to elevate my internal energy placed me outside my comfort zone, reflecting the broader theme of emotional and physical attunement. This misalignment underscored the theme of adjusting non-verbal signals and developing emotional regulation skills, as I worked to synchronise with the horse's energy and enhance our interaction.

The 8-point star diagram (*Figure 5*) assessed my abilities across several domains and enabled a comparison of my self-assessed competencies at the beginning and end of the intervention. The improvement observed across all skills highlighted enhanced *assertiveness* and *confidence*, reflecting a greater capacity to lead interactions with clarity. This aligns with the theme of the reciprocal and dynamic relationship between participant and horse. Growth in *empathy* and *communication* indicated a deeper attunement to the horse's emotional state and non-verbal cues, reinforcing the theme of mutual understanding and co-regulation within the partnership. Increases in *focus and perseverance* and *taking responsibility* underscored the participant's ability to remain engaged and accountable throughout the therapeutic process, consistent with the theme of the participant-horse partnership, where both parties contribute equally to the interaction.

While these self-reflective tools offered valuable insights into various aspects of the therapeutic experience, they had limitations

in fully addressing the themes identified in the study. They focused primarily on individual competencies and improvements but did not capture the full dynamic nature of the partnership between participant and horse, including the evolving interplay of leader and follower. Additionally, they overlooked how trust and safety were managed, the horse's autonomy and resistance, and the facilitator's role in mediating and enhancing the interaction.

4.6 Summary

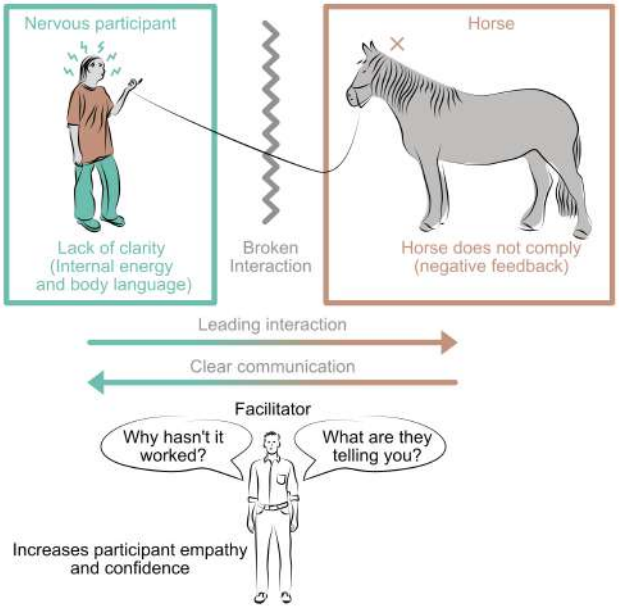

Figure 6: Increasing Participant-Horse Attunement over the Course of EAIs. This diagram illustrates the initial phase of disjointed interaction between the nervous participant trying to lead the interaction and the horse, who will not comply with the unclear request. This negative feedback, made clearer with the facilitator's guidance, leads the participant to become more aware and empathetic of how their non-verbal cues are affecting the horse, allowing for an adjustment and an increase in clarity between the partners.

Reflecting on the EAI experience, I can confidently state that it has profoundly impacted my life and significantly enhanced my competencies. At the outset, I faced considerable challenges reconciling seemingly conflicting elements such as empathy versus assertiveness and nervousness versus effective communication. These difficulties were compounded by my lack of trust in the horse and fear of its unpredictability. The horse's initial unresponsiveness heightened my anxiety, making effective communication and leadership particularly frustrating. My attempts to guide the horse often fell short as I struggled to balance clarity and relaxation in my interactions. The horse's negative feedback, highlighted in *Figure 6*, provided critical insights into how to lead more effectively, prompting me to consider how to refine my approach to communicate more clearly.

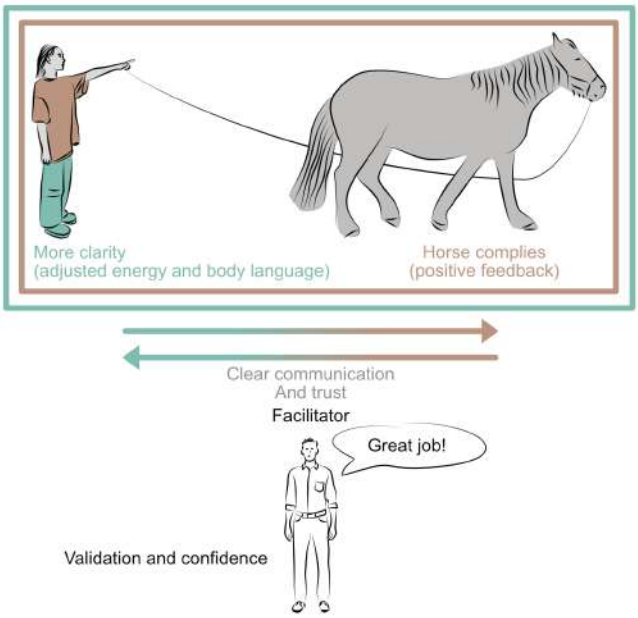

Figure 7: The Unification of Horse and Participant in Equine-Assisted Interventions. This diagram illustrates the process by which the horse and participant become more attuned. As the participant demonstrates clearer body language, energy, and assertive leadership, the horse better understands what is being asked. The horse responds with positive feedback by complying with the request, reinforcing the effectiveness of non-verbal communication. This reciprocal interaction enhances trust and attunement, with the facilitator mediating to validate the participant's efforts and affirm their progress.

As I progressed through the intervention, my ability to connect with the horse began to improve. Through continuous engagement, I developed a better understanding of how to align my physical and emotional states with those of the horse. This enhanced attunement facilitated a deeper connection, enabling me to provide clearer guidance to the horse. I learned to interpret the horse's responses more effectively, with the facilitator's guidance and validation further supporting this development. The process of 'dancing' with the horse—fluidly switching between leader and follower—became a central aspect of our interaction. This shift not only improved our mutual understanding but also empowered me to lead with greater confidence and responsiveness (*Figure 7*). This collaborative partnership between myself, the facilitator, and the horses was the foundation of a transformative journey, fostering personal growth, resilience, and an understanding of the power of non-verbal communication.

Having presented the lead researcher's perspective in this section, **we now return to a collective voice to provide implications of our work for the design of technological counterparts**.

Theme	Summary of Findings	Implication for HRI
Initial Barriers to the Human-Horse Connection	Seemingly counterproductive factors—such as emotional apprehension, difficulty interpreting cues, and variability in temperament and sensitivity—proved integral to achieving genuine attunement.	Challenges of User adaptation
The Non-Verbal Nature of the Horse	The immediate and honest non-verbal feedback provided by horses, necessitates participants to intentionally align their internal emotional states with their outward actions to ensure clear and effective communication.	Characteristics of the Robot
Leading the Horse Towards Mutual Attunement	Dynamic, reciprocal interactions gradually transformed into a fluid exchange, wherein distinctions between leadership and followership roles diminished, culminating in a more integrated and responsive partnership.	Characteristics of the Interaction
Facilitator Guidance in Enhancing Empathy	The facilitation of the intervention—offering guidance, clarification, and constructive feedback—was crucial in navigating the complex interplay of energy, body language, and empathy.	The Need for Explainability

Table 2: Summary of the lead researcher's autoethnographic findings across four themes: *'Initial Barriers to the Human-Horse Connection', 'The Non-verbal Nature of the Horse', 'Leading the Horse towards Mutual Attunement', and 'Facilitator Guidance in Enhancing Participant Empathy'*. Each theme is framed against the lens of Human-Robot Interaction: *'Challenges of User adaptation', 'Characteristics of the Robot', 'Characteristics of the Interaction', and 'The Need for Explainability'*.

5 Implications for Technological Counterparts

The primary motivation for this study was to gain a deeper understanding of the critical mechanisms underlying the positive psychosocial outcomes observed in equine-assisted intervention participation; aiming to identify the key elements that could be integrated into technological solutions to enhance the accessibility and scalability of these therapeutic approaches. As Jain and Gardner-McCune conceptualised, the framing of horses as teammates, companions, and co-workers represents a "holy grail for co-bots and social robots" [68]. Building on this perspective, our work extends this notion to therapeutic contexts, positioning horses as a paradigm for advancing the design of therapeutic robots. Thus, we propose several avenues for future research and practical design guidelines for the development of such technological interventions.

5.1 Challenges of User adaptation

From an HRI perspective, the theme of *"initial barriers to the human-horse connection"* reflects the challenges humans face when adapting to novel, autonomous systems. In equine-assisted interventions, this initial barrier—rooted in the participant's initial caution and awareness of risk—is a critical element of the therapeutic process. The emulation of risk, rather than its elimination, presents a paradigm shift in HRI, where health and safety considerations typically prioritise designs that minimise user anxiety, supporting both initial engagement and long-term adaptation [93].

Robots, as inherently unfamiliar entities, challenge users to build trust during initial interactions [101]. In HRI, trust is often cultivated by leveraging first impressions, with physical appearance and heuristic cues designed to ensure a user-friendly experience [73]. Therapeutic robots, for example, are typically designed with anthropomorphic or zoomorphic traits, often drawing inspiration from small domesticated pets to provide a social *companion* for users [53], drawing upon humans' innate desire to interact with, and familiarity in, engaging with living creatures [11]. In EAIs, however, horses are not merely companions, but serve as *co-workers* or *co-regulators*. This role requires a deliberate departure from conventional HRI design, introducing interaction dynamics that prioritise user self-awareness and behavioural adaptation over comfort.

Nervousness within EAI participants arises not only from unfamiliarity with horses, but also from the palpable sense of scale and risk that horses embody. This contrasts sharply with the common design of small, subservient, controllable, companion robots [87]. While overall safety remains a critical ethical requirement in HRI [120], we argue that the *perception of risk*—as experienced in interactions with horses—should be intentionally emulated in therapeutic robots. Existing research on large-scale anthropomorphic robots [9], although limited, indicates that such robots can elicit higher levels of user anxiety [60] and affect perceptions of empathy and emotional capability [85]. Rubagotti et al. emphasised that *"achieving a positive perception of safety is a key requirement if robots are to be accepted as partners and co-workers in human environments"* [120]. This tension—between the need for safety and the productive anxiety elicited by size and autonomy—merits further exploration.

We suggest a promising avenue for therapeutic robots, balancing familiarity and the challenge of unpredictability and risk experienced in human-horse relationships. By fostering a deeper awareness in users on their impact on the autonomous agent and enabling them to adapt their behaviour for more effective interactions and eventual attunement [64, 78], such robots could replicate the transformative journey characteristic of EAIs.

5.2 Characteristics of the Robot

Robots are regarded as capable of coexisting *"as social agents alongside humans but not necessarily as their social equals"* [148], with further attention required on *"how [the] inner world of a robot can be made accessible to human communication partners"* [148]. Within equine-assisted interventions, participants are acutely aware that they are interacting with a living creature that possesses its own agency and affective state. The *"non-verbal nature of the horse"*, a theme emphasised in this study, is pivotal for fostering empathetic consideration within participants. Communication with the horse is a dynamic, reciprocal process. Horses provide immediate and nuanced feedback through their body language, encouraging participants to consider their influence on the horse's state, and adjust their behaviour in real-time [78].

Developing non-verbal communicative abilities in robots has been extensively explored in HRI research. Naturalistic behaviours such as body language, orientation, eye gaze, and facial expressions [123] have been shown to be essential for fostering perceived social intelligence and meaningful human engagement [122, 140]. The importance of materiality of existing therapeutic robots has also been highlighted, conveying softness and warmth, along with features like simulated breathing, to effectively mimic the tactile experience of interacting with a living being [2, 9, 14, 23, 130]. Even if the design is inspired by less familiar animals [16, 134], these features have been shown to produce a calming effect [52], and help users overcome their initial fear and build a trusting relationship [37]. These elements not only enhance perceived safety, likeability, and anthropomorphism but also increase users' ability to interpret a robot's intentions [37], a key mechanism underlying the developed human-horse connection during EAIs.

The theory of agency proposed by Levin et al. is particularly relevant here, highlighting the human tendency to categorise robots as existing in a liminal space between living and non-living entities [81]. The naturalness of a robot's behaviour and appearance plays a critical role in shaping perceptions of agency, particularly when the robot's actions challenge or defy initial user expectations [66]. In EAIs, for example, horses do not merely provide positive feedback, but frequently resist, or defy, ambiguous commands or exhibit hesitation when participants lack clarity, providing a feedback loop that encourages improved communication.

Jain and Bradford [67] also argue that *"existing 'rebellious and disobedient' intelligent autonomous agents"*, such as horses, mark a significant shift from conventional HRI paradigms, which traditionally emphasise obedience and predictability. This reimagines robots not as subservient tools but as independent agents with distinct behaviours and objectives. Building on this perspective, we propose that therapeutic robots inspired by EAIs should exhibit a sense of agency, responding to signs of tension or confusion in users with subtle resistance or non-compliance until the user achieves a state of calm and clear communication [37]. This approach redefines the human-robot relationship, positioning robots as collaborative partners rather than mere instruments, thereby encouraging users to adapt their behaviours and fostering a dynamic sense of partnership and mutual negotiation.

5.3 Characteristics of the Interaction

A zero-acquaintance context—characterised by an incomplete understanding of, and familiarity with, each other's mental and physical cues [78]—the initial interaction between human and horse is often defined by conflicting intentions and abilities. These moments of misalignment necessitate shifts in leadership roles, requiring both parties to adapt to one another in real time to maintain coordination [149]. Over time, repeated interactions enable the dyadic partners to develop mutual understanding and trust, as highlighted by the comfort zone chart completed by the lead researcher (Figure 4). This dynamic allows each partner to better predict and respond to the other's actions, ultimately facilitating smoother and more intuitive interactions and, what this study identifies as, *"leading towards mutual attunement"*.

In human-human interactions with a leader-follower dynamic, a shift may occur if the interaction becomes overly forceful; in such cases, the follower may "override" the lead [102]. Horses exemplify this delicate balancing act in EAIs. For instance, when a participant exerts excessive control, the horse may resist, teaching the individual to lead with clarity and trust rather than domination [67]. Conversely, if the horse asserts unwarranted control—such as attempting to initiate an unprompted interaction—the participant must respond assertively, assuming the leadership role. In these interactions, the horse is not a subordinate but an autonomous partner, adapting its behaviour, ensuring a balanced and collaborative interaction.

The horse's role is not to be controlled but to participate as an equal, guiding and responding to the participant's actions [64]. To translate this dynamic into therapeutic robotics, it is essential to design systems that promote a reciprocal relationship rather than a hierarchical one [83, 94], where the roles of leader and follower are fluid and mutually negotiated. Robots must move beyond the mere execution of commands to embody an equal partnership between agents of different origins [16]. Resistance reinforces the robot's status as an autonomous, equal partner [102], rather than a passive tool or servant [25, 28].

Future research should examine how to balance autonomy and safety in robotic systems to ensure they facilitate authentic and effective therapeutic interactions while respecting user boundaries and fostering a genuine sense of partnership [134], without compromising the user relationship. Additionally, it is important to consider that each horse is unique, with its own boundaries, temperament, and preferences. Robots could be designed with differing levels of dominance, sensitivity, and autonomy, enabling a more personalised and dynamic user experience. Investigating how these variables influence interaction quality could yield valuable insights for developing robots capable of emulating the unique and adaptive relationships characteristic of human-horse partnerships.

5.4 The Need for Explainability

Facilitators play a vital role in equine-assisted interventions, interpreting the nuanced dynamics between participants and horses. Their role extends beyond mere instruction—*"enhancing participant empathy"*, emotional regulation, and attunement—guiding participants to understand and adapt to behavioural nuances, thereby aligning their responses more effectively [5, 17, 78]. Translating this into HRI underscores the necessity of *explainability* within robotic systems. A key challenge is determining how robots can replicate, complement, or substitute this facilitative role to promote improvement across all skill points associated with EAIs (Figure 5).

In EAIs, facilitators enable participants to develop shared mental models with horses, enhancing their ability to predict actions, detect intentions, and align behaviours; improving fluency and trust in interactions [35]. Robots must adopt similar strategies by offering transparent, interpretable behaviours and accessible feedback, allowing users to understand the robot's goals and intentions. Such transparency in a robot's actions fosters trust and positions robots as empathetic and effective collaborators, particularly in therapeutic settings [119, 155]. However, explainability extends beyond mere transparency. Facilitators achieve this not only by fostering clear communication but also by addressing moments of uncertainty or misalignment. Robots must actively contribute to shared understanding by clarifying their actions, providing meaningful context, and guiding users in anticipating future behaviours; a role akin to that of facilitators in EAIs.

Explainability in HRI literature is linked to fostering predictability and legibility in robotic behaviours. Legibility enables users to infer a robot's goals based on its actions, while predictability ensures that users can anticipate a robot's future behaviours [119]. However, therapeutic robots inspired by EAI mechanisms may require a more nuanced approach. In EAIs, the unpredictability of a horse's actions engages participants by requiring individuals to continuously analyse and adapt their behaviour in real time, promoting empathy, emotional regulation, and attunement. Translating this dynamic into robotics challenges the notion that predictability is always desirable in HRI. Instead, therapeutic robots might benefit from carefully calibrated unpredictability to encourage users to remain engaged and reflective during interactions.

A critical consideration is whether robots can independently provide facilitation through explainability features, or whether human or robotic co-facilitators are necessary to bridge current technological gaps. The *"handler effect"*, which describes the influence of human facilitators on the outcomes of animal-assisted therapy, offers an instructive parallel for HRI [91]. While a facilitator's presence positively influences the interaction, it remains unclear to what extent the observed therapeutic benefits are attributable to the horse, or robot, itself, rather than to the facilitator's involvement. Comparative studies on facilitated versus non-facilitated interactions could offer valuable insights into whether the presence of a human facilitator enhances therapeutic outcomes or merely mediates them [126], aiming to balance the depth of human intuition and empathy with the scalability and consistency offered by robotics.

6 Limitations

We have sought to be as transparent as possible about the inherent limitations of the autoethnographic methodology employed in this study. To enhance rigour through the convergence of evidence, several data collection methods were utilised [36]. The subjective, lived experience of the autoethnographer was essential, providing a participant-centred perspective that remains under-researched in the field of equine-assisted interventions. However, the study is limited by its narrow focus on a single type of intervention—Parelli Natural Horsemanship—and the use of a single facilitator, who may have been influenced by the lead researcher's differing profile when compared to 'typical' participants, throughout the process. This research does not claim to represent all participant perspectives; rather, it identifies several areas that warrant further investigation.

The use of non-verbal animals in therapeutic settings raises significant ethical considerations. Horses cannot verbally advocate for their well-being, relying instead on human interpretation of their signals [88], which is inherently fallible. While these horses are trained to set boundaries when experiencing discomfort, there remains a risk of misinterpretation or overexertion. While non-compliance by the horse is a recognised and integral aspect of the intervention, facilitators must ensure that horses are not compelled into situations that could cause distress.

This study addresses the pressing need to reduce this reliance on animals by investigating robotic alternatives. A crucial question, however, is whether these robotic substitutes can replicate the empathetic and dynamic feedback that living animals provide [68, 117]. Replacing a sentient being with a machine raises ethical considerations, particularly regarding the emotional and psychological ramifications of such a substitution on participants. Delving deeper into these issues is essential to advance this field. Specifically, understanding how therapeutic robots can replicate—or complement—the mechanisms that underpin trust, empathy, and attunement in EAIs is a critical challenge. While this paper marks an initial step in exploring these possibilities, subsequent research should build on these foundations, focusing on practical implementation and assessing their wider societal implications.

7 Conclusion

Inspired by the demonstrated benefits of Equine-Assisted Interventions for under-served populations, and recognising their limitations in accessibility and scalability, this study aimed to build upon Jain and Gardner McCune's pioneering work that drew parallels between human-horse and human-robot interactions [68]. We extended this connection into the therapeutic domain by using an autoethnographic account of the lead researcher's experiences with EAIs to identify the key factors underpinning the therapeutic benefits, and explore how these might inform the design of therapeutic robots.

This study presents several important implications for the field of HRI, and highlights key questions and avenues for future exploration. One such question concerns the emulation of risk and danger through the physical design and behaviour of an autonomous, unpredictable, and even overbearing robot, which could trigger the anxiety mechanisms observed in EAIs. A crucial consideration is fostering a genuine sense of agency in participants by moving away

from traditionally predictable and obedient therapeutic robots, towards those that exhibit resistance and adopt the role of leader. Enabling users to overcome these barriers and engage in the leader-follower "dance" with a robot, could foster the development of a more equal partnership. While this dynamic may become clearer over time, the robot must retain its unpredictability—similar to a trained horse, which can still "act like a horse" [111], behaving autonomously and with self-interest, and requiring empathy and respect from the participant.

While this study focuses on therapeutic robotics inspired by EAIs, its principles—such as fostering trust through perceived risk, encouraging agency through autonomy, and enabling dynamic role-switching—may offer valuable insights for the design of robots in other domains. To remain within the scope of our data, we have limited our conclusions to the therapeutic context, although it is tempting to speculate that these principles could have far-reaching implications beyond this domain. This research provides a strong foundation, but future work is needed to refine these designs, assess their practical implementation, and investigate their wider societal impact.

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References

[1] Mary D Salter Ainsworth, Mary C Blehar, Everett Waters, and Sally N Wall. 2015. *Patterns of attachment: A psychological study of the strange situation.* Psychology press.

[2] Ali Asadi, Oliver Niebuhr, Jonas Jørgensen, and Kerstin Fischer. 2022. Inducing changes in breathing patterns using a soft robot. In *2022 17th ACM/IEEE International Conference on Human-Robot Interaction (HRI).* IEEE, 683–687.

[3] Dana Atzil-Slonim, Christina S Soma, Xinyao Zhang, Adar Paz, and Zac E Imel. 2023. Facilitating dyadic synchrony in psychotherapy sessions: Systematic review and meta-analysis. *Psychotherapy Research* 33, 7 (2023), 898–917.

[4] Keren Bachi. 2012. Equine-facilitated psychotherapy: The gap between practice and knowledge. *Society & Animals* 20, 4 (2012), 364–380.

[5] Keren Bachi. 2013. Application of attachment theory to equine-facilitated psychotherapy. *Journal of Contemporary Psychotherapy* 43 (2013), 187–196.

[6] Marian R. Banks, Lori M. Willoughby, and William A. Banks. 2008. Animal-assisted therapy and loneliness in nursing homes: use of robotic versus living dogs. *Journal of the American Medical Directors Association* 9, 3 (2008), 173–177.

[7] Howard Becker and Ruth Hill Useem. 1942. Sociological analysis of the dyad. *American Sociological Review* 7, 1 (1942), 13–26.

[8] Beatrice Beebe. 2003. Brief mother–infant treatment: Psychoanalytically informed video feedback. *Infant Mental Health Journal: Official Publication of the World Association for Infant Mental Health* 24, 1 (2003), 24–52.

[9] Bijetri Biswas, Emma Powell, Robert Nixdorf, Richard Sewell, and Anne Roudaut. 2025. Encountering the Giant One: Exploring Human-Robot Interaction with Large-Scale Soft Robotics. In *CHI Conference on Human Factors in Computing Systems (CHI '25)* (Yokohama, Japan). ACM, New York, NY, USA, 24.

[10] Kirsten Boehner, Phoebe Sengers, and Simeon Warner. 2008. Interfaces with the ineffable: Meeting aesthetic experience on its own terms. *ACM Transactions on Computer-Human Interaction (TOCHI)* 15, 3 (2008), 1–29.

[11] Marta Borgi and Francesca Cirulli. 2016. Pet face: Mechanisms underlying human-animal relationships. *Frontiers in psychology* 7 (2016), 298.

[12] Marta Borgi, Dafne Loliva, Stefania Cerino, Flavia Chiarotti, Aldina Venerosi, Maria Bramini, Enrico Nonnis, Marco Marcelli, Claudia Vinti, Chiara De Santis, et al. 2016. Effectiveness of a standardized equine-assisted therapy program for children with autism spectrum disorder. *Journal of autism and developmental disorders* 46 (2016), 1–9.

[13] John Bowlby. 2008. *A secure base: Parent-child attachment and healthy human development.* Basic books.

[14] Hannah Louise Bradwell, Katie Jane Edwards, Rhona Winnington, Serge Thill, and Ray B Jones. 2019. Companion robots for older people: importance of user-centred design demonstrated through observations and focus groups comparing preferences of older people and roboticists in South West England. *BMJ open* 9, 9 (2019), e032468.

[15] Keri Brandt. 2004. A language of their own: An interactionist approach to human-horse communication. *Society & Animals* 12, 4 (2004), 299–316.

[16] Cynthia Breazeal. 2004. *Designing sociable robots.* MIT press.

[17] Hannah Burgon, Di Gammage, and Jenny Hebden. 2018. Hoofbeats and heartbeats: equine-assisted therapy and learning with young people with psychosocial issues–theory and practice. *Journal of Social Work Practice* 32, 1 (2018), 3–16.

[18] Hannah Louise Burgon and Hannah Louise Burgon. 2014. Horses, Mindfulness and the Natural Environment. *Equine-Assisted Therapy and Learning with At-Risk Young People* (2014), 154–189.

[19] L Elisabeth Burton, Fares Qeadan, and Mark R Burge. 2019. Efficacy of equine-assisted psychotherapy in veterans with posttraumatic stress disorder. *Journal of integrative medicine* 17, 1 (2019), 14–19.

[20] Emily A Butler. 2011. Temporal interpersonal emotion systems: The "TIES" that form relationships. *Personality and Social Psychology Review* 15, 4 (2011), 367–393.

[21] Emily A Butler and Ashley K Randall. 2013. Emotional coregulation in close relationships. *Emotion Review* 5, 2 (2013), 202–210.

[22] Donna Carlyle and Pamela Graham. 2019. Bodies of knowledge, kinetic melodies, rhythms of relating and affect attunement in vital spaces for multi-species well-being: Finding common ground in intimate human-canine and human-equine encounters. *Animals* 9, 11 (2019), 934.

[23] Diego Casas-Bocanegra, Daniel Gomez-Vargas, Maria J Pinto-Bernal, Juan Maldonado, Marcela Munera, Adriana Villa-Moreno, Martin F Stoelen, Tony Belpaeme, and Carlos A Cifuentes. 2020. An open-source social robot based on compliant soft robotics for therapy with children with ASD. In *Actuators*, Vol. 9. MDPI, 91.

[24] EunJeong Cheon, Eike Schneiders, Kristina Diekjobst, and Mikael B Skov. 2022. Robots as a Place for Socializing: Influences of Collaborative Robots on Social Dynamics In-and Outside the Production Cells. *Proceedings of the ACM on Human-Computer Interaction* 6, CSCW2 (2022), 1–26.

[25] Vijay Chidambaram, Yueh-Hsuan Chiang, and Bilge Mutlu. 2012. Designing persuasive robots: how robots might persuade people using vocal and nonverbal cues. In *Proceedings of the seventh annual ACM/IEEE international conference on Human-Robot Interaction.* 293–300.

[26] Janne Winther Christensen, Linda Jane Keeling, and Birte Lindstrøm Nielsen. 2005. Responses of horses to novel visual, olfactory and auditory stimuli. *Applied Animal Behaviour Science* 93, 1-2 (2005), 53–65.

[27] Bohkyung Chun. 2019. Doing autoethnography of social robots: Ethnographic reflexivity in HRI. *Paladyn, Journal of Behavioral Robotics* 10, 1 (2019), 228–236.

[28] Derek Cormier, Gem Newman, Masayuki Nakane, James E Young, and Stephane Durocher. 2013. Would you do as a robot commands? An obedience study for human-robot interaction. In *International Conference on Human-Agent Interaction*, Vol. 13.

[29] Sally Jo Cunningham and Matt Jones. 2005. Autoethnography: a tool for practice and education. In *Proceedings of the 6th ACM SIGCHI New Zealand chapter's international conference on Computer-human interaction: making CHI natural.* 1–8.

[30] Dwayne Custer. 2014. Autoethnography as a transformative research method. *The qualitative report* 19, 37 (2014), 1–13.

[31] Elizabeth Dampsey. 2017. *The effects of equine-assisted psychotherapy on emotion regulation: Self-efficacy and self-awareness as potential mediators.* Ph. D. Dissertation. Fielding Graduate University.

[32] Kate Darling. 2021. *The new breed: what our history with animals reveals about our future with robots.* Henry Holt and Company.

[33] Katherine Dashper. 2017. Listening to horses: Developing attentive interspecies relationships through sport and leisure. *Society & Animals* 25, 3 (2017), 207–224.

[34] Maartje MA De Graaf and Somaya Ben Allouch. 2015. The evaluation of different roles for domestic social robots. In *2015 24th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN).* IEEE, 676–681.

[35] Maryam Banitalebi Dehkordi, Reda Mansy, Abolfazl Zaraki, Arpit Singh, and Rossitza Setchi. 2021. Explainability in human-robot teaming. *Procedia Computer Science* 192 (2021), 3487–3496.

[36] Audrey Desjardins, Oscar Tomico, Andrés Lucero, Marta E Cecchinato, and Carman Neustaedter. 2021. Introduction to the special issue on first-person methods in HCI. 12 pages.

[37] Monika Eckstein, Ilshat Mamaev, Beate Ditzen, and Uta Sailer. 2020. Calming effects of touch in human, animal, and robotic interaction—scientific state-of-the-art and technical advances. *Frontiers in psychiatry* 11 (2020), 555058.

[38] Carolyn Ellis, Tony E Adams, and Arthur P Bochner. 2011. Autoethnography: an overview. *Historical social research/Historische sozialforschung* (2011), 273–290.

[39] Carolyn Ellis and Art Bochner. 2000. Autoethnography, personal narrative, reflexivity: Researcher as subject. (2000).

[40] Aubrey H Fine. 2010. Incorporating animal-assisted therapy into psychotherapy: Guidelines and suggestions for therapists. In *Handbook on animal-assisted therapy*. Elsevier, 169–191.

[41] Alan Fogel. 1993. *Developing through relationships*. University of Chicago Press.

[42] Batya Friedman, Peter H Kahn Jr, and Jennifer Hagman. 2003. Hardware companions? What online AIBO discussion forums reveal about the human-robotic relationship. In *Proceedings of the SIGCHI conference on Human factors in computing systems*. 273–280.

[43] Florence Gaunet and Fouzia E. Massioui. 2014. Marked referential communicative behaviours, but no differentiation of the "knowledge state" of humans in untrained pet dogs versus 1-year-old infants. *Animal cognition* 17 (2014), 1137–1147.

[44] Andy F Gianino and Edward Tronick. [n. d.]. Z. 1988."The mutual regulation model: The infant's self and interactive regulation and coping and defensive capacities". *Stress and coping across development* ([n. d.]), 47–68.

[45] Andrea Guidi, Antonio Lanata, Paolo Baragli, Gaetano Valenza, and Enzo Pasquale Scilingo. 2016. A wearable system for the evaluation of the human-horse interaction: A preliminary study. *Electronics* 5, 4 (2016), 63.

[46] Haruyo Hama, Masao Yogo, and Yoshinori Matsuyama. 1996. Effects of stroking horses on both humans' and horses' heart rate responses 1. *Japanese Psychological Research* 38, 2 (1996), 66–73.

[47] Mary Lynn Hamilton, Laura Smith, and Kristen Worthington. 2008. Fitting the methodology with the research: An exploration of narrative, self-study and auto-ethnography. *Studying teacher education* 4, 1 (2008), 17–28.

[48] Phillippa Harrison, Gillian E Hardy, and Michael Barkham. 2019. The relationship between expected engagement and talking therapy outcome. *Clinical Psychology & Psychotherapy* 26, 4 (2019), 492–501.

[49] Elke Hartmann, Janne W Christensen, and Paul D McGreevy. 2017. Dominance and leadership: Useful concepts in human–horse interactions? *Journal of Equine Veterinary Science* 52 (2017), 1–9.

[50] Martine Hausberger, Hélène Roche, Séverine Henry, and E Kathalijne Visser. 2008. A review of the human–horse relationship. *Applied animal behaviour science* 109, 1 (2008), 1–24.

[51] David M Hayano. 1979. Auto-ethnography: Paradigms, problems, and prospects. *Human organization* 38, 1 (1979), 99–104.

[52] Alice C Haynes, Annie Lywood, Emily M Crowe, Jessica L Fielding, Jonathan M Rossiter, and Christopher Kent. 2022. A calming hug: Design and validation of a tactile aid to ease anxiety. *Plos one* 17, 3 (2022), e0259838.

[53] Melina Helm, Felix Carros, Johannes Schädler, and Volker Wulf. 2022. Zoomorphic robots and people with disabilities. In *Proceedings of Mensch Und Computer 2022*. 431–436.

[54] Ann Hemingway. 2019. A study exploring the implementation of an equine assisted intervention for young people with mental health and behavioural issues. *J* 2, 2 (2019), 236–246.

[55] Ann Hemingway. 2021. The embodied nature of horse human communication: A feasibility study of an equine assisted intervention; benefits for horses and humans. *Mind and matter–Challenges and opportunities in cognitive semiotics and aesthetics* (2021), 69–82.

[56] Ann Hemingway, Sid Carter, Andrew Callaway, Emma Kavanagh, and Shelley Ellis. 2019. An exploration of the mechanism of action of an equine-assisted intervention. *Animals* 9, 6 (2019), 303.

[57] Ann Hemingway, Rosie Meek, and Caroline Ellis Hill. 2015. An exploration of an equine-facilitated learning intervention with young offenders. *Society & Animals* 23, 6 (2015), 544–568.

[58] Ann Hemingway and Kezia Sullivan. 2022. Reducing the incidence of domestic violence: An observational study of an equine-assisted intervention. *Family process* 61, 2 (2022), 549–570.

[59] Anna Henschel, Guy Laban, and Emily S Cross. 2021. What makes a robot social? A review of social robots from science fiction to a home or hospital near you. *Current Robotics Reports* 2 (2021), 9–19.

[60] Yutaka Hiroi and Akinori Ito. 2008. Are bigger robots scary?—The relationship between robot size and psychological threat—. In *2008 IEEE/ASME International Conference on Advanced Intelligent Mechatronics*. IEEE, 546–551.

[61] Christian MP Holmes, Deborah Goodwin, Edward S Redhead, and Katy L Goymour. 2012. The benefits of equine-assisted activities: An exploratory study. *Child and Adolescent Social Work Journal* 29 (2012), 111–122.

[62] Michael J Hove and Jane L Risen. 2009. It's all in the timing: Interpersonal synchrony increases affiliation. *Social cognition* 27, 6 (2009), 949–960.

[63] Sherick A Hughes and Julie L Pennington. 2016. *Autoethnography: Process, product, and possibility for critical social research*. Sage Publications.

[64] Sally Hultsjö and Henrika Jormfeldt. 2022. The role of the horse in an equine-assisted group intervention-as conceptualized by persons with psychotic conditions. *Issues in Mental Health Nursing* 43, 3 (2022), 201–208.

[65] Lily Hung, Chiachi Liu, Emilie Woldum, Angel Au-Yeung, Anne Berndt, Chloe Wallsworth, and Habib Chaudhury. 2019. The benefits of and barriers to using a social robot PARO in care settings: a scoping review. *BMC geriatrics* 19 (2019), 1–10.

[66] Ryan Blake Jackson and Tom Williams. 2021. A theory of social agency for human-robot interaction. *Frontiers in Robotics and AI* 8 (2021), 687726.

[67] Eakta Jain and J. Cortney Bradford. 2024. Rebellion and Disobedience in HRI: Insights from Human-Horse Interaction. In *Proceedings of the ACM HRI 2024 Workshop on Rebellion and Disobedience in Human-Robot Interaction (RAD-HRI)*. Association for Computing Machinery.

[68] Eakta Jain and Christina Gardner-McCune. 2023. Horse as Teacher: How human-horse interaction informs human-robot interaction. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–13.

[69] Annika Kaltenhauser, Evropi Stefanidi, and Johannes Schöning. 2024. Playing with Perspectives and Unveiling the Autoethnographic Kaleidoscope in HCI–A Literature Review of Autoethnographies. In *Proceedings of the CHI Conference on Human Factors in Computing Systems*. 1–20.

[70] Susan M. Keaveney. 2008. Equines and their human companions. *Journal of business research* 61, 5 (2008), 444–454.

[71] Linda J Keeling, Liv Jonare, and Lovisa Lanneborn. 2009. Investigating horse–human interactions: The effect of a nervous human. *The Veterinary Journal* 181, 1 (2009), 70–71.

[72] Kathleen Kemp, Tania Signal, Helena Botros, Nik Taylor, and Kathy Prentice. 2014. Equine facilitated therapy with children and adolescents who have been sexually abused: A program evaluation study. *Journal of child and family studies* 23 (2014), 558–566.

[73] Bing Cai Kok and Harold Soh. 2020. Trust in robots: Challenges and opportunities. *Current Robotics Reports* 1, 4 (2020), 297–309.

[74] Veronika Konok, Beáta Korcsok, Ádám Miklósi, and Márta Gácsi. 2018. Should we love robots?–The most liked qualities of companion dogs and how they can be implemented in social robots. *Computers in Human Behavior* 80 (2018), 132–142.

[75] Sander L Koole and Wolfgang Tschacher. 2016. Synchrony in psychotherapy: A review and an integrative framework for the therapeutic alliance. *Frontiers in psychology* 7 (2016), 862.

[76] Frank Krueger, Kelsey C Mitchell, Gopikrishna Deshpande, and Jeffrey S Katz. 2021. Human–dog relationships as a working framework for exploring human–robot attachment: a multidisciplinary review. *Animal Cognition* 24 (2021), 371–385.

[77] Katherine A Kruger and James A Serpell. 2010. Animal-assisted interventions in mental health: Definitions and theoretical foundations. In *Handbook on animal-assisted therapy*. Elsevier, 33–48.

[78] H. Laurie and J. Noble. 2015. Evidence Reviews Theory of Change and Contribution Analysis. TheHorseCourse.

[79] Ping-Tzu Lee, Emily Dakin, and Merinda McLure. 2016. Narrative synthesis of equine-assisted psychotherapy literature: Current knowledge and future research directions. *Health & Social Care in the Community* 24, 3 (2016), 225–246.

[80] Jennifer A Lentini and Michele Knox. 2009. A qualitative and quantitative review of equine facilitated psychotherapy (EFP) with children and adolescents. *The open complementary medicine journal* 1, 1 (2009).

[81] Daniel T Levin, Julie A Adams, Megan M Saylor, and Gautam Biswas. 2013. A transition model for cognitions about agency. In *2013 8th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 373–380.

[82] Daniel Leyzberg, Aditi Ramachandran, and Brian Scassellati. 2018. The effect of personalization in longer-term robot tutoring. *ACM Transactions on Human-Robot Interaction (THRI)* 7, 3 (2018), 1–19.

[83] Ernesto A Lozano, Carlos E Sánchez-Torres, Irvin H López-Nava, and Jesús Favela. 2023. An open framework for nonverbal communication in human-robot interaction. In *International Conference on Ubiquitous Computing and Ambient Intelligence*. Springer, 21–32.

[84] Christina M Luberto, Sian Cotton, Alison C McLeish, Carolyn J Mingione, and Emily M O'Bryan. 2014. Mindfulness skills and emotion regulation: The mediating role of coping self-efficacy. *Mindfulness* 5 (2014), 373–380.

[85] Houston Lucas, Jamie Poston, Nathan Yocum, Zachary Carlson, and David Feil-Seifer. 2016. Too big to be mistreated? Examining the role of robot size on perceptions of mistreatment. In *2016 25th IEEE international symposium on robot and human interactive communication (RO-MAN)*. IEEE, 1071–1076.

[86] Andrés Lucero, Audrey Desjardins, Carman Neustaedter, Kristina Höök, Marc Hassenzahl, and Marta E Cecchinato. 2019. A sample of one: First-person research methods in HCI. In *Companion Publication of the 2019 on Designing Interactive Systems Conference 2019 Companion*. 385–388.

[87] Hamza Mahdi, Sami Alperen Akgun, Shahed Saleh, and Kerstin Dautenhahn. 2022. A survey on the design and evolution of social robots—Past, present and

future. *Robotics and Autonomous Systems* 156 (2022), 104193.
[88] Clara Mancini. 2017. Towards an animal-centred ethics for Animal–Computer Interaction. *International Journal of Human-Computer Studies* 98 (2017), 221–233.
[89] Erin Manning. 2006. *Politics of touch: Sense, movement, sovereignty*. U of Minnesota Press.
[90] Emanuela Marchetti, Sophie Grimme, Eva Hornecker, Avgi Kollakidou, and Philipp Graf. 2022. Pet-robot or appliance? Care home residents with dementia respond to a zoomorphic floor washing robot. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems*. 1–21.
[91] Lori Marino. 2012. Construct validity of animal-assisted therapy and activities: How important is the animal in AAT? *Anthrozoös* 25, sup1 (2012), s139–s151.
[92] Carla Martin, Zaffer Iqbal, Nicola D Airey, and Lucy Marks. 2022. Improving Access to Psychological Therapies (IAPT) has potential but is not sufficient: How can it better meet the range of primary care mental health needs? *British Journal of Clinical Psychology* 61, 1 (2022), 157–174.
[93] Hironori Matsuzaki and Gesa Lindemann. 2016. The autonomy-safety-paradox of service robotics in Europe and Japan: a comparative analysis. *AI & society* 31 (2016), 501–517.
[94] Derek McColl, Alexander Hong, Naoaki Hatakeyama, Goldie Nejat, and Beno Benhabib. 2016. A survey of autonomous human affect detection methods for social robots engaged in natural HRI. *Journal of Intelligent & Robotic Systems* 82 (2016), 101–133.
[95] Sean McGlynn, Braeden Snook, Shawn Kemple, Tracy L Mitzner, and Wendy A Rogers. 2014. Therapeutic robots for older adults: investigating the potential of paro. In *Proceedings of the 2014 ACM/IEEE international conference on Human-robot interaction*. 246–247.
[96] Gail F Melson, Peter H Kahn Jr, Alan Beck, and Batya Friedman. 2006. Toward understanding children's and adults' encounters with social robots. In *Paper to the AAAI Workshop on Human Implications of Human-Robot Interaction (HRI), Boston*.
[97] Katrina Merkies and Olivia Franzin. 2021. Enhanced understanding of horse–human interactions to optimize welfare. *Animals* 11, 5 (2021), 1347.
[98] Joseph E Michaelis, Amanda Siebert-Evenstone, David Williamson Shaffer, and Bilge Mutlu. 2020. Collaborative or simply uncaged? understanding human-cobot interactions in automation. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. 1–12.
[99] Ádám Miklósi, Péter Korondi, Vicente Matellán, and Márta Gácsi. 2017. Ethorobotics: A new approach to human-robot relationship. *Frontiers in psychology* 8 (2017), 958.
[100] Mario Mikulincer, Phillip R Shaver, and Ety Berant. 2013. An attachment perspective on therapeutic processes and outcomes. *Journal of personality* 81, 6 (2013), 606–616.
[101] Linda Miller, Johannes Kraus, Franziska Babel, and Martin Baumann. 2021. More than a feeling—interrelation of trust layers in human-robot interaction and the role of user dispositions and state anxiety. *Frontiers in psychology* 12 (2021), 592711.
[102] Natawut Monaikul, Bahareh Abbasi, Zhanibek Rysbek, Barbara Di Eugenio, and Miloš Žefran. 2020. Role switching in task-oriented multimodal human-robot collaboration. In *2020 29th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*. IEEE, 1150–1156.
[103] Sara Kerstine Kaya Nielsen, Nicole Lønfeldt, Kate B Wolitzky-Taylor, Ida Hageman, Signe Vangkilde, and Sarah Ingrid Franksdatter Daniel. 2017. Adult attachment style and anxiety–The mediating role of emotion regulation. *Journal of Affective Disorders* 218 (2017), 253–259.
[104] Jeffry R Nurenberg, Steven J Schleifer, Thomas M Shaffer, Mary Yellin, Prital J Desai, Ruchi Amin, Axel Bouchard, and Cristina Montalvo. 2015. Animal-assisted therapy with chronic psychiatric inpatients: Equine-assisted psychotherapy and aggressive behavior. *Psychiatric services* 66, 1 (2015), 80–86.
[105] Aisling Ann O'Kane, Yvonne Rogers, and Ann E Blandford. 2014. Gaining empathy for non-routine mobile device use through autoethnography. In *Proceedings of the SIGCHI Conference on Human factors in Computing Systems*. 987–990.
[106] Anastasia K Ostrowski, Cynthia Breazeal, and Hae Won Park. 2022. Mixed-method long-term robot usage: Older adults' lived experience of social robots. In *2022 17th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 33–42.
[107] Anastasia K Ostrowski, Daniella DiPaola, Erin Partridge, Hae Won Park, and Cynthia Breazeal. 2019. Older adults living with social robots: promoting social connectedness in long-term communities. *IEEE Robotics & Automation Magazine* 26, 2 (2019), 59–70.
[108] Steven Pace. 2012. Writing the self into research: Using grounded theory analytic strategies in autoethnography. (2012).
[109] Maike Paetzel, Giulia Perugia, and Ginevra Castellano. 2020. The persistence of first impressions: The effect of repeated interactions on the perception of a social robot. In *Proceedings of the 2020 ACM/IEEE international conference on human-robot interaction*. 73–82.
[110] Elyssa Payne, Jodi DeAraugo, Pauleen Bennett, and Paul McGreevy. 2016. Exploring the existence and potential underpinnings of dog–human and horse–human attachment bonds. *Behavioural processes* 125 (2016), 114–121.
[111] Elizabeth Phillips, Kristin E Schaefer, Deborah R Billings, Florian Jentsch, and Peter A Hancock. 2016. Human-animal teams as an analog for future human-robot teams: Influencing design and fostering trust. *Journal of Human-Robot Interaction* 5, 1 (2016), 100–125.
[112] Jayne Pitard. 2017. A journey to the centre of self: Positioning the researcher in autoethnography. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, Vol. 18. DEU, 20.
[113] Alessandra Prieto, Kennea Martins Almeida Ayupe, Latife Nemetala Gomes, Ana Cristina Saúde, and Paulo Gutierres Filho. 2022. Effects of equine-assisted therapy on the functionality of individuals with disabilities: systematic review and meta-analysis. *Physiotherapy Theory and Practice* 38, 9 (2022), 1091–1106.
[114] Amon Rapp. 2018. Autoethnography in human-computer interaction: Theory and practice. *New directions in third wave human-computer interaction: Volume 2-Methodologies* (2018), 25–42.
[115] Deborah Reed-Danahay. 2021. *Auto/ethnography: Rewriting the self and the social*. Routledge.
[116] Laurel D Riek. 2017. Healthcare robotics. *Commun. ACM* 60, 11 (2017), 68–78.
[117] Florence Roberts, Judy Bradberry, and Cheryl Williams. 2004. Equine-facilitated psychotherapy benefits students and children. *Holistic nursing practice* 18, 1 (2004), 32–35.
[118] Marcelo Rocha, Pedro Valentim, Fábio Barreto, Adrian Mitjans, Dagoberto Cruz-Sandoval, Jesus Favela, and Débora Muchaluat-Saade. 2021. Towards enhancing the multimodal interaction of a social robot to assist children with autism in emotion regulation. In *International Conference on Pervasive Computing Technologies for Healthcare*. Springer, 398–415.
[119] Alessandra Rossi and Silvia Rossi. 2024. On the Way to a Transparent HRI. In *Adjunct Proceedings of the 32nd ACM Conference on User Modeling, Adaptation and Personalization*. 215–219.
[120] Matteo Rubagotti, Inara Tusseyeva, Sara Baltabayeva, Danna Summers, and Anara Sandygulova. 2022. Perceived safety in physical human–robot interaction—A survey. *Robotics and Autonomous Systems* 151 (2022), 104047.
[121] Agnieszka Sabiniewicz, Karolina Tarnowska, Robert Świątek, Piotr Sorokowski, and Matthias Laska. 2020. Olfactory-based interspecific recognition of human emotions: Horses (Equus ferus caballus) can recognize fear and happiness body odour from humans (Homo sapiens). *Applied Animal Behaviour Science* 230 (2020), 105072.
[122] Maha Salem, Katharina Rohlfing, Stefan Kopp, and Frank Joublin. 2011. A friendly gesture: Investigating the effect of multimodal robot behavior in human-robot interaction. In *2011 ro-man*. IEEE, 247–252.
[123] Shane Saunderson and Goldie Nejat. 2019. How robots influence humans: A survey of nonverbal communication in social human–robot interaction. *International Journal of Social Robotics* 11, 4 (2019), 575–608.
[124] Nikki Savvides. 2012. Communication as a solution to conflict: Fundamental similarities in divergent methods of horse training. *Society & Animals* 20, 1 (2012), 75–90.
[125] Eike Schneiders, Christopher Fourie, Stanley Celestin, Julie Shah, and Malte Jung. 2024. Understanding Entrainment in Human Groups: Optimising Human-Robot Collaboration from Lessons Learned during Human-Human Collaboration. In *Proceedings of the CHI Conference on Human Factors in Computing Systems*. 1–13.
[126] Lonneke GJA Schuurmans, Inge Noback, Jos MGA Schols, and Marie-Jose Enders-Slegers. 2021. Social Interaction during Dog and Robot Group Sessions for Nursing Home Residents with Dementia: the Handler Effect. *Human-animal interaction bulletin* 2021 (2021).
[127] Chiara Scopa, Laura Contalbrigo, Alberto Greco, Antonio Lanatà, Enzo Pasquale Scilingo, and Paolo Baragli. 2019. Emotional transfer in human–horse interaction: new perspectives on equine assisted interventions. *Animals* 9, 12 (2019), 1030.
[128] Fiona Seaman-Thornton. 2020. *Exploring change processes in an equine-assisted intervention*. Ph. D. Dissertation. Canterbury Christ Church University.
[129] Rita Seery and Deborah Wells. 2024. An Exploratory Study into the Backgrounds and Perspectives of Equine-Assisted Service Practitioners. *Animals* 14, 2 (2024), 347.
[130] Yasaman S Sefidgar, Karon E MacLean, Steve Yohanan, HF Machiel Van der Loos, Elizabeth A Croft, and E Jane Garland. 2015. Design and evaluation of a touch-centered calming interaction with a social robot. *IEEE Transactions on Affective Computing* 7, 2 (2015), 108–121.
[131] Alison Selby and Alexa Smith-Osborne. 2013. A systematic review of effectiveness of complementary and adjunct therapies and interventions involving equines. *Health Psychology* 32, 4 (2013), 418.
[132] Suleman Shahid, Emiel Krahmer, and Marc Swerts. 2010. Playing with iCat: investigating children's appreciation of game plays with a social robot. In *Proceedings of the 7th international conference on advances in computer entertainment technology*. 106–107.

[133] Liat Shani. 2017. Animal-assisted dyadic therapy: A therapy model promoting development of the reflective function in the parent–child bond. *Clinical child psychology and psychiatry* 22, 1 (2017), 46–58.

[134] Takanori Shibata and Kazuyoshi Wada. 2011. Robot therapy: a new approach for mental healthcare of the elderly–a mini-review. *Gerontology* 57, 4 (2011), 378–386.

[135] Mark Shucksmith, Jayne Glass, Jane Atterton, and Polly Chapman. 2023. *Rural poverty today: experiences of social exclusion in rural Britain.* Policy Press.

[136] Daniel J Siegel. 2020. *The developing mind: How relationships and the brain interact to shape who we are.* Guilford Publications.

[137] Sheldon Siporin. 2012. Talking horses: Equine psychotherapy and intersubjectivity. *Psychodynamic Practice* 18, 4 (2012), 457–464.

[138] Alexa Smith-Osborne and Alison Selby. 2010. Implications of the literature on equine-assisted activities for use as a complementary intervention in social work practice with children and adolescents. *Child and Adolescent Social Work Journal* 27 (2010), 291–307.

[139] Christina S Soma, Brian RW Baucom, Bo Xiao, Jonathan E Butner, Peter Hilpert, Shrikanth Narayanan, David C Atkins, and Zac E Imel. 2020. Coregulation of therapist and client emotion during psychotherapy. *Psychotherapy research* 30, 5 (2020), 591–603.

[140] Cady M Stanton, Peter H Kahn Jr, Rachel L Severson, Jolina H Ruckert, and Brian T Gill. 2008. Robotic animals might aid in the social development of children with autism. In *Proceedings of the 3rd ACM/IEEE international conference on Human robot interaction.* 271–278.

[141] Marlys Staudt and Donna Cherry. 2017. Equine-facilitated therapy and trauma: current knowledge, future needs. *Advances in Social Work* 18, 1 (2017), 403–414.

[142] Daniel Stern. 1998. Non-interpretive mechanisms in psychoanalytic therapy: The'something more'than interpretation. *The International Journal of Psycho-Analysis* 79, 5 (1998), 903.

[143] Vanessa Xue-Ling Tan and Janette Graetz Simmonds. 2018. Parent perceptions of psychosocial outcomes of equine-assisted interventions for children with autism spectrum disorder. *Journal of autism and developmental disorders* 48 (2018), 759–769.

[144] Eileen Thomas and Joan Kathy Magilvy. 2011. Qualitative rigor or research validity in qualitative research. *Journal for specialists in pediatric nursing* 16, 2 (2011).

[145] József Topál, György Gergely, Ágnes Erdőhegyi, Gergely Csibra, and Ádám Miklósi. 2009. Differential sensitivity to human communication in dogs, wolves, and human infants. *Science* 325, 5945 (2009), 1269–1272.

[146] Edward Z Tronick, Nadia Bruschweiler-Stern, Alexandra M Harrison, Karlen Lyons-Ruth, Alexander C Morgan, Jeremy P Nahum, Louis Sander, and Daniel N Stern. 1998. Dyadically expanded states of consciousness and the process of therapeutic change. *Infant Mental Health Journal: Official Publication of The World Association for Infant Mental Health* 19, 3 (1998), 290–299.

[147] Wolfgang Tschacher, Georg M Rees, and Fabian Ramseyer. 2014. Nonverbal synchrony and affect in dyadic interactions. *Frontiers in psychology* 5 (2014), 1323.

[148] Jacqueline Urakami and Katie Seaborn. 2023. Nonverbal cues in human–robot interaction: A communication studies perspective. *ACM Transactions on Human-Robot Interaction* 12, 2 (2023), 1–21.

[149] Emma M Van Zoelen, Emilia I Barakova, and Matthias Rauterberg. 2020. Adaptive leader-follower behavior in human-robot collaboration. In *2020 29th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN).* IEEE, 1259–1265.

[150] Theo Verheggen, Marie-Jose Enders-Slegers, and Jannes Eshuis. 2017. Enactive Anthrozoology: Toward an integrative theoretical model for understanding the therapeutic relationships between humans and animals. *Human-animal interaction bulletin* 2017 (2017).

[151] Eleanor White, Jaclyn Zippel, and Saravana Kumar. 2020. The effect of equine-assisted therapies on behavioural, psychological and physical symptoms for children with attention deficit/hyperactivity disorder: A systematic review. *Complementary therapies in clinical practice* 39 (2020), 101101.

[152] Caitlin Wilson, Gillian Janes, and Julia Williams. 2022. Identity, positionality and reflexivity: relevance and application to research paramedics. *British paramedic journal* 7, 2 (2022), 43–49.

[153] Kaitlyn Wilson, Melissa Buultjens, Melissa Monfries, and Leila Karimi. 2017. Equine-Assisted Psychotherapy for adolescents experiencing depression and/or anxiety: A therapist's perspective. *Clinical child psychology and psychiatry* 22, 1 (2017), 16–33.

[154] Adrienne Wood, Jennie Lipson, Olivia Zhao, and Paula Niedenthal. 2021. Forms and functions of affective synchrony. *Handbook of embodied psychology: Thinking, feeling, and acting* (2021), 381–402.

[155] Elmira Yadollahi, Marta Romeo, Fethiye Irmak Dogan, Wafa Johal, Maartje De Graaf, Shelly Levy-Tzedek, and Iolanda Leite. 2024. Explainability for Human-Robot Collaboration. In *Companion of the 2024 ACM/IEEE International Conference on Human-Robot Interaction.* 1364–1366.

[156] Jan Yorke, William Nugent, Elizabeth Strand, Rebecca Bolen, John New, and Cindy Davis. 2013. Equine-assisted therapy and its impact on cortisol levels of children and horses: A pilot study and meta-analysis. *Early child development and care* 183, 7 (2013), 874–894.

[157] Moniek AJ Zeegers, Cristina Colonnesi, Geert-Jan JM Stams, and Elizabeth Meins. 2017. Mind matters: A meta-analysis on parental mentalization and sensitivity as predictors of infant–parent attachment. *Psychological bulletin* 143, 12 (2017), 1245.

[158] Sigal Zilcha-Mano, Mario Mikulincer, and Phillip R Shaver. 2011. Pet in the therapy room: An attachment perspective on animal-assisted therapy. *Attachment & human development* 13, 6 (2011), 541–561.