Interspecific emotional contagion: human-horse

(SUMMARY OF THE PhD THESIS)

PhD student **Dan Manolăchescu**

Scientific coordinator **Prof. univ. dr. Ionel PAPUC**

INTRODUCTION

The relationship between humans and horses is one of the oldest and most complex interspecies interactions, bearing profound implications both on a practical and emotional level. In recent decades, research in the fields of animal psychology and neuroscience has clearly highlighted the existence of the phenomenon of emotional contagion between humans and animals, defined as the involuntary transfer of emotions between individuals without the use of verbal language. In the case of horses, this phenomenon is particularly relevant due to their heightened sensitivity to human emotional states and their ability to adaptively respond to them. Horses not only perceive human emotions but also respond to them through behavioral and physiological changes that can influence performance, stress levels, and the quality of interactions with humans (Panksepp, 2011).

Equine personality is a complex and multifaceted subject that has attracted growing interest in the fields of ethology, veterinary science, and equine psychology. As in humans, personality refers to consistent patterns of behavior, emotions, and interactions that characterize each individual. Understanding horses' personality traits is essential for improving training methods, enhancing welfare, and fostering effective human-horse relationships (Suwala, 2016). Horses, as socially developed animals, exhibit a wide range of personality traits influenced by genetic, environmental, and social factors (Rankins & Wickens, 2020).

From an ethological perspective, the mechanisms of emotional contagion can be explained by the presence of shared neural systems and processes of social emotion regulation, which are common among mammals with social behavior. Moreover, frequent interactions between humans and horses contribute to the consolidation of a partnership based on trust and emotional synchronization, suggesting that understanding this phenomenon has direct implications for horse training, stress management, and equine-assisted therapy.

Emotional contagion between humans and horses is a complex phenomenon, grounded in neurobiological, behavioral, and social mechanisms, which influences both behavior and the welfare of both species. By understanding and applying these principles, the human-horse relationship can be optimized for training, competition, and therapy, ensuring improved cooperation and enhanced emotional well-being.

Interest in promoting animal welfare has significantly increased, with welfare being defined as the physical and psychological well-being of horses, with an emphasis on positive emotions and stress reduction (Dalla Costa et al., 2016; Merkies & Franzin, 2021). Stress can be assessed through non-contact and non-invasive methods, such as ethograms or heart rate variability (HRV) (Kim et al., 2018). The ethogram is one of the frequently used methods in both traditional equitation and scientific research, aiding in the decoding of body language (Christensen et al., 2005; McGreevy et al., 2009). Recent studies have shown that heart rate assessment, and particularly its variability, can provide reliable information regarding nervous system excitability (Ille et al., 2014). Valence and arousal are two fundamental dimensions in the understanding of emotions,

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helping to classify and characterize emotional experiences based on their perceived intensity and affective quality (Scherer, 2005).

The research conducted within this study was carried out in accordance with the ethical standards for animal research, in compliance with national legislation (Law no. 43/2014) and European directives (EU Directive no. 63/2010) and was approved by the Ethics Committee of the University of Agricultural Sciences and Veterinary Medicine (USAMV) Cluj-Napoca, approval no. 371 from April 7, 2023. Prior to investigating human-horse interactions, horse owners signed an informed consent form detailing the purpose of the study, working procedures, inherent risks, benefits, and confidentiality of information.

The aim of this doctoral thesis was to provide a new conceptual and applied framework for the assessment of equine temperament and personality, to identify reliable and non-invasive markers of acute stress in horses, to perform a detailed analysis of emotional transfer from human to horse, and to investigate the scientific principles underlying equine-assisted therapy.

In this context, several objectives were established for the development of the research design:

- To refine a classification system for equine temperament into four accessible typologies that facilitate behavioral evaluation and establish standard measurement units regarding equine personality;
- To monitor heart rate as a reliable, non-invasive, accessible, and practical biological marker for detecting acute stress in horses, and to investigate the behavioral correlates of stress based on ethograms and heart rate in order to create a comprehensive model for stress evaluation;
- To assess the possibility that certain emotional states, such as stress and anxiety, can be transferred from humans to horses during interactions, using heart rate variability and ethograms in both species to quantify emotional states and potential interspecific contagion;
- To explore the long-term benefits of equine-assisted therapy for individuals with neuromotor disabilities from a holistic perspective that integrates hippotherapy with emotional support and social reintegration, aiming to provide a coherent understanding of the human-horse dynamic and to create a robust framework for the therapeutic use of horses in physical and emotional rehabilitation.

STRUCTURE OF THE DOCTORAL THESIS

The doctoral thesis entitled *"**Interspecific Emotional Contagion: Human-Horse"*** comprises 134 pages and adheres to current academic and national formatting standards. The work is structured into two main sections consisting of twelve chapters and includes 21 figures, 29 tables, and 181 bibliographic references.

The first section, titled *"State-of-art"* encompasses five chapters across 25 pages. This part synthesizes information regarding the types, origins, and components

of emotions, their adaptive functions, and the similarities and differences in emotional expression between humans and animals **(Chapter 1).** Horses, like other animals and humans, perceive the world using sensory systems that allow them to collect information from their environment, which is then transformed into sensations, organized, interpreted, and experienced through perception **(Chapter 2)**. Horses communicate both intra- and interspecifically through the interpretation of posture, body attitude, facial expressions, and chemical signals, often combined for optimal environmental adaptation **(Chapter 3)**. While equids are capable of learning complex behaviors, a scientific approach necessitates the demystification of traditional equestrian terminology and its replacement with the language of learning theory (**Chapter 4).** The final chapter in this section **(Chapter 5)** presents an overview of equine-assisted therapy (EAT), emphasizing its benefits for individuals diagnosed with neuromotor disorders.

The second section of the thesis is dedicated to original research and comprises seven chapters over 69 pages.

Chapter 6 outlines the research hypotheses and objectives, from which the study design was developed.

Chapter 7 presents *Study 1*, titled *"Assessing Horse Behavior Using a Practical Typology That Combines Temperament and Personality Traits."* This study aimed to establish the practical relevance of consensus around personality metrics in equine research and to propose an accessible, standardized nomenclature for horse temperament and personality types by integrating traits commonly referenced in the literature. Four typologies were identified: energetic/confident, energetic/unconfident, passive/confident, and passive/unconfident. The primary instrument was an online questionnaire administered via the Typeform platform, allowing efficient data collection and secure management. The survey was distributed to 1,300 individuals involved in equine-related activities, including: (1) students from the Faculties of Veterinary Medicine and Animal Science at USAMV Cluj-Napoca, Romania; (2) veterinarians affiliated with the Romanian Association of Equine Veterinarians; and (3) professionals working in handling, training, equitation, and breeding at 78 equestrian centers in Romania. A total of 1,260 responses were validated, with high correlation (over 90%) between specific traits and the proposed typologies, supporting the construct validity of the classification system.

Chapter 8 details *Study 2*, *"Heart Rate and Behavioral Ethogram as Indicators of Acute Stress in Mares."* This study aimed to validate the use of heart rate monitoring (Polar H10 sensors) as a non-invasive method for assessing acute stress in horses. The hypothesis posited that heart rate serves as a reliable stress indicator, and that its simplicity and accessibility would facilitate better welfare practices and improve lay understanding of equine behavior. The sample included 49 lactating mares from Transylvania, Romania (mean age = 11.69 years, SD = 4.38), of various breeds: mixed-breed (n=15), Romanian Sport Horse (n=10), Arabian (n=8), and Lipizzaner (n=6). All mares had foals aged 2–6 months. Housing, feeding, and paddock access were standardized. The study involved two stages: (1) baseline data collection following a 15-minute habituation period with the sensor and (2) a mild stressor involving the

temporary removal of the foal from the mare's visual field. Heart rate was recorded using a Polar H10 sensor placed on the left side of the chest with conductive gel, and behavioral data were collected via video recording (GoPro Hero10®). Baseline and stress-phase measurements were compared to assess physiological responses.

Chapter 9 describes *Study 3*, *"Emotional Contagion in Human-Horse Interactions: The Role of Stress and Body Language in Emotional Transfer."* This study aimed to determine whether emotional contagion from human to horse occurs during direct contact when humans experience stress. The investigation included 33 human-horse interactions at five equestrian centers in Transylvania, Romania. Participants were university students or staff from the aforementioned centers. Horses were maintained under consistent conditions, with no changes to diet, training, or social interactions prior to the study. Experimental preparation included isolating horses in individual stalls and fitting them with heart rate monitors, with a 30-minute habituation period. Human participants underwent psychological evaluation using the State Anxiety Scale and were assigned to high-anxiety (HA) or low-anxiety (LA) groups based on both psychological and physiological criteria. Two interaction styles were designed: (1) *Constrained Style* (CS), in which participants wore sunglasses and mouth coverings and approached horses at a metronome-set pace with hands in pockets; and (2) *Free Style* (FS), where participants interacted naturally. The within-subject experimental design included baseline measurement, the emotional contagion phase, and a recovery period. Data from both species were used to analyze physiological and behavioral indicators of emotional transfer.

Chapter 10 presents *Study 4*, titled *"Equine-Assisted Therapy (EAT): A Holistic Approach to Physical Rehabilitation, Emotional Well-Being, and Social Reintegration in Individuals with Neuromotor Disorders – A Case Study."* The aim was to identify and quantify the therapeutic benefits of EAT in a 49-year-old male subject diagnosed with tetraparesis following a spinal cord injury at the C4 level during a riding accident. After limited recovery over six months, EAT was integrated into his rehabilitation program, including twice-weekly sessions over a four-year period. The intervention was guided by a multidisciplinary team (riding instructor, physiotherapist, psychologist, and the patient) and focused on two goals: (1) enhancing psychological well-being and (2) improving physical function. Assessments included the ASIA scale for neurological impairment and the WHO Quality of Life scale (WHOQOL). Initial efforts targeted emotional recovery due to the impact of anxiety, depression, and low self-esteem, followed by improvements in complex motor function.

Chapter 11 summarizes the main findings and practical recommendations based on the conducted research, while. **Chapter 12** highlights the thesis's originality and innovative contributions to the field.

RESULTS OF THE ORIGINAL RESEARCH

Chapter 7. The results of Study 1 indicate that classifying equine temperament and personality into four typologies provides several key advantages: it enhances clarity and reliability by offering a simplified framework that enables equestrian professionals to rapidly identify a horse's type and apply appropriate strategies. Furthermore, this classification system offers a scientific foundation for behavioral assessment and is supported by statistically significant correlations between traits and typologies. It helps unify terminology and promotes a "common language" for describing horse behavior, reducing confusion stemming from inconsistent terminology found in the literature. The four categories-energetic/confident, energetic/unconfident, passive/confident, and passive/unconfident-form a straightforward yet comprehensive model for understanding and describing equine behavior. This integrative approach is applicable across various contexts, including scientific research, equine sports management, and therapeutic settings. Identifying temperament/personality traits serves as a basis for tailoring individualized training and care methods that align with a horse's natural tendencies, thereby improving both performance and safety in human-horse interactions.

Chapter 8. The results of Study 2 were analyzed and interpreted using statistical methods. Data showed a significant increase in heart rate during the foal–mare separation phase, suggesting that this acute stressor was clearly perceived and experienced by the mares. This physiological response aligns with findings from the literature, which confirm that activation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system directly impacts heart rate under stressful conditions. In addition to heart rate data, behavioral ethograms confirmed the presence of stress, indicating notable changes in observable behaviors. The increase in ethogram scores during the experimental phase, as compared to baseline, reflects a positive correlation between behavioral and physiological responses to stress. This finding is particularly important as it supports the use of heart rate variability as a complementary tool alongside behavioral analysis for detecting and quantifying acute stress in equids.

Chapter 9. The results of Study 3 provide compelling evidence for the existence of emotional contagion between humans and horses. Body language emerged as a major factor in the transmission of emotions from human to horse. By analyzing how horses responded to human emotional states in both free and constrained interaction styles, the data highlight the pivotal role of body language in emotional transfer. In free-style interactions, where human movements were unrestricted, emotional contagion was more apparent, as evidenced by heightened stress responses in horses. In contrast, constrained-style interactions-where participants wore sunglasses and mouth coverings and limited their movements-did not result in significant emotional contagion. These findings suggest that horses do not simply "sense" human emotions directly; rather, they respond to behavioral cues associated with those emotions. The results offer valuable insights for optimizing human-horse interactions, emphasizing the importance of mindful body language and self-regulation in humans to foster calm, productive, and stress-free engagement with equines.

Chapter 10. This case study highlights the holistic benefits of Equine-Assisted Therapy (EAT) for a person diagnosed with tetraparesis, demonstrating its positive impact on physical recovery, emotional well-being, and social reintegration. The patient's ability to psychologically overcome the trauma of the accident by returning to horseback riding played a key role in restoring self-confidence and managing anxiety and depression. Structured physical activities, delivered through hippotherapy sessions, facilitated improvements in motor function-particularly in pelvic movement and core strength-while also helping reduce spasticity, manage pain, and enhance sleep quality.

Emotionally, the patient experienced increased regulation of the autonomic nervous system through consistent interaction with horses and participation in therapeutic riding sessions. This contributed to greater emotional stability, reduced anxiety, and improved overall quality of life. The multidisciplinary approach, integrating psychological, physical, and social dimensions, underscored the therapeutic potential of EAT as an effective intervention for individuals with complex conditions such as tetraparesis. By addressing both physical and psychological needs in a supportive, familiar environment, EAT enabled a more comprehensive recovery process. The patient's return to equestrian activity, combined with structured psychological and psychiatric interventions, proved crucial in rebuilding self-esteem, alleviating emotional distress, and achieving social reintegration. While EAT played a significant role in facilitating physical and emotional recovery, these improvements occurred within the broader framework of integrated care, in which each therapeutic component contributed meaningfully to the rehabilitation process.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

Chapter 11. The general conclusions of the thesis were formulated based on the cumulative results of the research and provide important insights into the dynamics of horse behavior, stress assessment, human-horse interaction, and therapeutic applications. The key findings are as follows:

1. The classification of equine temperament and personality into four distinct typologies-energetic/confident, energetic/unconfident, passive/confident, and passive/unconfident-offers a practical and scientifically grounded framework that integrates temperament traits with personality characteristics. This model supports more accurate behavioral assessments and individualized care strategies.
2. Heart rate and behavioral ethograms are validated as reliable, objective, and non-invasive indicators for assessing acute stress in mares. Their combined use enhances the accuracy of stress evaluation and provides a comprehensive method for monitoring equine welfare.
3. The phenomenon of emotional contagion and affective transfer from humans to horses is demonstrably real. When humans are free to move and express emotions naturally, body language plays a pivotal role in mediating emotional transfer, influencing horses' physiological and behavioral responses.

4. Equine-Assisted Therapy (EAT) has a demonstrable positive impact on physical rehabilitation, emotional well-being, and social reintegration in individuals diagnosed with complex conditions, such as tetraparesis. The holistic nature of EAT makes it a valuable component of multidisciplinary rehabilitation programs.
5. To enhance the understanding and application of emotional contagion principles in equine settings, it is recommended that standardized visual tools (e.g., posters or brochures) be implemented in stables and equestrian centers. These tools should facilitate the rapid identification of equine behavioral typologies by staff and visitors. Their adoption would support effective educational strategies, improve the quality of human-horse interactions, and contribute to better management of equine emotional states.

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