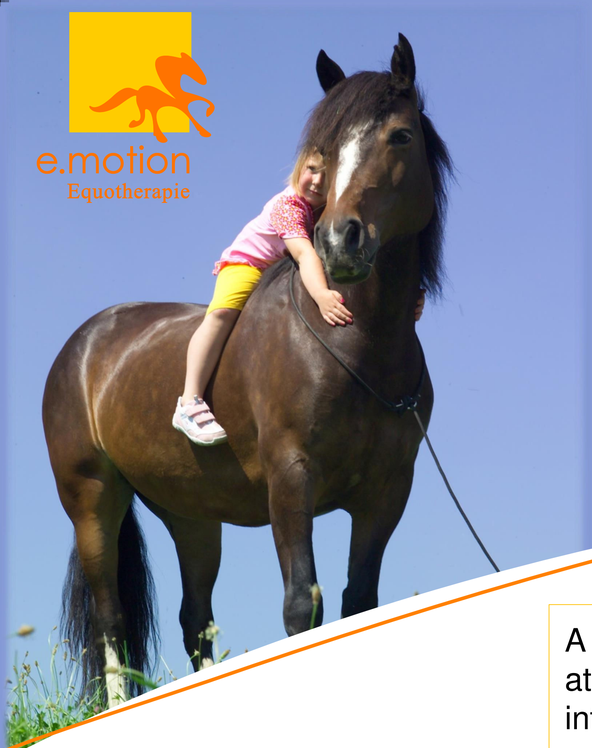


Heart rate, heart rate variability and salivary cortisol as indicators of arousal and synchrony in clients with intellectual disability, horses and therapist during equine-assisted interventions

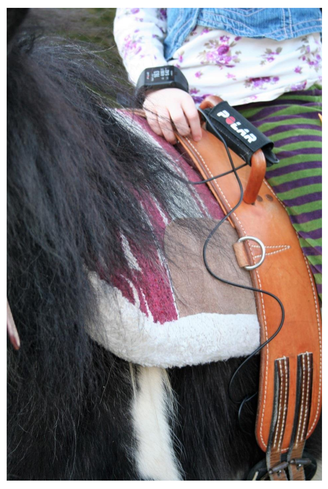
Naber A.[1], Kreuzer L.[2], Zink R.[1], Millesi E.[3], Palme R.[4], Hediger K.[5,6], Jensen-Jarolim E.[2],Glenk L.M.[2]

1. E.motion Equotherapy, Vienna, Austria
2. Comparative Medicine, The Interuniversity Messerli Research Institute of the University of Veterinary Medicine Vienna, Medical University Vienna and University Vienna, Austria
3. Department of Behavioural Biology, University of Vienna, Austria
4 .Unit of Physiology, Pathophysiology und experimental Endocrinology, University of Veterinary Medicine Vienna, Austria
5. Faculty of Psychology, University of Basel, Switzerland
6. Swiss Tropical and Public Health Institute, Department of Epidemiology and Public Health, Switzerland

e.motion

E.motion Equotherapy is a nonprofit organization that has been offering equine-assisted therapy for children at the Otto Wagner Hospital in Vienna since 2003.

Intensive efforts in working with burdened children, young adults and horses over the last decade revealed that synchrony between breath, mood and activity is related to beneficial outcomes of equine-assisted therapy.



"Two preliminary studies with video analysis showed that there are similar nonverbal interaction patterns between horses and clients that naturally occur during mother-child interactions. As a consequence, we are now strongly looking for a deeper understanding of the underlying body and mind effects that help to strengthen those children."

R. Zink, Managing Director
http://www.pferd-emotion.at/

INTRODUCTION

A growing body of research has attributed effects of human-horse interaction to improved bio-psycho-social health. Intellectual disability (ID) refers to impaired intellectual and adaptive functioning (APA, 2018). Equine-assisted therapy (EAT) has been considered a promising practice as complementary treatment of ID (e.g. Borgi et al. 2016), however its feasibility with regard to stress reduction has been questioned (Anestis et al. 2014).

While evidence on physiological benefits such as increased motor control exists (Del Rosario-Montejo et al. 2015), psychological benefits and underlying mechanisms of EAT are not yet fully settled (Kendall et al. 2014).

Effective autonomic and adrenal regulation of arousal plays a key-role in the maintenance of (mental) health and progression of diseases (Glenk & Kothgassner, 2017).

Coordination of nonverbal behaviors between interactive partners takes place during the process of synchronization in many mammalian species. The experience of synchrony roots in the mother-child relationship, and high levels of synchrony have been related to efficient bonding and stress reduction (Aztil et al., 2014; Leclère et al., 2014). All creatures prefer interactions with a high level of synchronization (Atzil et al., 2014) , which can occur even across species (Julius et al. 2014).

AIMS

This study sought to elucidate mechanisms and psychological effects of EAT within the therapeutic triangle (i.e. participating humans and horses, see Figure 1).

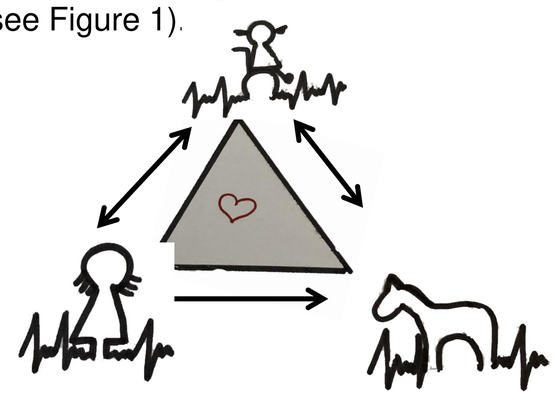


Fig. 1: Therapeutic triangle in EAT. Arrows indicate bi-directional relationships between client, horse and therapist.

Heart rate (HR), heart rate variability (HRV) and salivary cortisol served as objective measures of arousal.
The aims of this study were
1) to investigate physiological effects of a standardized EAT for young adults with ID
2) to explore synchronization patterns between humans and animals
3) to lay the scientific foundation for a continuative study with a larger sample (hypothesis generation).

METHODS

Ten EAT-experienced women (Mn = 21.8, SD = 3.39) with mild (N=5) to moderate (N=5) ID according to the Glasgow Level of Ability and Developement Scale (Cooray et al., 2015) participated in the study and were paired with their favourite (N=5) or an unfamilar horse (N=5). The therapist (N=1) took part with familiar (N=2) and less familiar horses (N=2).
Each client underwent two EAT sessions with the real horse and two control sessions with the same schedule (baseline, relaxation, challenge) but where on-horse activities were carried out on a barrel horse (*see table 1*).

		5 min	2 Rounds	5 min	5 min		5 min	5 min		30 min	
Saliva sampling	S1					S2			S3		S4
Horse		BL1	Walk	R1	CH		R2	BL2		Rest	
Control		BL1	Walk	R1	CH		R2	BL2		Rest	

Tab.1: Study design.
indicates 5 min intervals of HR recordings; BL…Baseline, CH…Challenge, R…Relaxation, S1-S4….Saliva Samples

During relaxation phases, therapist-guided recreation exercises were carried out, while the challenge phase included a simple cognitive-motor task. HR was recorded with a Polar V800 telemetric system (Figuth 2014; Gehrke et al. 2011). The HRV readout included SD1, RMSSD, SDNN, LF/HF-Ratio. SC was measured via enzyme immunoassay (Palme & Möstl, 1997) .

RESULTS

The mean HR of clients during the challenge was significantly lower under the horse condition compared to the control (*p<0.01, see figure 2).*

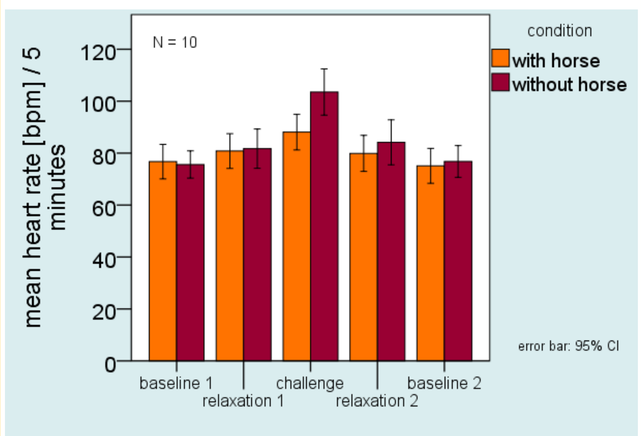


Fig. 2: Mean (±SD) heart rate of clients over the course of a session compared between conditions.

Whereas a decrease in mean HR seemed to be a general tendency over the course of an EAT compared to the control condition, the HRV of clients tended to be higher in interaction with a horse compared to the control sessions.
No differences in salivary cortisol emerged between the conditions except for a non-significant trend toward lower cortisol levels after EAT compard to control (Naber, 2018).

RESULTS

The quality of bond between humans and the therapy horse influenced the HR of the therapeutic triangle. Patterns of synchrony regarding mean HR were found for clients who interacted with their favourite horse (r_s=.38, p<0.05) but not for clients who interacted with an unknown horse (*see figure 3*).

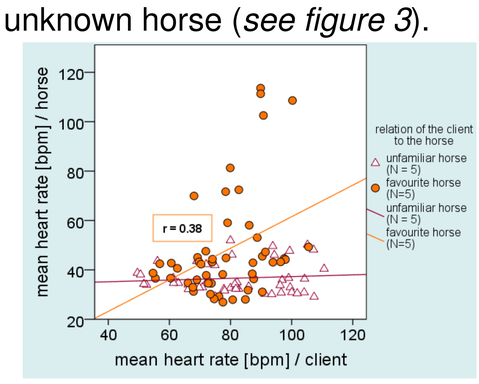


Fig.3: Correlation of mean heart rate (clients and horses).

A stronger correlation of mean HR was found between the therapist and her own horse (r_s=.70, p<0.05) compared to a less familiar horse (r_s=.55, p<0.05, *see figure 4).*

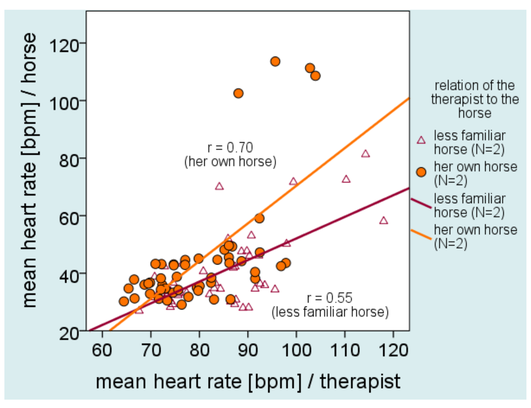


Fig.4: Correlation of mean heart rate (therapist and horse)

The HR of horses appeared to be most stimulated in interaction with familiar humans *(see figure 5).*

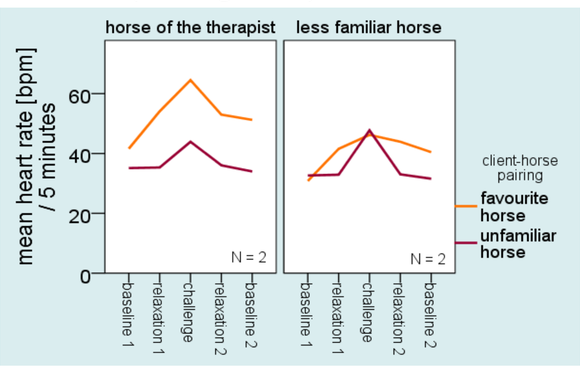


Fig.5: Mean heart rate of horses during EAT grouped after the bond of humans towards the horse.

CONCLUSIONS

Our findings suggest that EAT may effectively modulate stress in humans with ID. Despite the small sample, our data revealed that the horse condition led to lower autonomic arousal during a cognitive-motor task. The trend of data shows a stress reduction, probably because in interacting with horses people with ID feel more understood without the needs of words for communication and resources are activated. Our results further elucidate synchronization patterns in HR highlighting the pivotal role of relationship quality and intensity as modulators of synchrony.

Contact:
Dr. Lisa-Maria Glenk
Comparative Medicine
Messerli Research Institute
Lisa.glenk@vetmeduni.ac.at

e.Motion Equotherapy:
info@pferd-emotion.at