ENCOUNTERING THE OTHER:

AN INTERDISCIPLINARY INQUIRY INTO HORSE/HUMAN INTERACTION

HANA GARTNER

A THESIS SUBMITTED TO
THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF ARTS

GRADUATE PROGRAM IN INTERDISCIPLINARY STUDIES
YORK UNIVERSITY
TORONTO, ONTARIO

July 2017

Abstract

This thesis is a quest for answers to how and why a serendipitous and spontaneous personal encounter with a being from another species broke through the barriers of anxiety and fear and created an ongoing bond. It travels from the personal to the universal exploring how this animal that has evolved over the past forty five million years has gone from serving humans as warrior, labourer and entertainer, to becoming a teacher and therapist. My unique encounter has led me down many intersecting and interdisciplinary paths, exploring why horses are able to relieve human stress and suffering and how humans and horses 'speak' to each other.

I studied human-horse relations through the lens of three intersecting disciplines: environmental studies, animal behaviour and health science.

Much of the literature exploring how two species can co-create a non-verbal understanding of each- other extols the benefits of human-animal interaction (HAI). It relies heavily on qualitative research based on interviews with humans, and observations of animals. Much of the research reinforces an intuitive instinct that animals are good for humans; that they decrease our anxiety, improve social behaviour, and enhance learning. However researchers are still unable to explain the mechanisms through which these benefits are delivered.

Because heart rate is an indication of stress and horses are hyper sensitive to their environment and everything in it, including the human animals in their midst, this study examined the correlation between horse and human heart rates recorded during equine assisted learning sessions. Horses and humans wore portable activity trackers during four one hour sessions involving no riding and minimal exertion. We found no correlation of heart rate variability between humans and horses. Exit questionnaires demonstrated further disconnects

between what participants were reporting they experienced and what their wearable activity monitors were recording. If it is not heart rate, then what is the source of well-being that some interspecies encounters are reported to promote? Can we make a constructive connection between the psychological and the physiological? Stories about the healing qualities of horses abound. However with little available empirical evidence and mixed outcomes, current literature does not make conclusive statements about the effects of HAI in the long term. This is the gaping gap that hopefully will be filled by future study.

Acknowledgments

I most gratefully thank the chair of my supervisory committee, Dr. Suzanne MacDonald, Department of Psychology, York University. In spite of her own impressive workload, Professor MacDonald made me feel as if I was her only student. Her Socratic method inspired me and her enthusiasm motivated me. She was always there telling me: “It’s so interesting”, even when I didn’t think it was. I extend my gratitude as well to the other two members of my supervisory committee. The Faculty of Environmental Studies, Dr. Leesa Fawcett’s engaging classes and conversations steered me into intellectual intersections I had never navigated before. If it wasn’t for Dr. Cheryl Van Daalen-Smith, School of Nursing, I would never have even considered applying for a Masters in Interdisciplinary Studies; another serendipitous encounter for which I am most grateful. But she’ll be the first to tell you, there are no accidents.

My most sincere gratitude and respect to Tracey Evans, Owner/Program Director of Dreamwinds Equine Assisted learning Centre in Bradford, Ontario. Not knowing what my research might uncover, Tracey nevertheless supported it most generously and enthusiastically because she really wanted to know how her program was affecting her horses. She’s an example to be emulated along with Gayle and Daryl Cartier who were most helpful and gracious during my four days at the Cartier Equine Assisted Learning Centre in Prince Albert, Saskatchewan.

A special acknowledgment to Dan and Dorothy McCormick, owners of Duke, who have always welcomed me and encouraged me in my journey encountering ‘The Other’.

Good writing is good editing. Without the invaluable assistance of science librarian Ilo Maimets I really don’t think I would have made it to the finish line.

And then there’s my family; my biggest fans who so patiently put up with my incessant SOS calls for computer assistance, cups of tea and proofreading. I couldn’t have made it without you. Thank you all.

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Epigraph

I met a horse. We made a connection, created communication, and shared communion. While I marvelled at the mystery and miracle of encountering ‘The Other’, especially another animal from a different species, I undertook this investigation seeking insight into what had transpired between us and why. The answer to why interspecific interaction between two individuals with no common language can have such an immediate and profound affect may remain elusive, but the query, like a pebble tossed into the water, has had a ripple effect producing even more tantalizing questions which I pose and pursue in the body of this thesis.

> The scientific mind does not so much provide the right answers as ask the right questions.
>
> – Claude Levi-Strauss.

Chapter One
– I met a horse

Social behaviour and adaptation

That horses have the power to teach, even to heal, has almost become a metaphysical cliché. Much has been written about the mysterious and transformational bond between horse and human, and how animals, in general, can not only measurably reduce stress responses in humans, but also relieve pain and suffering, both psychological and physiological (Klontz, Bivens & Leinart, 2007; Beetz, Uvnas-Moberg, Julius & Kotrschal, 2012). Some scientists suggest this symbiotic relationship is born of a mutual innate understanding of suffering (Bekoff, 2007). Stories about elephants that mourn the death of one of their own, and dogs dying of a 'broken heart' (p. 66) after their human commits suicide (Bekoff, 2007; Safina, 2015), are anecdotes at the intersection of science and poetry (Bekoff, 2007) that speak of the communication of shared emotion. The horse-human alliance has been characterized as everything from a spiritual connection to a partnership that promotes happiness, self-confidence, even transcendence. It cannot be denied. But can it be quantified?

While we are used to hearing primarily about therapy dogs, horses too are being used more and more often in therapeutic situations with adults suffering with everything from depression (Nimer & Lundahl, 2007) to PTSD (Randy, Critchely & Marland, 2014). Equine assisted therapy and learning have also helped children with socio-behavioural and emotional disturbances (Geist, 2011; Trotter, Chandler, Goodwin-Bond, & Casey, 2008). Because of the perceived sensitivity of equines, both to their surroundings and the emotional state of the animals

around them, they have more recently been put in the service of humans to help them become more centered, self-aware and reflective (Hamilton, 2011; Gehrke, 2009).

I have observed all of these types of human-horse interaction and communication firsthand throughout the research process. To date, I have spent well over 100 hours at Dreamwinds Equine Assisted Learning Center in Bradford, Ontario; at Cartier Farms in Prince Albert, Saskatchewan; and in a barn in Lindsay, Ontario involved in my own unexpected, yet surprisingly powerful relationship with a 1134 kg (2500 pound) Belgian draft horse named Duke. It would appear to be a most unlikely association, considering that I've never cared much about horses, and Duke most decidedly did not much care for humans. A history of abuse by previous owners, who wrote him off as a wilfully defiant and dangerous animal, had left Duke with serious, unresolved trust issues. As luck would have it, this incorrigible animal ended up at Belgian Haven Farm, which turned out to be exactly that, a safe haven for Duke. Here, his power, strength and character were admired, not admonished. The qualities others feared and sought to squash were successfully redirected to the competitive arena of horse pulling where Duke excelled. He appeared to have the will to pull and the heart to win. However being well treated and cared for did not noticeably ameliorate this horse's aloof and suspicious nature. Some animals clearly enjoy the attention and touch of humans. Not Duke. His powerful build, extraordinarily large size, and intimidating demeanour very eloquently cautioned humans to keep their distance, which made my chance encounter with this imposing animal all the more intriguing. Even though Duke belongs to a species about which I knew little, he captured my imagination and propelled me down a path of inquiry which presented me with the endless questions I am compelled to seek answers to. While I have on occasion shared my life with dogs, I wouldn't call myself an 'animal lover', but Duke had me at hello. He was also the one who

made the first move. While it may sound like a soft focus slow motion scene from a cheesy rom-com, I can still recall Duke standing at the far end of his spacious pen, looking right at me. Interestingly, in spite of his extraordinary size, I felt no fear. Then, very slowly, he walked right up to me. There were other people there that day, including Duke's owner, which made me wonder why Duke chose me. Why did I sense some softness about him, and why was I compelled to return to Lindsay to spend more time with him? What is the source of the energy between two individuals that creates a bond and affects a change in both? Is it simply a squishy, hard to define psychological or emotional interaction, a sensory response, akin to 'love at first sight'? Or is it part of a more complex physiological reaction that can be measured and analyzed?

Two organisms from different species, with different natures, coming from dissimilar cultures meet, and an attachment is formed. It's a nice story but it's not science, and anecdotes, in themselves, are not quantitative data. While reports about the human benefits of bonding with other animals are powerful and compelling, they do not, for the most part, answer the very fundamental questions: how and why?

Perhaps because horses and humans share such a long evolutionary history we may sometimes conflate anecdotal wisdom and scientific fact. To date, much of the literature exploring how two species, in the absence of a shared verbal language, can co-create a non-verbal understanding of each other relies on qualitative research based on interviews with humans, and observations of animals. The results are exciting, even promising, strongly reinforcing ways in which horse-human interaction in therapy and learning can benefit humans psychologically and physiologically. Unable to explain the mechanisms through which this benefit is delivered, most research concludes with recommendations for further investigation

employing more exacting research standards, larger sample sizes and better control groups (Klontz et al., 2007). Also, there has been a dearth of research on the actual impact of these inter-species encounters on the non-human animal.

An interdisciplinary approach

Interspecies communication is by its very nature a truly interdisciplinary subject, involving multiple branches of science including biology, psychology and communication theory, which seek to find new ways of understanding the human-animal relationship (Shapiro & DeMello, 2010). Until very recently, study of the horse-human equation emphasized the human benefits exclusively. I hope to add to this field of knowledge by examining three aspects of horse-human interaction: behaviour, communication, and their impact on the health of both species. Through my work in Environmental Studies I have been exploring the nature of Human/ non-Human relationships; how our separate ways of being and acting within our own societies and cultures impacts the other. This has led me to wonder about the ways humans and horses 'speak' to each other, and how to characterize or measure that communication. Through readings in the Health Sciences, and from my own personal experience, I have been researching the source of the well-being that some interspecies encounters are reported to promote. Through my study in animal behaviour, I have investigated a new technology that objectively measures a horse's vital signs, activity, and movement. Recording comparing certain aspects of human-horse interaction that may help inform humans how to better interact with and care for their animal partners.

I needed to understand this curious relationship with an animal I had never really encountered before. I thought perhaps measuring an aspect of the bond could help explain our connection; that the physiological would help illuminate the psychological.

A lengthy entanglement

Equis caballus has been serving *Homo sapiens* for well over five thousand years (Goodwin, 2010). Evolution and environment have influenced their social behaviour and go a long way to explaining human horse partnerships (Davis, Maurstad, & Dean, 2014). Horses have always worked. They cleared the land, transported goods and people, and carried men to their death in battle. Hippocrates was the first to describe the benefits of horses for rehabilitation purposes, calling horseback riding 'universal exercise' (Hardy, 2011). Linda Kohanov (2001) argued that the natural nomadic spirit of the horse instigated a merging of species - human and horse - "into a single herd of mutual influence and cooperation" (p. 54). This lengthy entangled association between horse and human, along with many features of equine behaviour, suggest a predisposition to interspecific co-operation (Goodwin, 2010) which has altered with the times. As society changed, so has human use of this animal: from warrior to farm labourer, from performer and competitor to therapist and teacher. Horses, unlike other animals, have become more like partners to humans than companions (Burke, 2008). What has remained constant, for the most part, are attitudes about the horses' welfare and suffering which still take a back seat to human need and greed. Perhaps that is in part because human perception has evolved under very different evolutionary conditions. As our relationship moved from predation to partnership (Goodwin, 1999), we neglected to better learn our partners language, often resulting in a misreading of the horses' wants and needs. For example, the assumption from the human perspective is that a horse would enjoy his own stall in a warm stable where he could be fed and kept safe. The horse, on the other hand has not moved so far from his evolutionary roots. That safe stable goes against all its survival instincts. Being a herd animal, a tight enclosure can make the horse feel isolated, imprisoned, and vulnerable. Because these prey animals are always on the

lookout for possible predators (Goodwin, 1999) they can get very anxious and feel trapped when prevented from observing their surroundings. Sometimes humans' best uninformed intentions can and do have unintended consequences that can have damaging and long lasting effects on the horse. It is an important consideration, because while our use for workhorses has diminished, their nature and their power have continued to attract our attention, interest and money. The Canadian equine industry contributes more than $19 billion annually to the national economy and supports more than 154,000 jobs in Canada (Canadian Equine, 2012). What I am proposing is a reimagining of the horse-human relationship. By linking lived experiences with a more nuanced appreciation of the animal's perspective we can better create new forms of 'we' (Haraway, 2008, p. 5). If we learn to better understand what they're 'saying', our interactions can become more stimulating, less controlling and hopefully lead to better, more enlightened welfare strategies. This requires bridging a nature-culture of the horse-human divide (Davis et al., 2014). Humans are the ultimate predators who throughout history have sought to control and colonize. Not the horse. Social dominance carried far less of a reproductive advantage in this species, since conflict in the group serves only to increase instability and decrease chances of survival (Goodwin, 1999). Cooperation within the herd creates an early warning system that protects the horse from being preyed upon. Conspecific cooperation, heightened sensitivity, and the ability to read body language are survival traits that have been exploited during domestication. A horse's willingness to work is a trait resulting from 600 years of genetic selection and selective breeding (Hanson, 2014).

He had me at hello

Racing, rodeos and riding stables have never particularly interested me. Until meeting Duke I never paid much attention to horses at all, except perhaps admiring them in pastoral

tableaus through a car window. That is precisely why my journey with The Horse is so intriguing. It was at a fall fair in 2014 that I encountered something I'd never seen before; a contest in which a man holding on to the reins of a pair of horses, with a cumulative weight of over 2300 kg (5070 lbs.), walks behind as they attempt to pull a sleigh filled with concrete slabs weighing up to five times their body weight, over a distance of four and a half meters (15 ft.) See Supplementary Materials 1 for video.

Image 1. Orangeville Horse Pull 2014
Photographer: Dorothy McCormick

I didn't get it; powerful animals straining against extraordinary weight in a testosterone-soaked arena. This is very much a man's world. Even though I couldn't relate to it, I remained fascinated and transfixed by it. One equine competitor in particular captured my attention. He looked pretty cocky, strutting about looking every bit the champion. Even from the stands, it appeared to me that this broadly built Belgian draft horse really wanted to do this thing that was being demanded of him. He exuded determination; a fire in his belly that made him dig deep and

pull with everything he had! This is a trait that has after all been bred-in-the-bone. The Belgian, one of the strongest draft breeds, has consistently held the record for the tallest and the largest horse in the world. But what attracted me most about this particular Belgian was his attitude, a quality, a singularity that made him conspicuous. He not only had the confidence of a winner, he had what it took to be the undisputed victor that day.

Image 2. Duke's very first encounter with me February, 2015.
Photographer: Samm Griffin

I wouldn't be introduced to Duke until four months later when I paid him a visit on a very frigid February weekend at Belgian Haven Farm in Lindsay, Ontario. He stood there looking right at me from the other end of his spacious pen. Then, very slowly he began his approach. With me being five feet tall (152.4 cm), and Duke, over eighteen hands (185 cm) high, I was forced to look up when he stood beside me. He lowered his head and cautiously sniffed my hand. Not yet knowing anything about his history, I was drawn to this animal. It was mutual. Duke's owner, Dan McCormick, appeared somewhat taken aback when he said disbelievingly: "you two are communicating"! It's difficult enough to explain *human* attraction. How then would one begin to characterize an immediate human-animal bond? There were after all 20 other horses in the barn. Why Duke? Popular publications by experts have much to say on the subject. Linda Kohanov's "The Tao of Equus" (2001), provides an interesting and provocative perspective. Her own deep relationship with her horse led Kohanov to a new sense of self, and a new calling; helping others to heal and grow through equine assisted therapy. The story of Kohanov's sensitivity to the power of her horse resonated with me; her explanation intrigued me. Kohanov

attributed her powerful human-horse attraction to a "morphogenic field". She believes whirlpools of energy connect everyone and everything, that nothing ever dies and all thoughts are forever. Kohanov claims to be able to look deeply into the eyes of her horse and communicate with the "Voices of the Ancestors" (p. 41-71) who can interpret horses and people's emotions and channel them back to her. Others attempt to describe that intangible, metaphysical state of connectedness similarly. Biologist Rupert Sheldrake (1999) calls it "morphic resonance" echoing Kohanov's explanation that all of nature participates in a giant collective memory. Sheldrake posits that a strong animal-human bond is due to telepathy, precognition and extra sensory perception. He provides numerous anecdotes about various animals' extraordinary feats, such as dogs knowing when their owners are coming home. Sheldrake (1988) explains they're able to intuit this by telepathically picking up the owner's intention to come home from many miles away through "organizing fields of animal and human behaviour, of social and cultural systems, and of mental activity" (p.112). These are terms and concepts beyond the limits of established science. But does that mean they are totally without merit? After all, our bodies have mass, generate heat, pump fluids, and have millions of electric signals which are constantly being transmitted through our nervous systems. The phrase 'energy field' permeates pop culture, suggesting energy is a thing unto itself that can be transmitted and shared. Sceptics and mainstream science define 'energy' differently; as a measured, quantified amount of work capability, such as kinetic, mechanical, or the chemical energy that our bloodstream absorbs from eating a steak for example (Dunning, 2014; dictionary.com, 2016). But how then to explain the energy inherent in the communication, I experienced and others observed, between me and this individual from another species? Rhetorician George Kennedy (1992) argues that all animals, human and nonhuman, constantly navigate rhetorical situations by delivering gestures

to an audience with a specific purpose. He sees language as less of a distinguishing mark of human exceptionality and more of a commonality given the evolutionary origin shared by many animals. **“** Rhetoric in the most general sense may perhaps be identified with the emotional energy that impels the speaker to speak, the physical energy expended in the utterance, the energy level coded in the message, and the energy experienced by the recipient in decoding the message” (Kennedy,1992, p. 2). Anyone with a pet understands this. Scold a dog and he gets the message. The animal isn’t reading your mind or necessarily comprehending the words you speak. He understands your displeasure by the tone of your voice, the look on your face and the position of your body. He is reading your behaviour and you his. There is an empathetic understanding. This is reflected in John Peter’s (1999) definition of communication: “the occasional touch of otherness” (p. 256). “The task in animal communication is to find a fellow intelligence in a body of a different shape and species. The task is to find affinities not limited by our anthropomorphic dispositions” (p.256). “…‘Communication’ gives us an image of humanity not as standing on an ontological ladder betwixt the beasts and the angels, but as a nexus within a biological network and circuit of information flows” (p. 230-244).

The most common thread among all who write on the subject of animal human communication is: do not underestimate animals, they are smarter than we think they are and capable of much more than we assume (Sheldrake, 1999; Kohanov, 2001, Frans De Waal, 2016). That too is Temple Grandin’s conclusion (2005). As profound as her personal triumph over autism may be, she still feels completely alienated from human emotion and interaction; however, among animals she is at home. Grandin makes the point that we’ve lost touch with animals, focusing not on our relationship to them, only their use to us. She maintains it is animals

that make us human, if we can only learn to talk to them and listen to what they have to say (Grandin, 2005).

No one had ever listened to Duke. They only punished him. His present owner, Dan McCormick himself characterized the 13 year old horse as aloof, unpredictable and dangerous; this coming from the man who has been training, feeding and caring for Duke for the past nine years. Yet even though McCormick prizes Duke above all the other horses in his stable, Duke still would not voluntarily approach Dan or take the treats he offered. McCormick grudgingly confesses that there have been times when he was afraid of Duke (McCormick, personal communication, May 25, 2016). He's not alone. The farmworker at Belgian Haven still will not to go into his pen alone.

Duke's past is not pretty. His previous owners called him 'Devil Horse' and treated him accordingly. Submission was their goal and domination their preferred training method. They admitted they would tether one leg, putting the horse off balance then yank him to the ground, pinning his head under the steel bucket of a skid steer. The animal was left alone to squeal and struggle long into the night. Duke was crazy; crazy with fear. Unable to break the Devil Horse's spirit, they decided to just get rid of him. The subsequent owner, also unable to handle him, sold the horse to Dan McCormick, who had had his eye on him for a long time. But something inside Duke was broken. He trusted no one and everyone was afraid of him. So, why was I not scared of this leviathan of a horse? Why, when he deigns to accept an apple from his owner, he gobbles up all the carrots and apples I proffer?

Encountering 'The Other'

Image 3. A herd of two - Selfie

Since our first meeting over two years ago, I have been driving from Toronto to Lindsay to visit with Duke whenever I could, never ceasing to wonder why it is that we both so clearly enjoy being in each other's company. I demand nothing of Duke. I simply am with him, sometimes for several hours. Initially, I was embarrassed to admit I was spending so much time with a horse. Judging by the reaction some had to my newfound 'friend'; they clearly thought it a bit bizarre. But the experience was clearly so mutually satisfying that eventually I stopped fearing what others would think. I began documenting our time together with the camera on my cellphone, capturing the calm, serene, and sometimes very amusing moments we shared. It's uncanny how Duke always seemed ready for our 'selfies', appearing to look right into the phone at the end of my outstretched arm. None of the more than 300 images (see Supplementary Materials 2) I have taken over the last couple of years would lead you to believe this 'Devil Horse' is anything but a pussycat. Does Duke have any concept of what he observes? Does he see himself, or me, or does he simply enjoy being close to me? Science tells us that individuals of most species, except for some great apes, possibly dolphins, elephants and magpies cannot recognize their own reflections. Even humans under the age of 18 months are unable to pass the (MSR) mirror self-recognition test (Gallup, 1970); reinforcing a claim that self-recognition requires self-awareness and relies on a form of introspection as a crucial criterion (Griffin, 1992).

Image 4. From 'Devil Horse' to 'Pussycat' - Selfie

While most would agree that animals have minds, disagreement abounds when it comes to discussion around how those minds might be operating (Andrews, 2016). Attributing mental content to other species invites a charge of anthropomorphism. So I attempt to check the instinct to anthropomorphise Duke's behaviour at the barn door, trying not to make unjustified generalizations about this non-linguistic animal. What then do I make of the endless images of Duke snuggling up to me? They have not been edited to support any theory, nor have I intentionally eliminated images, save for those that are useless because they are blurred, out of focus or come in a burst of 20. So what does Duke 'think' about our routine with the camera? Is there a connection between the content of what he perceives and the behaviour that is demonstrated in his action (Beck, 2012)? Duke's consistent behavioural response to the camera is to come close when I present it. Is Duke's response simply due to learned operant or instrumental conditioning (Skinner, 1963)? It should be noted that I have never consciously trained him to respond this way by rewarding the behaviour with praise or treats of any kind. Perhaps Duke has become so habituated to seeing me with this 'thing' in my hand he associates it with his desire to be close to me, which he appears to enjoy. Perhaps the pleasurable sensation of proximity is the 'reward'. Perhaps we have become a herd of two given that one of the strongest positive social signs that horses give is their desire to stand very close to another horse with whom they have become 'friends' (Leste-Lasserre, 2016).

When I admit how much time I spend in a barn just hanging around with a horse, I'm inevitably asked: "Do you talk to him"? My response is equally incredulous: "It's a horse"! Not expecting Duke to understand English I don't use many words, I simply try to meet this animal on his own ground, sharing, observing and intermittently recording our relationship. First I took the snaps for my own amusement, then noticing a pattern in Duke's demeanour and body

language, I realized these images of his behaviour could be a useful record of what this animal might be thinking or feeling. Is Duke able to think without words? Critics suggest animals, lacking language may not have concepts, and without language, scientists are not in a position to attribute content (Andrews, 2016). Others are uncomfortable attributing thought to animals because they doubt whether animals can reason because that would require reflection, which means they can think about their thoughts. And because language is necessary for such thoughts they conclude animals do not think (Beck, 2012; Chomsky, 2006). Because Duke doesn't think like a human, does it mean he doesn't think? Should the question even be whether animals have or don't have human-like language? Perhaps instead of finding out how much they are like us, the more relevant questions revolve around how animals communicate their experience of their world to us and each other. If animals are to be measured only against a human yardstick, will they not always fail by comparison (Noske, 1997)? A perennial example of an animal's ability, or inability, to think is the story of Clever Hans, a famous horse in turn of the century Germany. The animal's devoted trainer enthralled audiences with his horses' miraculous mathematical feats. Hans could add, subtract, multiply and even divide, tapping out the correct answer with his hoof. Eventually it was discovered the whole act was a fraud. Hans was not actually thinking about numbers. He was responding and reacting to the imperceptibly subtle body language unconsciously communicated by the human asking the question (Noske, 1997). Ever since Hans and his trainer were exposed as fakes, scientists have been using the story of Clever Hans as a "definitive example of mistaken inference of complex mental abilities in animals" (Griffin, 2001, p.30). That scientific denunciation has mushroomed into a blanket denial that animals have even the simplest conscious thoughts (Griffin, 2001). Hans not being able to add added up to: Hans can't think. The fraud totally wiped out the fantastic. While rigor and caution are essential to

good science, perhaps something extraordinary has been overlooked in ignoring the fact the horse was accomplishing a significant and quite remarkable feat. Hans was singling out one person in the crowd and catching the smallest most inadvertent movement they didn't even realize they were making while anxiously focusing on whether or not the horse would come up with the correct answer. Body language and facial expression communicated the correct answers. Hans was clever, very clever, just not in the way everyone thought. But was he thinking? Was he aware or simply reacting to stimuli in the same way as any other horse in the wild would?

Horses are ever vigilant. They are always aware of and responding to the most minute warning signals in body language of their own, and any other species, in their midst. It is an integral part of horse/ herd dynamic (Goodnight, 2007). Domestication has exploited this survival strategy (Goodwin, 1999) and has influenced the evolution of both humans and horses, who've become who they are through their interactions with The Other (Smuts, 2005; Brandt, 2004).

Charles Darwin argued animal signals, while species-specific, are expressions of emotions with the function of relaying the signaller's emotional and motivational states (Darwin, 1886; Andrews, 2016). Duke's actions appear to be an expression of his emotions. While he may not have a concept of self, akin to my self-concept as a unique mortal who is able to reflect upon itself, Duke does recognize me to be an individual different from the others he knows, and is an active participant in our unique relationship. His behaviour suggests he not only remembers me and the activity related to the thing in my hand, but he also appears 'happy' to see me, as I have recorded countless times in my journal. What is 'happy' for a horse? I choose to agree with Carl Safina (2015) who has written extensively on what animals think and feel: "Sometimes when an animal looks happy to see you, it's because he is happy to see you"

(Safina, 2015). Sadly, Duke's owner laments that this horse, which he admittedly loves, never exhibits similar behaviour with him or anyone else. McCormick has repeated on more than one occasion that his volatile horse has mellowed over the last two years as a result of my influence. Duke has become rehabilitated and is no longer the aloof, unpredictable and unmanageable 'Devil Horse' (McCormick, 2016). Horses remember their interactions with humans, and those experiences can profoundly influence how they view and communicate with other humans in the future (Sankey, Richard-Yris, Leroy, Henry, & Hausberger, 2010).

As it turns out, our association has had a serious and beneficial impact on both of us. In *When Species Meet*, Donna Haraway (2008) talks about how animal and human may be joined, in a bond of respect and caring which can and often does lead to a change in both species. "As ordinary knotted beings, they are also always meaning-making figures that gather up those who respond to them into unpredictable kinds of "we" (p.5)." A useful definition of conspecific as well as interspecific communication is: when information is exchanged between a sender who signals and a receiver whose behaviour changes as a result of the stimulus (Andrews, 2016). It may not be the functional communication that occurs between Duke and the other horses in the barn, but our own personal heterospecific coevolution has objectively brought significant changes not only to Duke but me as well. After an absence of forty seven years, I returned to university entirely as a consequence of my encounter with The Other, searching for answers that might explain the source of this inter-species communication, because clearly Duke and I have produced and exchanged messages and meanings (Danesi, 1998, p. 283). How does one decipher a message

Image 5. Co-creating a common language. - Selfie

without a common language? In the human/animal binary, verbal language has always held a privileged status. Meaning is what it means to humans. Yet while human speech is perceived as the superior means of communication, one of the most frequently quoted statistics is that 93% of all daily communication is nonverbal (Mehrabian, 1981). That number may be disputed (PsyBlog, 2007), but not the fact that nonverbal behaviour is a crucial aspect of any communication (Knapp & Hall, 2009). Is the perceived horse-human connection a true intersubjective experience or simply an anthropomorphic response to an animal upon which we project our own feelings of love, compassion and empathy? Is Noam Chomsky correct in maintaining that human language and animal ways of communicating are totally incompatible, and that animal communication does not deserve to be labeled language (Chomsky, 2006)? The assertion appears to be that human language is an intellectual response. Whereas animals, because they are not self-aware enough to know they are transmitting messages and meanings, are simply reacting out of an evolutionary, conditioned reflex. Still others argue that variations in animal sounds are used in specific social contexts to carry specific meaning (Noske, 1997). It is our anthropocentric bias that denigrates and devalues animal 'communication.' It has been pointed out that many species including apes', elephants', wolves', bees' and dolphins' communication serves a social and communicative purpose (Noske, 1997; Bekoff, 2007). Most recently, in a breakthrough discovery in animal vocalization, songbirds known as Japanese Great Tits have been shown to create their own complex, structured language. Suzuki, Wheatcroft, & Griesser (2016) have discovered evidence that animal communication systems share many of the basic properties of human language. For example, mammals and birds can use specific call types to denote specific objects, and Japanese Great Tits can send out a compound message by combining different sounds (Suzuki, Wheatcroft, & Griesser, 2016).

The 'language' of horses

Head, hoof, tongue and tail, the entire body of the horse, sends signals that communicate emotion and intent. What horses can't say in words, they communicate with their bodies (Brandt, 2004). It's taken over fifty million years of evolution for horses to develop their own extremely effective nonverbal language (Hamilton, 2011; Roberts, 1997). Modern domesticated horses live in conditions very different from their wild ancestors, which includes being asked to ignore their own natural instincts and submit willingly to new and stressful situations. That this quintessential prey animal submits to and accepts the ultimate predator as leader (Brubaker & Udell, 2016; Roberts, 1996; Evans, 2010; Hamilton, 2011) would in itself be a source of great stress. Horses are by nature skittish (Keaveney, 2008). Every fibre of their being is primed for flight at the first hint of danger (Beetz et al, 2012; Hamilton, 2011; Gehrke, 2010). What makes horses afraid? Almost everything (Evans, 2010). In spite of the fact there are no longer natural predators lurking around every corner, the horses' evolutionary instinct tells him there still are. This powerful drive to avoid being eaten puts the horse on constant alert (Goodwin, 1999); always fearful of something, anything and everything that may suddenly jump out and devour him. It is a continuous connection through millennia to their ancestors that makes these huge but fearful animals ever wary and watchful. It is also what can make them unpredictable and dangerous. For a horse, fear can sometimes be a more punishing emotion than pain (Grandin, 2005). But it is also part of what makes horses appear to bristle with vibrancy and dynamism: an energy emanating from a hypersensitivity that reacts to tension in humans with the same alarm as if it were exhibited by equine companions (Goodwin, 1999). This ability to communicate silently by focusing on the states of others has adaptive advantages (Goodwin, 2002), because survival belongs to the silent and the swift (Hamilton, 2011). Horses are so keenly aware and sensitive

that they are able to detect not only fear in others, but also a heartbeat from over 68.58 meters (75 yards) away (Cartier, 2015); a significant capability in predator detection.

"Horses speak and listen with their skins" (Noske, 1997). They communicate with every flick, flinch and muscular contraction (Brandt, 2004; Evans, 2010). This highly developed set of physical characteristics, an acute sense of smell and hearing, and an almost 369 degree field of vision alerts horses to the slightest novel sensory stimulus (Keaveney, 2008). Perpetually searching for safety, they are primed for flight. It is their primary survival instinct. So while potential danger keeps them vigilant, the protection of the herd keeps them safe. Unlike the predatory dog which relies on the pack for food, the horse relies on the herd for comfort, safety and security (Goodnight, 2007; Hamilton 2011). So much so, that a horse will leave food for safety, unlike the dog which will leave safety for food (Goodnight, 2007). Horses remember and react to new situations based on old experiences. It's not uncommon for a horse to resist returning to a spot where once something spooked him. While highly reactive, horses are not great problem solvers. Some researchers think they are unable to figure out the source of their distress, or what it might mean; they just want the annoyance to stop and will do anything in their power to escape (Goodnight, 2007). They run, but they can't hide; especially from humans. Despite thousands of years of coevolution, horses have retained many of the same survival traits their ancestors had developed (Evans, 2010). Recent research suggests that the natural social behaviours of horses could have primed them for domestication which may have helped the horse acquire another survival technique by shaping the way horses pay attention to social cues of the humans who feed and breed them (Goodwin, 1999). The fact that horses are such excellent communicators, that they are able to recognize one another's facial expressions, body language and a variety of contact calls may have helped them cross the species barrier to understand

human cues, including their ability to assess human facial expressions (Smith et al., 2016). This was born out in an experiment that involved showing twenty eight domestic horses large photos of human faces with a variety of expressions like anger and happiness. The photos of angry faces triggered negative responses in the horses. Their heart rates increased significantly when they stared at the photo with their left eye which in the mammalian brain is processed in the right brain hemisphere. The left eye is usually the 'rapid reaction' side, and the side the horse prefers to have anything it is unsure about. It's also the side on which most horses learn more quickly and the side they prefer to see humans. Because of their eye placement on the sides of their heads, the horses would deliberately shift their heads so they could view the angry photos with their left eye (Smith et al., 2016). Interestingly, Duke would shift his head so he could look at me through his right eye. It always appeared softer to me.

Image 6. Through his right eye. - Selfie

History will attest to the fact that as predators, *Homo sapiens* generally appear to be goal oriented reward seekers with an inclination towards colonization and control. Horses don't want that kind of pressure. They adapt, try to please, and are willing to accept a dominant leader, even if it's from a different species. These animals just want to be left in peace (Hamilton, 2011; Goodnight, 2007). But too often their super sensitivity and highly reactive natures have been misinterpreted by humans. Experts agree deficiencies in knowledge of horse language and behaviour may be the leading cause of horse-related accidents (Hamilton, 2011; Goodwin, 1999). I encountered a

most sobering example of the consequences of interspecies miscommunication at Cartier Farms in Prince Albert, Saskatchewan. Owner, Daryl Cartier's life is horses. He began riding long before he could reach the stirrups, becoming an award winning competitor and professional horse trainer for over 20 years. Daryl Cartier attributes his success to always working with the horses' well-being foremost in his mind and his uncanny ability to communicate with them. He half-jokingly claims to like horses more than people because he understands them better. It's all about respect and trust, and the ability to understand and correctly read a horse's body language. He explained this while inside a round pen with a horse he was rehabilitating. He was having two simultaneous conversations - with me, and with the horse. The one with the horse was silent. As Daryl moved around the pen, his body was communicating what he wanted the horse to do, most often positioning himself at a 45 degree angle between the horse's head and left shoulder, the most effective and safest place from which to communicate. Daryl explained when approaching, to avoid our predator instincts and behave more like a prey animal. Not to look the horse in the eye or march up to the horse's head. And if you act calm but are tense, you won't fool the horse. He knows how you're feeling sometimes better than you know yourself. Miscommunication can be very dangerous as the steel plate in Daryl's jaw attests to. Daryl almost died when a horse he was working with reared, coming down on his head and almost killing him. Daryl doesn't blame the horse at all, saying it was his mistake for making the wrong move that communicated the wrong message (D. Cartier, personal communication, October 13, 2015).

To understand what a horse is 'saying' (his intention) a human needs to pay close attention to every aspect of the animal. The ears speak volumes: depending on their position the horse is either paying attention, preoccupied, in discomfort or fearful. If the ears are pinned to

the back of its head you know this horse is mad. Facial muscles are as telling as the tail. Are they tight or relaxed? And as in humans, a horse's eyes can help communicate emotion. They can be frighteningly piercing or soft and inviting. But unlike humans, horses have monocular vision which enables them to see about 160 degrees in either direction with two blind spots: one right in front, between their eyes, and the other right behind them. Only now do I realize how significant it is that Duke often lowers his head and presses the space between his nose and eyes against my forehead. It is the ultimate expression of trust for a horse to allow a human to touch a part of his anatomy he cannot see (Roberts, 1997, p.32; Evans, 2010).

Duke and I may share some sort of bond but we perceive each other in a very different context. Human and non-human animals experience the world very differently. They see, smell, feel, taste and hear through their own lens and frame of reference (Noske, 1997; Evans, 2010). Each inhabits its own *umwelt*: the world as perceived by organisms within it. The mind interprets the world for the organism; consequently human and horse may share the same environment but different *ümwelten*. Nor should we assume all animals share the same perceptions of a shared environment. A dog or cat sharing the same barn will respond and react as if occupying totally different worlds. This only serves to make my bond with Duke even more mystifying. It is the paradox that's the hub of the horse-human connection that two species without a common language occupying the same world but perceiving it differently, one prey the other predator, could learn to trust and respect each other.

Some common beliefs maintain that horses have a brain the size of a walnut, (it's one third the size of the human brain (Goodnight, 2007)), are not very intelligent, and are simply the result of good breeding and expert training (Hanggi, 2005). Others maintain horses manage not only ordinary daily cognitive tasks but mental challenges as well (Hanggi, 2005). Coming from

very different cultures and attitudes, the co-evolutionary effects have impacted horses and humans differently. Instead of learning the language of the horse, humans have insisted on bending it to their will (Goodwin, 1999; Brubaker & Udell, 2016), understanding 'training' to mean making the animal understand who's boss - 'breaking him'. Perhaps a vestige of human exceptionalism rooted in the Old Testament dictum: "…And he (man) shall have dominion over the beasts in the field" (Genesis 1:26). It is this bias of human domination that maintains the staus quo and the "object status of animals" (Noske, 1997, p. 101). Despite their being huge and potentially dangerous, horses amazingly still submit to being used as a tool, a resource, a captive labour force, and a vehicle in sport and recreation and entertainment. They serve and strive to please.

Language and the ability to analyze and rationalize may have served humans well, but they have also severed us from our more visceral and intuitive instincts which challenges us when trying to reach across the species barrier. How can we meet The Other on his own turf with acceptance and compassion? We know horses perceive their worlds differently than humans do, and that we will never really be able to know for certain what a horse is thinking or feeling, but we can get some clue by observing and responding to its behaviour and by learning his language and perhaps reconnecting more with our own animal intuition. Traditionally, scientists studying animal communication have focused on traits that humans also have, such as body language. But by thinking about the world as a horse experiences it, scientists can gain more insight into how these animals share information (Wathan, 2016). For example, a horse's large, highly mobile ears can help the herd by indicating where to direct its attention. This is one way in which these social animals interact: by watching each other's backs and keeping a lookout for potential predators while others are busy eating or looking for food. We know horses have very good

vision – better than that of dogs or cats- but the use of facial expressions has been overlooked (Watham, 2016). Jennifer Watham (2016) hypothesized that horses could use ear direction as a cue for where to look and if they should pay attention to something in the environment. To test this idea, horses were first photographed in a pasture looking at one of two buckets of food. In one set of photographs, the horse's ears were covered. In a second set, the horse's eyes were covered. A third group of photos showed the horse's head as normal. Then researchers turned these photos into life-size pictures for a horse to look at as it chose between one of two buckets of food. Preliminary experiments established that the horses were able to recognize that they were looking at another horse in the photo. When horses looked at a photo from the third set, where both eyes and ears were uncovered, they picked the bucket of food the horse in the photo was looking at about 75 percent of the time. When either the eyes or ears were covered by a mask in the photo, the observing horse selected between the two buckets of food more or less randomly. However, the horses performed slightly better when the photo showed the ears uncovered than when it showed the eyes uncovered. The study represents the first evidence that horses can signal information about food to each other (Smith, Proops, Grounds, Wathan, & McComb, 2016). That the horse's head speaks volumes became evident when I referred to my own journal notes and the photographs (see Supplementary Materials). The most significant point of interaction between me and Duke was his head: ears, eyes, nostrils, and especially the mouth, which every handler holding on to a horse's reins will appreciate. The mouth is considered the point of 'contact'.

Image 7. Point of Contact - Selfie

It is so sensitive it will respond to stimuli that are almost imperceptible (Warren-Smith, Curtis, Greetham, & Mcgreevy, 2007).

Duke demonstrated the point during a visit when I found him particularly communicative. Feeling tired I found an overturned bucket I used as a stool which brought me very low to the ground, so low I was looking underneath his belly. He came over and bent his head very low so I could scratch his forehead which he loved. I made no eye contact while stroking the side of his head, his nostrils and his lips. Then Duke began to groom me. With his lips soft and without any rigidity, he began gently pulling at my jacket, then at my hand and my fingers. I knew I should have stopped him but became fascinated with the ritual. He then accidently nipped the tip of the nail of my index finger with his teeth. It may have been 'gentle' for a horse, but the bite pressure made me recoil and scream out in pain. Duke retracted his head without moving his body. He stood tall, towering over me just watching as I assiduously rubbed my finger, which I was certain would eventually turn black and blue. Then Duke lowered his head again and began to gently rub my hand and finger with his upper lip. He didn't put my finger in his mouth this time, just kept rubbing with a stiff upper lip, back and forth. Did he know he had hurt me? Understanding that Duke and I perceive our shared world differently and that I may be reading intent in his actions; I try to understand this behaviour which I had never experienced before or since. Duke's mouth is very sensitive so he knew he bit me and he observed my reaction. He watched as I made a sudden loud distressed noise and began rubbing my finger. He responded and executed an action in a way that

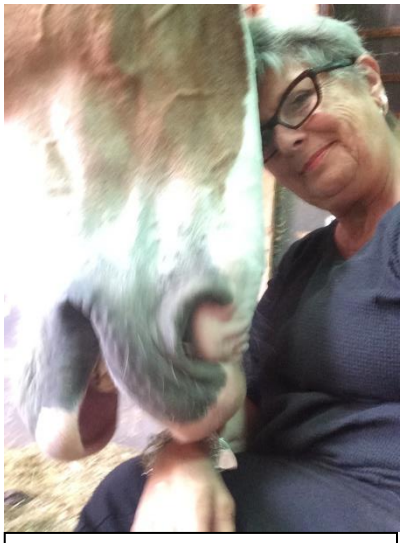


Image 8. Empathy - Selfie

resembled my own action (Gallese, 2003). Was this 'contagious behaviour', like yawning or laughter, or did Duke understand my behaviour and was he modeling it? What it appeared to demonstrate was a link between Duke as the observer and me, the agent (Gallese, 2003). He appeared to understand that he chomped down on my finger when I expressed pain and displeasure, to which Duke had a biological reaction which I interpreted as empathy.

I don't want to control Duke. I don't demand anything from him, not even affection. I just like "being" with him, and this fearful and potentially dangerous animal responds. There is softness in his body movement, eyes and countenance. And every time I visit with Duke in his pen I am left with a calm, peaceful grounded state of being, akin almost to a meditative state. I have tried to be careful to adhere to practical, observable signs and meanings in interspecies communication, but there is still an unquantifiable aspect to encountering the other. A rather non-scientific observation that has resonated with me comes from Barbara Smuts' description of her experience while exploring the kinds of relationships that can develop between a human and non-human animal. "Intersubjectivity implies the presence in another of something resembling a human 'self'…". "The 'presence' we recognize in another when we meet in mutuality is something we feel more than something we know, someone we taste rather than someone we use. In mutuality, we sense that inside this other body, there is 'someone home,' someone so like ourselves in their essence that we can co-create a shared reality as equals" (Smuts, 2001, p. 17).

The question remains: how to quantify these qualitative observations? While it is vital that we explore, describe and explain, is it not equally important to quantify quality in order to create a standard against which things may be compared or assessed? I began this inquiry with an acknowledged bias that came from my own powerful, personal and unique experience with an individual from another species, and wanted to understand what, if anything was going on. Over

the course of my research I spoke with many who not only related to my experience but employed very similar language in describing their own ‘unique’ relationships. I wanted my research to honour an inductive style by focusing on individual meaning and the importance of presenting the complexity of a situation (Creswell, 2014), as well as comparing that to a measurable indicator to help me develop a theory rather than to test one.

With this in mind, in Chapter Two I explored exactly what is going on ‘inside’ when horses and humans work together. To do this I compared the psychological /behavioural response in human-animal interaction to the physiological responses present in both species by studying fluctuations in heart rates. Does my heart rate reflect my head state when I experience calmness and serenity spending time with Duke? And does Duke’s heart rate correspond to or reflect our interaction? The notion that horses are so sensitive to human emotional and physical states that they respond in kind is often evidenced in the reported successes of equine assisted therapy and education. The implications and ramifications of that are examined in Chapter 3.

Chapter Two –
Field study of human-horse interactions and heart rates

Physiological and behavioural indicators of horse-human interaction

Over the last decade it has become widely accepted that animals involved in therapy and education can have a positive effect on humans. They have been reported to reduce stress (Klontz, Bivens & Leinart, 2007), lower blood pressure (Beetz et al. 2012), and reduce depression and anxiety (Wells, 2009). I have not only witnessed the benefits of human-animal interaction, I have experienced them in my own interspecies relationship with a horse named Duke. While we increasingly accept that animals help and heal humans, the processes to assess and evaluate the effectiveness of human/animal interaction and the underlying mechanisms have lagged behind (Beetz et al., 2012). In a review of 69 original studies on human-animal interactions, Beetz (2012) concluded there was compelling research that oxytocin, "the feel good hormone", associated with social bonding and a feeling of trust and calm, plays a role in the psychological and physiological benefits of animal-human interaction. Oxytocin is produced in the hypothalamus, an important regulation center of the brain, located just above the brain stem. It is released into the human circulatory system in response to pleasurable tactile contact such as mating and nursing via a network of oxytocin-containing nerves. More oxytocin means less adrenalin and stress-related cortisol secretion. Popular publications latched onto this simple explanation referring to oxytocin as the "hug hormone" and the "cuddle chemical". Neuroeconomist, Paul Zak announced that after ten years of experiments he had uncovered the "chemistry of morality" (2011). Zak had formulated a comfortingly simple answer to the

confoundingly complex question of what makes us moral: the "moral molecule" (Zak, 2011). An experiment with ewes who neglected their new born lambs when the production of oxytocin was inhibited (Ricard, Mandell, & Gordon, 2016) produced a similarly enthusiastic conclusion; as did the study of promiscuous montane voles (*Microtus montanus*) who adopted the monogamous behaviour of their prairie cousins (*M. ochrogaster)* when they were dosed with oxytocin (Cormier, 2013). Consequently some have come to think of this 'good hormone' as fundamental to morality (Churchland, 2012). However, recent research has some scientists calling oxytocin the "hype hormone" (Takahashi, 2015). It turns out that even though oxytocin is released in the brains of all mammals, there is a difference between species. Apparently it's not about how much oxytocin is released, but rather where these hormones act (Leng & Sabatier, 2016) and under what conditions (Bartz, 2011). Jennifer Bartz (2011) found that oxytocin enhanced positive behaviour only in certain situations and individuals; fostering trust and generosity under some circumstances, and envy and bias under other conditions (Bartz, Zaki, Bolger, & Ochsner 2011). She also observed that oxytocin increased sociability in the sociable and exacerbated anxiety in the anxious (Bartz et al., 2011). Furthermore, some animals like humans, show a rise in corticosteroid hormones both in association with positive emotions such as the anticipation of food or sex, and in association with fear and negative emotions such as when confronted with a predator (Bartz et al., 2011; Rushen, 1991; Toates, 1995). This presents problems in interpreting both human and non-human emotions beyond the assertion that an individual is active and aroused (Dawkins, 2015).

The results from a review of 69 original studies (Beetz et al., 2012) confirmed that the production of oxytocin during human-animal interaction improved social attention, behaviour, interpersonal interaction and mood and reduced stress, fear and anxiety. However it also reported

that oxytocin has little or no effect on stress-related parameters such as adrenalin production, pain levels, immune system functioning, feelings of trust, and it is not positively correlated with enhanced empathy, reduced aggression or improved learning (Beetz, et al., 2012). The results appear to suggest the reported improvements were more of a psychological rather than a physiological nature.

Hype hurts the vulnerable that see the ‘moral molecule’ as the perfect prescription for everything from trauma and depression to hypertension and autism. What oxytocin does might be better understood with more research into how oxytocin works providing a more nuanced view with greater insight into long term consequences, rather than simpler short term solutions.

So if it’s not simply a ‘feel good’ hormone that keeps me going back to the barn, why do I feel good when I go? What about Duke? His behaviour would indicate he is clearly not stressed and obviously relaxed in my presence. It’s obvious because he provides the feedback by licking and chewing, looking sleepy, shifting his weight from one leg to another, yawning, snorting, softening his eyes, even passing gas; all signs of a ‘relaxation response’ (McDonnell, 2016). Given that both Duke and I relax in each other’s company, and because calm and relaxed behaviour is usually reflected in lowered or stable heart rates (Taelman, Vandeput, Spaepen, & Huffel, 2009), I hypothesized that the effects of human-horse interaction could be reflected in their recorded heart rates.

A study by the Swedish University of Agricultural Sciences provided an insight into this aspect of human-horse interaction. They reported that an increase in a human's heart rate affected the heart rate of the horse they were leading or riding (Keeling, Jonare, & Lanneborn, 2009). The study was set up as a test to see if humans inadvertently communicate fear and anxiety to horses.

The researchers asked 20 people to walk and also ride 10 horses from Point A to Point B four times. They were told an umbrella would open as they rode or led the horse on the fourth pass. The umbrella never opened, but heart rates in both horses and humans increased when the human expected the umbrella to open. However other experiments involving electrocardiograms (EKG or ECG) measuring heart rate variability (HRV) of horses partnered with humans have been inconclusive in proving that horses' HRV reflects the inner state of humans (Gherke, 2010). Gherke (2010) found that the heart rhythm patterns, the intervals between consecutive heart beats, from the horse influenced the human's cycle but not vice-versa. Gherke, Myers, Evans and Garman (2016) more recently showed that horses did not "mirror" the emotional state of a human rider and that the calmness of the horse had a greater influence on the human response rather than the other way around.

Thus far, there is insufficient empirical data to support a basic physiological connection between horses and humans either while in close contact, or as the underlying cause of reported positive results of animal-assisted therapy (Drinkhouse, Birmingham, Fillman & Jedlicka, 2012). Further research clearly is necessary in this area.

Our study was designed to further investigate horse/human interaction to assess if – and to what extent – there was a change in human behavior, animal behavior or their respective heart rates when concurrent measurements from both species were taken. While there have been many anecdotal reports of the healing and transformative affect horses can have on humans, there has been very little written about just what is going on physiologically during these encounters (Drinkhouse et al., 2012). Research has primarily focused on questions of human stress reduction and increased well-being as a result of human animal interaction, and has not

thoroughly investigated how the process of stress reduction occurs (Crossman, 2016). If we can demonstrate a relationship between emotional well-being and physiological indicators, it would greatly assist in designing better equine assisted learning/therapy programs. It would also help in matching the right horse to the appropriate person, and also reveal how the individual animal is responding. While horses continue to serve humans, as they have done for thousands of years, the psychological well-being of horses has too often been ignored. This research will hopefully have the potential to help equestrians, facilitators and health providers in better assessing the real effects of horse-human interaction.

Human volunteers were recruited to participate in an equine-assisted learning session, during which they wore personal fitness tracker devices that measured their heart rate in real time. The horses with which the humans were paired were also fitted with real-time heart rate tracking devices, so the data from both humans and horses could be compared over the hour-long session. Human participants also completed a short questionnaire at the end of the session, to assess their subjective views of the interaction. The purpose of the study was to see if heart rate variability (HRV) could be used as a physiological demonstration of an emotional connection between horses and humans when they interact. The hypothesis was that the HRV of the horse would provide a clue to how his human partner was feeling. Even if people (or horses) try to conceal their emotions, the HRV will show if they are stressed or relaxed because it reflects the autonomic nervous system responses that are not under conscious control (Gherke, 2010). The hypothesis I tested was that the stress in humans would be reflected in increases in the horses' HRV and, conversely, that a calm and relaxed horse would similarly be reflected in decreases in the humans' HRV.

Methods

Thirty six human participants were recruited from the volunteers enlisted by Dreamwinds Equine-Assisted Learning Centre, located in Bradford, Ontario whose aim is to help individuals recognize opportunities for learning within themselves, build confidence and develop communication and leadership skills. Dreamwinds employs a team approach consisting of facilitators and horses working with clients in structured sessions. Facilitators are equine specialists trained in monitoring the horses' wellbeing as well as their clients' safety, while continuously observing the horse/human interaction. This process requires the client to understand their own action or inaction, and how it affects their equine and human partners. In the role of 'teacher', the horse is just doing what comes naturally to any horse in nature. Being sentient, prey animals, horses react to anything in their environment quickly and honestly. They do not judge, they do not make assumptions, and they do not hold grudges (O'Connor, 2017; Vidrine, Owen-Smith & Faulkner, 2002). Their immediate response to any human emotional or physical behaviour is a by-product of the domestic horses' long evolutionary path. It is the same instinct that makes them react immediately and instinctively to any possible danger from potential predators.

The intention is that while clients guide the horse from the ground through obstacles and problem solving exercises they begin to learn about the obstacles impeding them in their daily lives, in relationships and in their careers.

Dreamwinds offers corporate and youth leadership and team building programs as well as a certificate program for those seeking to become facilitators themselves. For this study,

volunteers agreed to serve as the clients of the future facilitators during one hour practice sessions in the arena. Each session was typically attended by 10 participants. We collected data from four sessions with a total of sixteen participants (14 female and 2 males) who were self-selecting, in that they agreed to be part of the equine-assisted learning exercises in advance. Demographic data other than gender were not collected to protect participants' anonymity. The study was approved by York University's Human Participant Research Committee (HPRC), protocol # E 2016-280.

There were also seven equine participants who were residents at Dreamwinds Equine Assisted Learning Centre (shown in Table 1) selected for their appropriateness for their client base, that is, horses that had the temperament and behaviour suitable to work with humans who may have had no prior experience with horses. All participating horses were active in other jobs outside of equine assisted learning (EAL).

After signing an informed consent form (shown in Appendix A), participants were asked to strap a wireless heart rate and activity wristband (FitBit Charge HR) no wider than a typical watchband on their non-dominant wrist. The FitBit monitored their heart rates in beats per minute (BPM) continuously throughout the session and their data were uploaded from the devices to the computer for later analysis.

Table 1

Equine Residents at Dreamwinds Equine Assisted Learning Centre, Bradford, Ontario

Horse	Age	Sex	Breed	At Dreamwinds Since	Job Description
Oliver	19	Gelding	Thoroughbred	July 2012	EAL Horse, Light Riding Horse
Zoey	12	Mare	Clydesdale x Hackney	August 2014	EAL Horse, Dressage Horse
Whisper	15	Mare	Tennessee Walking Horse	January 2013	EAL Horse, Trail Riding Horse
Grace	12	Mare	Spotted Saddle Horse	March 2013	EAL Horse, Trail Riding Horse
Finnigan	16	Gelding	Thoroughbred	July 2012	EAL Horse, Dressage Horse
Patience	7	Mare	Spotted Saddle Horse	March 2013	EAL Horse, Trail Riding Horse
Baylee	20	Gelding	Thoroughbred	April 2016	EAL Horse, Riding Lesson Horse

The horses were fitted with an equine equivalent of the Fitbit called a SeeHorse™, which is a completely non-invasive method of measurement recently developed by a Kitchener, Ontario based company. It's a wireless, wearable equine monitoring device that clips onto the bridle and continuously scans and displays real-time data that can be sent to a phone or computer even while the horse is moving. The accuracy of the data collected and presented through the SeeHorse™ device is not intended to match that of medical devices or scientific measurement devices, but neither is the Fitbit. Since we compared patterns in heart rate variability, rather than needing exact absolute accuracy, we considered both these devices to be comparable in providing mirrored measurement. Also it was the non-invasive nature of this new technology that was so attractive since it required no leads or electrodes and was so small and unobtrusive (measuring 6 cm x 3 cm x 3 cm) that it could be placed anywhere on the horse. We attached the device onto the bridle close to the brow band, next to each horse's temple. Using properties of light (IR) to scan the horse's heart rate in real time, the SeeHorse™ recorded and logged historical data, all of which could then be viewed through on a smart phone or tablet and accessed online through our computers. As well as collecting physiological data, we observed and recorded the time of any significant behavioural interactions that appeared to be stressful or out of the ordinary.

At the end of each 90-minute session, participants were given an exit survey (see Appendix B) consisting of five questions pertaining to their behavior and physiological responses to their interactions with the horses to which they were assigned.

This study employed different methodological approaches to assess the effects of horse-human interaction on both the human and the animal participants. Since qualitative research can provide a broad analysis of a phenomenon and quantitative research can focus on social

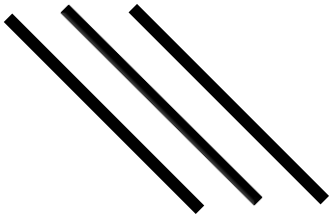
processes in greater depth (Creswell, 2014), combining and integrating qualitative and quantitative research and data would serve to better understand some of the effects of human-animal relationships, and at the same time, take a look at the reality of these interactions.

Each pair of human participants was assigned to a horse and took part in one of four different exercises, regularly used at Dreamwinds for EAL:

1. ***Blindfold*** is a 3-part exercise where the first participant is the leader and the second participant is blindfolded and guides the horse. Using words and no touch, the leader instructs the blindfolded participant while she guides the horse through a series of mazes. The purpose of these exercises is to build trust and cooperation among all 3 team members by learning to follow and rely on instructions, practicing active listening and reflecting on how both the horse and the handler respond to stressful situations. Participants alternated in their roles of sighted leading and blindfolded following.

Maze #1: The blindfolded partner is instructed by the leader to guide the horse through a maze, and then back again through the maze to the starting point.

Maze #2: The blindfolded partner is instructed by the leader to guide the horse over three parallel bars lying on the ground, without disturbing them.



Maze #3: The blindfolded partner is instructed by the leader to pick up a plastic frog at one end of the maze, guide the horse through the maze avoiding obstacles along the path such as plastic flowers and pylons, and deposit the frog into a box at the other end.

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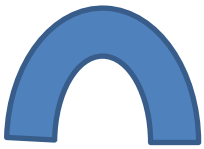

Pick up frog put frog in box

Getting the team of three to complete the *Blindfold* exercises successfully can be stressful because the horse will not follow if the human team members are tense or working uncooperatively and will resist and become impatient when it senses confusion and stress.

After the exercise, participants are debriefed as to what they did and why they did or did not succeed in completing the mazes.

2. ***At the End of Your Rope*** is an exercise where each of two human participant holds a rope attached to opposite sides of the horse's bridle. They must work cooperatively to push and pull strategically to get the horse to complete a circuit through the maze while adhering to rules like not allowing any part of the rope to touch the ground, and not stepping onto the path within the obstacle course. The purpose of this team exercise is to foster cooperation by helping individuals to see themselves as integral members of the team through recognizing the importance of everyone's individual contributions and membership on the team (including the horse).
3. ***Silent Communication*** is an exercise where using gestures and body language without physical contact, the team leader must silently instruct his human partner to direct the horse to proceed through the maze or obstacle course. The purpose of this exercise is to

demonstrate the power of body language and how important it is in communication and in conveying messages.

4. ***Who's the brain*** is about teamwork and active listening. Three people link arms behind a horse. The middle person is the brains and holds the reins while leading the team through the obstacle course. Those on either side of the brain are the 'arms', which cannot do anything until the brain tells them what to do in a very specific and detailed manner. For example, picking up a flower first requires the brain to tell the arm to bend over, reach out, open its hand, grasp the flower and then stand up. The purpose of this exercise is to foster active listening and clarity in human interactions by demonstrating how communication can break down when we anticipate what people are going to say. Communication breakdown occurs when we anticipate the message without actually hearing it.

In none of the exercises do clients ever mount or ride the horses. Likewise, facilitators never tell clients what to do, or whether they are right or wrong. Rather they encourage clients to creatively seek their own solutions. By not accusing the client of inattention to their human and or horse partner they avoid a defensive denial. By asking what happened and how it felt, the clients realized when they were not effectively communicating their plan to their human partner and how that incongruence confused and confounded the horse.

Each session lasted approximately 90 minutes. In the first 15 minutes, participants were seated and received instructions about the exercises. The next 60 minutes were spent conducting the exercises with the horse and human partners, and the last 15 minutes were spent reviewing and reflecting on the session with the horse. At the end of the session, clients were asked to pick from a board random words or phrases (such as communication, team work, creative listening, and bravery) that could best describe their personal experience.

Due to unforeseen problems with the new SeeHorse™ technology, our most successful data collection from the SeeHorses and Fitbits took place during four consecutive days from November 28 to December 1, 2016. Unfortunately the data collected from five previous sessions in September failed to successfully capture the horses' heart rates. However, the Fitbits that the human participants were wearing successfully recorded their heart rates throughout all sessions. The responses to all 36 participants' questionnaires from sessions beginning in September were reviewed enabling comparisons between the emotions that participants reported feeling and their corresponding heart rates.

Results

Heart rate data:

Four sessions, each approximately an hour long, were conducted on consecutive days in the Dreamwinds 18 m x 36 m x 4 m indoor arena. The arena was enclosed, so participants were protected from the elements and undue distractions, such as external noises. Each session included 4 horses and 8 human participants; teams were made up of 2 humans plus a horse.

Figure 1 illustrates the average heart rate of the 36 participants at the beginning, middle, and end of the test sessions. As you can see from the figure, the average heart rate was significantly lower at the beginning of the session (mean = 77.1 BPM, range = 62 to 96 BPM, standard deviation=24.04163; paired samples $t_{(15)}= 1.75$, $p < .05$). Average heart rate increased midway through the session (mean = 87.44 BPM, range = 34 to148 BPM, standard deviation = 80.61017), and was the highest at the end of the session (mean = 90 BPM, range = 67-117 BPM, standard deviation = 35.35534); although there was no significant difference between average HRs at the middle and end of the session (paired samples $t_{(15)} = .42$, $p>.05$).

Figures 2 through 9 represent the human heart data for each participant and horse (when horse data was available) plotted at five minute intervals across sessions. As illustrated in the Figures, the human heart rates varied considerably over the course of the sessions (range = 62 – 170 BPM). As is also evident from the figures, the corresponding heart rates for the horses did not vary as much (range = 24-50 BPM). More important, the heart rate data for the humans and horses were not correlated (Pearson correlations ranging between $r = .20$ and $r = .57$, all p's $>.05$).

In addition to heart rate data, behavioural observations were also done at all sessions. Any unusual or stress-related behaviour was recorded, in the hope that I could correlate the observed behaviour with concomitant changes in human and/or horse heart rates. The time segment 1:25 – 1:45 was not only significant within Figure 6 (Session C), but illustrative of the results in general. Observational notes made during the session on events that appeared out of the ordinary (the human partners were struggling to cooperate with each other to successfully communicate with their equine partner), corresponded to large fluctuations in the human participants' heart rates which was not reflected in the horses'. As the data for all sessions revealed, when the heart rate of the humans spiked there wasn't a corresponding increase in the horses' heart rates. And while the humans' variable heart rates fluctuated, the horses' heart rates had far less variability.

As well as gathering heart rate and behavioural data, we also requested that participants fill out an exit survey at the end of each session (Appendix B). The data from these surveys are shown in Table 2. Of the 36 participants, 19 reported having significant prior experience with horses, 4 had some experience and 12 had none. All respondents supplied succinct one word answers to most questions except when describing their anxiety during the exercise. Six

participants said they felt no stress at all. The other 29 participants used anywhere from 1 to 36 words indicating fear, insecurity, confusion, worry and frustration. Not one participant indicated that they disliked the experience. Twenty five participants came away less fearful of horses and all, except for one, said it was a "positive and useful learning experience that they will carry forward" in their daily lives.

The survey data confirmed the discrepancy between what participants experienced and what the horses experienced, at least in terms of heart rate. While not all clients found the experience transformative they all described some positive insight or feeling of empowerment that was acquired as a result of working with the horses. While most participants reported satisfaction, increased self-awareness and well-being from participating in the human-horse interaction, their heart rates showed a growing level of arousal as the exercise went along (Figure 1), ultimately peaking even when the exercise had been completed. Of course, it is impossible to know if the arousal the participants were experiencing was physiologically stressful or not. What is interesting is that despite their spiking heart rates, the majority characterized the experience as positive, enjoyable and insightful. One respondent said the experience taught her that she could conquer her fears and learn to trust again. Several said they learned to think outside the box and be more assertive. Perhaps most interestingly, the individual who answered the questionnaire with the fewest words (12) had the highest heart rate at 170.

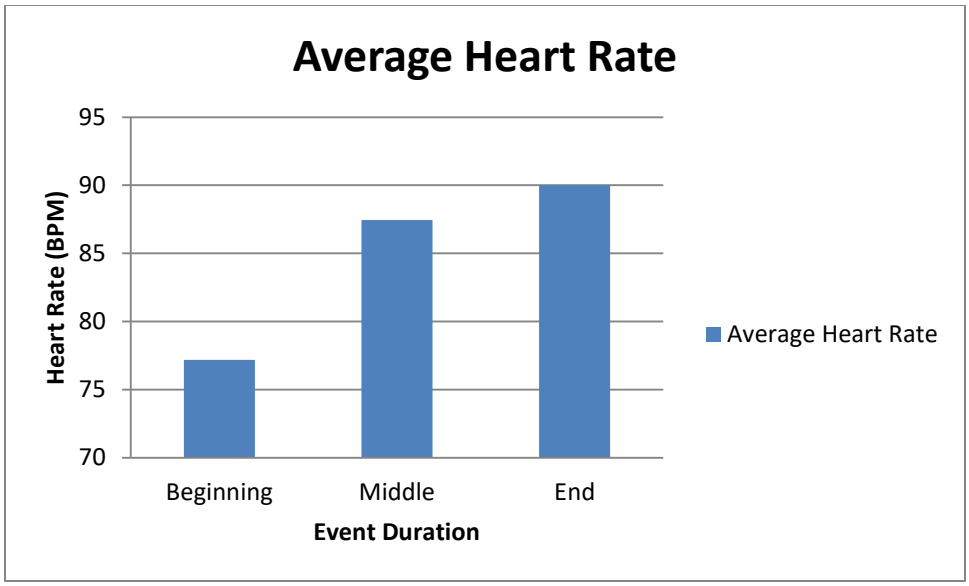

Figure 1. Average Human Heart Rates. Thirty six participants' Heart Rates averaged over five 90-minute sessions, and the heart rates were measured at the beginning, midpoint and end of each test session.

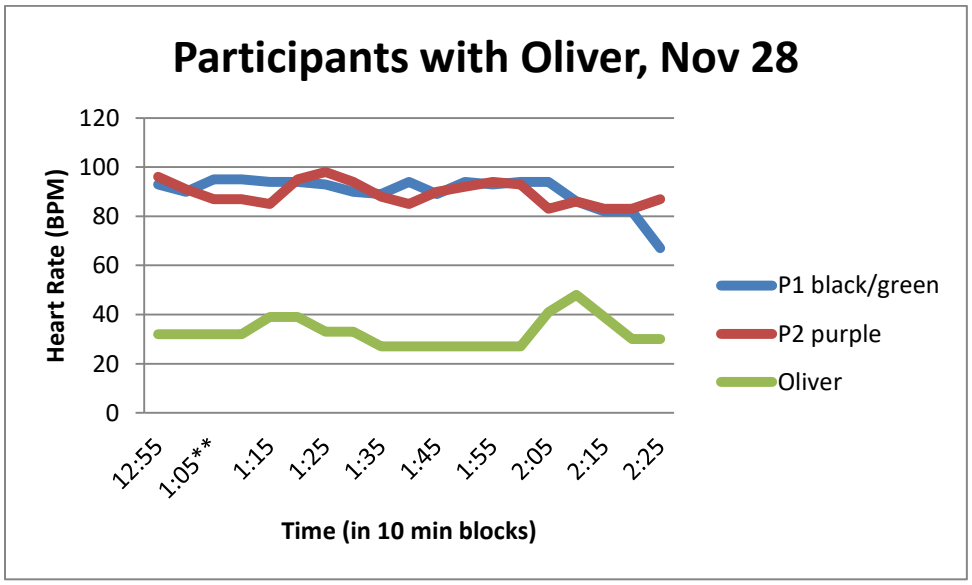

Figure 2. Horse and Participant heart rates (beats per minute--BPM) across time during Session A.

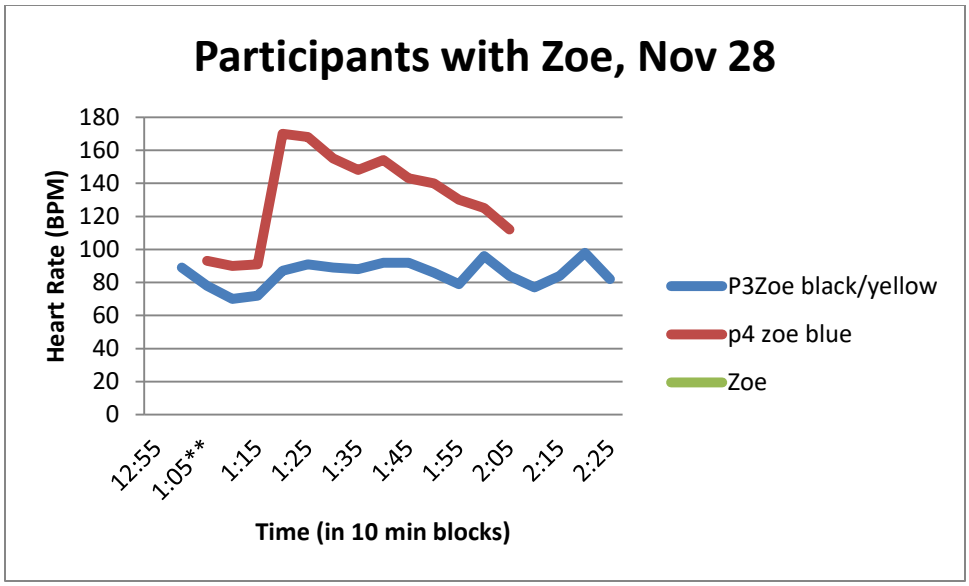

Figure 3. Participant heart rates (beats per minute--BPM) across time during Session A. (horse heart rate not available)

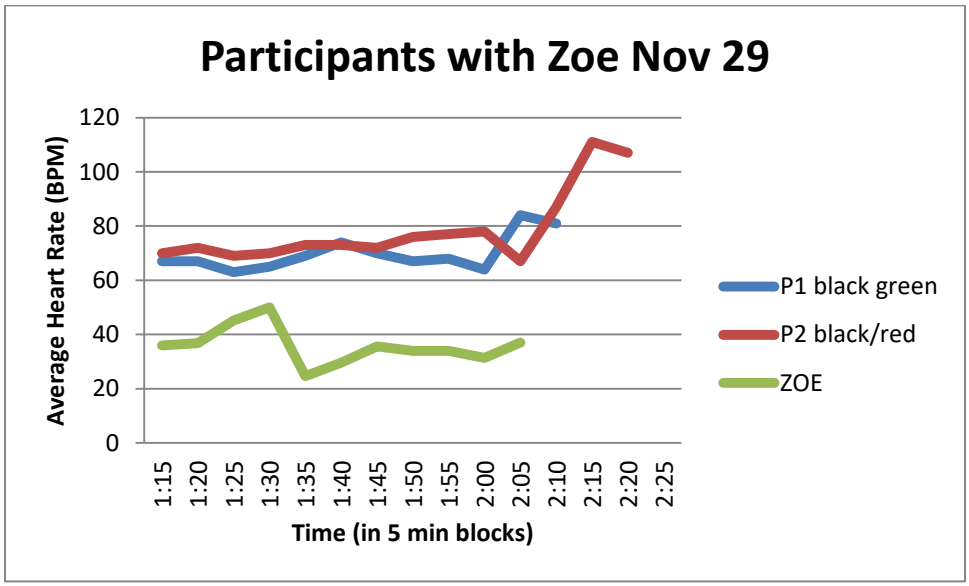

Figure 4. Horse and Participant heart rates (beats per minute--BPM) across time during Session B.

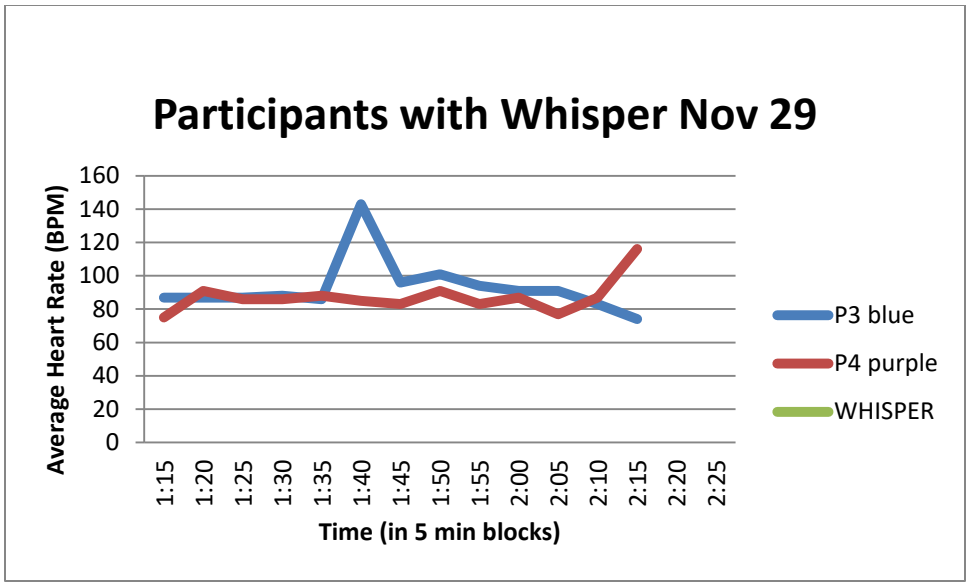

Figure 5. Participant heart rates (beats per minute--BPM) across time during Session B. (horse heart rate not available)

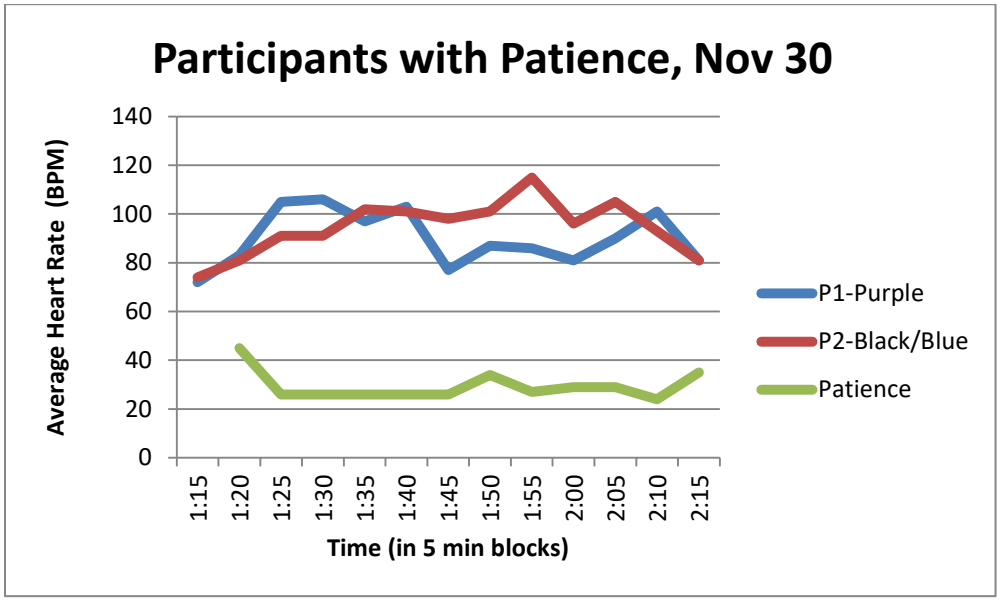

Figure 6. Horse and Participant heart rates (beats per minute--BPM) across time during Session C

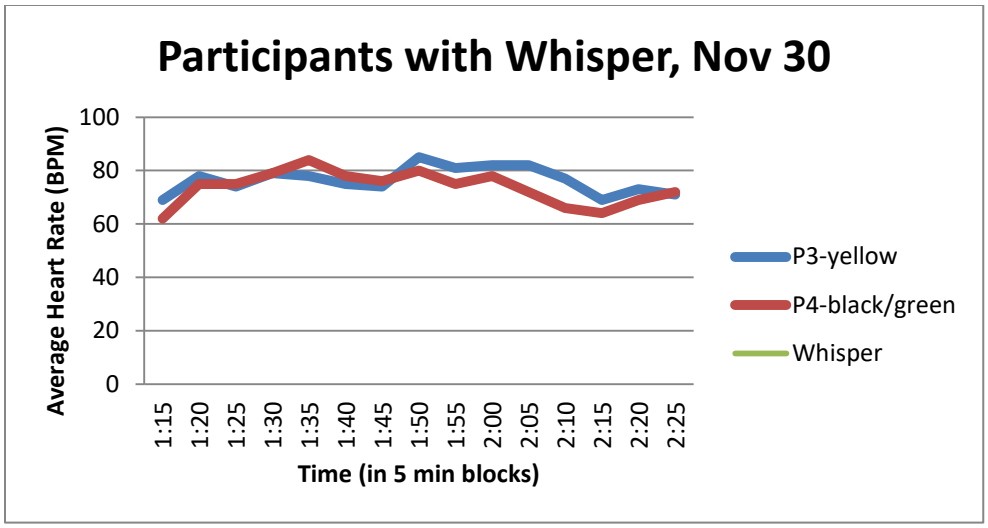

Figure 7. Participant heart rates (beats per minute--BPM) across time. During session C. (horse heart rate not available)

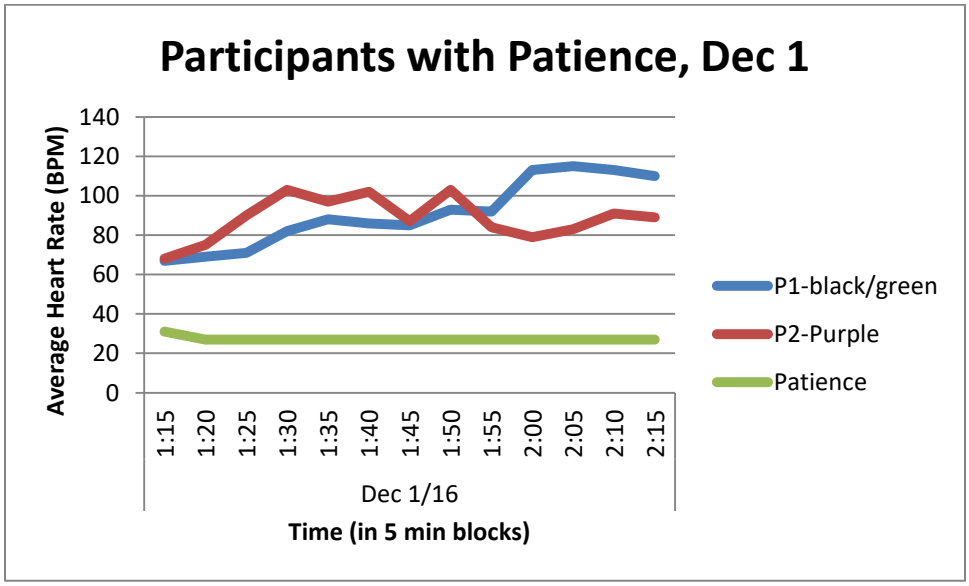

Figure 8. Horse and Participant heart rates (beats per minute--BPM) across time during Session D.

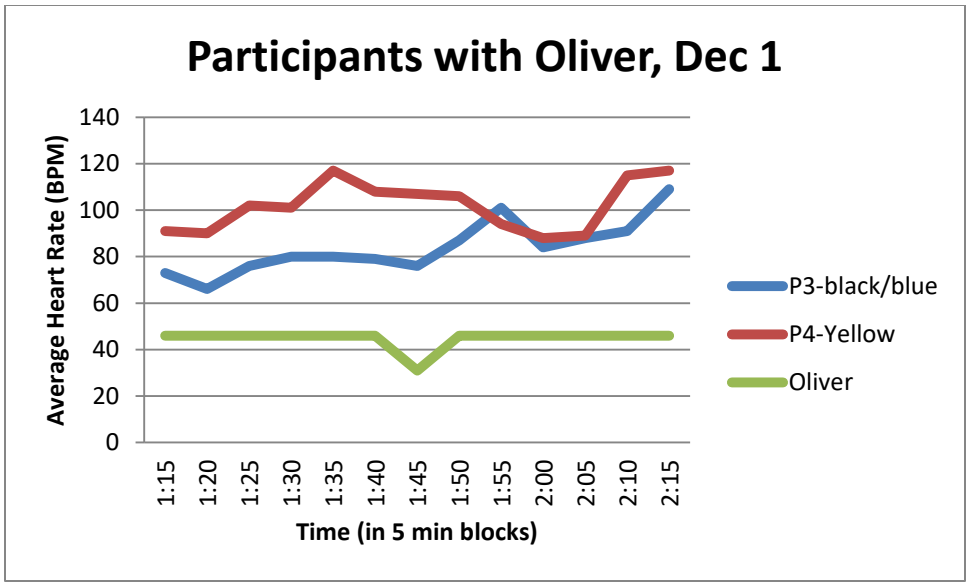

Figure 9. Horse and Participant heart rates (beats per minute--BPM) across time during Session D.

Table 2

***Quantitative Analysis of Exit Questionnaire Responses* (36 from Sept 3 to Dec 1, 2016)**

1. Have you had any significant experiences with horses?

   19 said yes
   4 said some experience
   12 said none

2. From 1-5, how would you rate your fear and discomfort level being around horses, with 5 being the most afraid and uncomfortable.

   22 wrote 0-1
   6 wrote 2
   4 wrote 3
   3 wrote 4
   1 wrote 5

3. Has this experience made you more or less fearful of horses?

   20 said less fearful
   9 said n/a
   5 replied yes
   2 said no

4. Did you feel anxious during the session? If so, describe one or two moments when you felt particularly stressed.

   6 participants reported no anxiety at all
   29 said yes, they felt anxious and stressed when not sure what to do next. They reported frustration when unable to communicate successfully with or predict the behaviour of either the horse and/or the human partner

5. What did you learn about yourself that you can use outside of the arena?

   Only one person made a sign designating ‘nothing’. The other 35 wrote mostly of learning the importance of thinking out of the box and using clear, concise and direct communication. The importance of body language and active listening were also mentioned. One participant said they learned that being a good leader also meant being able to follow.

Analysis

The proliferation of anecdotal reports about the healing and transformative effects of the interaction of animals and humans has led to a popular almost intuitive acceptance of the salubrious impact of animals. Published reports have indicated that the relationship between horses and humans can be measured using heart rate variability to determine levels of stress or well-being in the human and the horse when interacting (Gehrke, 2010 p.23). There has also been compelling research indicating oxytocin plays a significant role in the psychological and physiological benefits of animal-human interaction (Beetz, Uvnäs-Moberg & Julius, 2012). While the effects of these encounters are the source of much research, there has been very little written about just what is going on physiologically during these encounters (Drinkhouse et al., 2012) to bring about the stated sense of calm and well-being in humans.

The goal of this study was to further investigate the relationship between the physiological and psychological benefits of horse-human interaction. Since lowered or stable heart rates are usually indicators of calm and relaxed behaviour, I hypothesized that if there was a change in human and animal behavior due to the interaction between the two species, the effects could be reflected in both human and animal heart rates. This study was designed to assess human and animal behavior and heart rate when concurrent measurements from both species were taken. Until recently the only way to record a horses' heart rate was by using invasive EKG or ECG machines that required leads and terminals. About a year and a half ago I began to research an emerging technology called a SeeHorse™ which had recently been developed in Kitchener, Ontario. It was the noninvasive nature of this new technology that was so attractive since it required no leads or electrodes and was so small and unobtrusive that it could be placed anywhere on the horse. This wireless equine monitoring system was not unlike the wireless

human heart rate and activity wristband called a FitBit. They both work around the clock to continuously scan and display real-time data building an ongoing history of vital signs. And like the FitBit, the SeeHorse™ scans and transmits data to a phone or computer. Developed primarily for industry, this was the first scientific study employing the SeeHorse™ as a diagnostic tool.

My assumption was that the novelty of the equine experience, unfamiliarity between the horse and human partner, and insecurity about the process, would create anxiety and cause participants' heart rates to increase immediately. The hypothesis was that the human participants would undergo physiological changes that would reflect their psychological state. It seemed logical that the humans' heart rates would decrease as they relaxed during continued interaction with the horse. In fact the opposite was true. There was no correlation of HRV between humans and horses. The average human heart rate was the lowest at the beginning of the session and even though there was no significant physical exertion, it rose significantly by the mid-point as shown in Figure 1. By the end of the session, instead of regaining the calm with which they began the session, participants' heart rates peaked. Even when one participant's heart rate topped at 170 BPM, the horse with whom they had been partnered maintained a low and steady heart rate that did not reflect the excited state of his human partner. Also an exit questionnaire produced little quantitative evidence to empirically support an emotional reaction between horse and human that related to the demonstrated physiological connection. This 'disconnect' between the horses' documented data and the humans' stated and recorded responses can perhaps be explained by the two-factor theory of emotion (Schacter & Singer, 1962) which is based on a physiological response that the mind then identifies and labels.

Schacter and Singer (1962) hypothesized that we identify the arousal in order to feel the emotion. We search the immediate environment for emotionally relevant cues to label and interpret unexplained physiological arousal, which is susceptible to the emotional influences of others around us. This hypothesis was confirmed by our observations. Most difficulties encountered by the participants during the exercises were as a result of fear, insecurity, overthinking, frustration and too often forgetting the horse was an integral part of the team. The significant question was: what change has to happen in the person to effect change in the horse? It is interesting to note that at the end of the session, participants as a group, sat in front of a board listing several words describing different emotional and psychological states. They were asked to choose the one word that would best describe their experience and share why they picked it. The suggested descriptors had a positive connotation encouraging insight into the process: teamwork, confidence, leadership, creative listening and bravery. Everyone characterized their equine experience as positive in that they learned about their strengths and vulnerabilities and the qualities they had to work on in future. Afterwards I asked the same participants to fill out the questionnaire that was the final part of this study. If cognition and peer influence, and not the physiological arousal, provided the label for the emotion, might it be that participants misattributed their arousal (Schacter & Singer, 1962)? Did their consistently rising heart rates contradict their reports of a positive and enjoyable experience? Going in, one participant reported having no experience with horses and rated their level of discomfort at only 2 out of a possible 5. They said the experience made them even less fearful yet their heart rate had soared from a low of 90 to a high of 170 BPM. Heart rate and heart rate variability (HRV) are accepted stress parameters. Were they kidding themselves about how afraid they really were about their human-animal interaction or how much they enjoyed it? As Schacter and Singer

(2012) discovered we don't just feel, we interpret our feelings and we can't always trust our interpretation.

The SeeHorse™ technology had its limitations. It was not expressly designed for or adapted to this study, nor was it capable of simultaneously receiving and recording the humans' data. Therefore timed SeeHorse™ and Fitbit numbers were recorded separately, and synced manually at the end of the sessions. The challenge was monitoring two horses and four humans in an open arena at the same time. When horse and human partners' paths would sometimes intersect, signals from the SeeHorse™ became crossed interrupting data flow. The Fitbits worked well consistently enabling us to monitor and record data from 36 people over eight 90 minute sessions. The SeeHorse™ was less dependable. During the first four sessions conducted on consecutive days we were unable to get any reliable equine readings. During the next four sessions we were able to capture data from five out of eight horses. Because of the unreliability of the new technology, results did not conclusively prove an emotional connection between human and horse, nor did they support a physiological connection between horse and human.

If SeeHorse™ technology continues to improve over time, and if a continuous concomitant FitBit / SeeHorse™ recorded outputs can be developed, it would undoubtedly be very useful in supporting further research into the relationship between emotional well-being and physiological indicators. Establishing such a connection would not only provide practical insight into the design of better equine assist learning/therapy programs, but it would also assist equestrians, facilitators, and health providers in better assessing the real effects of horse-human interaction. So while it does have its limitations, this new type of technology provides opportunities to learn things that have previously been 'unknowable' or left to speculation.

Chapter Three
– 'The Healing Horse'

"People who can talk to animals are happier than people who can't"
- Temple Grandin

Health effects of human-animal interaction

I have come full circle to the very source of my query: Duke. I have had a relationship with this horse for over two years now and I know what I feel. He makes me smile.

Image 9. Obvious connection - Selfie

Our visits promote in me a sense of serenity and well-being. While I am unable to presume what Duke feels, he too appears happy and calm in my company. Wanting to see if there might be a psychological and physiological connection that would provide some empirical proof of that bond, I tried the Seehorse/Fitbit experiment on us. While not scientific, it might possibly confirm that Duke and I did have some 'special' connection. In the protocol we set established, Dan, Duke's owner, wore a Fitbit and placed the Seehorse on Duke's bridle the same way we did at Dreamwinds. He would leave for 10 minutes, then return and spend 15 minutes with Duke, without touching or talking to him. He'd leave and after 10 minutes I would repeat the process. Then a third person

Duke had never met before came in. The results reflected what we discovered at Dreamwinds. Duke's HRV remained fairly constant. The variability was in my heart rate. I admit I was expecting or perhaps hoping to see some empirical evidence that would substantiate what I had been interpreting as an inimitable and healing interspecies bond. Clearly I am not alone; witness the vast repository of anecdotal evidence validating the fact that pets are good for human health (Griffin, McCune, Maholmes, Hurley, 2011). The positive and beneficial ways Duke and I have altered each other's' behaviour is also reflected in much of the literature (O'Haire, 2010; Wells, 2009; Kendall, Maujean, Pepping, & Wright, 2014). Many horse/human interaction studies have concluded that ownership and or equine assisted therapy and learning have a multitude of positive psycho-physiological and psycho-social effects on humans (Davis, Maurstad, & Dean, 2014; Wells, 2009). Researchers using qualitative open-ended interviews have documented themes of pleasure, recreation and therapy interwoven into the narratives of non-professional riders. Interestingly it is primarily horsewomen ((Davis et al., 2014), thought to be more intuitive than men, who feel so connected to their horses that the sense of wellbeing they derive from just 'being' with their horse precludes any need for therapeutic intervention for their stress and or anxiety (Davis, Maurstad, & Dean, 2015). It's thought that horses are a calming influence in part because they exist more on an avoidance order which functions on minimizing conflict and promoting stability (Goodwin, 1999).

In its many forms, human/animal interaction is being accepted as an effective and credible way to improve mental health (Rabbitt, Kazdin, & Hong, 2014), lower heart rate, blood pressure, and cholesterol (Allen, Shykoff, Izzo, 2001; Hodgson, Barton, Darling, Antao, Kim, & Monavvari, 2015). Studies have found people interacting with therapy dogs were less depressed, had reduced levels of stress and pain and anxiety and were less lonely (Klontz, Bivens & Leinart,

2007; Beetz, Uvnas-Moberg, Julius et al. 2012). This is so well accepted that many universities and colleges are incorporating animals in their counselling. In nursing home settings, interaction with visiting dogs has led to more social behaviours and more interaction among residents (Johnson, 2011; McCardle, 2011; Griffin, McCune, Maholmes, & Hurley, 2011; Thorpe, Serpell & Suomi, 2011; Lee Davis, Maurstad, & Dean, 2015). It has become widely accepted that there are benefits to health and wellbeing that are derived from human-animal interaction (HAI), including decreased anxiety and aggression, improved social attention and behaviour, and enhanced learning (Beetz, Uvnas-Moberg, Julius, & Kotrschal, 2012). And while some studies have reported that interacting with horses may improve aspects of social functioning among children and adolescents with autism spectrum disorder (Anderson & Meints, 2016), the health benefits bestowed by horses are still quite theoretical based on anecdotal data. With little available empirical evidence and mixed outcomes that are difficult to interpret, current literature does not provide a definitive conclusion that equine-assisted interventions are efficacious (Kendall, Maujean, Pepping, & Wright, 2014; Anderson & Meints, 2016).

The Universities of Saskatchewan and Regina together with Cartier Farms brought together two fields of practice in which there is limited documented research: equine assisted learning (EAL) and its role in the wellbeing of First Nations youth who misuse volatile substances (University of Saskatchewan, 2013). The study involved female addicts between the ages of 9 and 16 who had been sent to a six month residential treatment program. Part of their recovery was attending Cartier Farms' structured EAL program for an hour twice a week. Part of the field research for this study took place at Cartier Farms where Gayle Cartier developed the program fifteen years ago. It is based on building trust through behaviour, teaching communication, sharing, inclusion and problem solving. When the young addicts focused on the

horse they defocused on their own deficit. It was a form of behaviour modification through motivation. When they projected a calm and relaxed state, they were better able to calm and control the horse. The Universities of Saskatchewan and Regina study (2013) concluded that interacting with the horses in this facilitated experiential learning situation, even for a short time, appeared to improve the girls' self-awareness and as a result, their social awareness as well (University of Saskatchewan, 2013). I observed this myself in a class with 11 young girls from The White Buffalo Inhalant Treatment Centre, a volatile population with very poor interpersonal and coping skills. Many came into the Cartier Farm arena uninterested, disengaged and uncooperative, but in the end they all participated willingly. Being accepted by such a large and powerful animal and having it cooperate in any way, was a big confidence booster (Cartier 2015). The girls worked in teams of two paired with a specific horse, very much like the Dreamwinds equine assisted learning program in Ontario. The challenge was to work cooperatively together while trying to lead the horse through the maze, or to traverse a barrier, or put his hoof on a glove. Getting the task done correctly was not in and of itself the main goal, but rather learning from the process was the object of the exercises. Gayle Cartier facilitates without micromanaging. In an effort to quantify some of what I was observing when the participants interacted with the horses, I picked three girls, and spent an equal amount of time with each counting how often they touched the horse and how long the touch lasted. I also observed how the nature of the touch changed during the course of the hour class. Interestingly there was a relationship between the frequency, duration and quality of touch. The girl with the poorest communication skills who was most disengaged with her surroundings and unable to make eye contact touched the horse the least, and for the shortest time engaged in a furtive superficial touching. The second girl touched the horse more and longer but she didn't pat or stroke the

horse as much as poked and scratched in an awkward absentminded manner. The third girl touched her horse most often and for the longest periods of time. She stroked and caressed it, often ignoring the assigned task altogether. Her relationship to the horse was far more demonstrative than any of her interaction with the humans. Given their lack of self-confidence and assertiveness it was interesting to watch the girls at the end of the hour when each was asked to pick a word from the board that best described their experience. Interestingly the words they chose were similar to those chosen by the participants at Dreamwinds: bravery, courage, teamwork and communication. My impression was that by focusing on their relationship with the horse the girls began to defocus on their deficits.

While the equine assisted activity was designed to provide opportunities for motivational and educational benefits that would enhance the children's quality of life (University of Saskatchewan, 2013), the study, while endorsing the psychosocial benefits of the program, did not address the duration of those benefits. Was the girls' improved confidence and communication visible on the bus ride home from Cartier Farm, or back at their residence where caregivers reported much friction and conflict? Did the equine experience reduce that emotional upheaval, and if so for how long? It's a relevant point in better assessing the real effects of EAL.

While at the Cartier Equine Assisted Learning centre, I was also introduced to a Prince Albert firefighter who had been off work for three years suffering from debilitating post-traumatic stress syndrome. After years of pulling bodies from burning buildings he found himself in a situation where he was the "body". He was driving his wife, pregnant with their first child to Saskatoon. They were T-boned at an intersection. His wife was unconscious and he was immobilized unable to help his pregnant wife. He could do nothing. That is what triggered the PTSD. His wife survived but his life grew dark. Depressed and suicidal he was unable to work…

unable to do much of anything except go to his doctors' appointments to get more pills that turned him into a walking zombie. By now he and his wife had a new baby but he couldn't bear being around the noise coming from his own child. Nothing was working. He couldn't stand being around people but found he could enjoy the company of his uncle's horse. That's what brought this firefighter to Cartier Farms; their equine assisted learning course. He described it as a centered, non-judgmental, almost meditative process that he claims saved his life. He's now off his meds, back at work. With an almost evangelical zeal he is advocating that all first responders enrol in an EAL class.

Wounded warriors suffering with post-traumatic stress disorder (PTSD) also face huge rehabilitation challenges. In an effort to help soldiers with PTSD, Veterans Affairs Canada funded a 2013 pilot program investigating whether EAL might be a useful tool. The program which uses experiential therapy using horses to facilitate personal exploration, reported very promising early trends. Four veterans (12.9 percent) reported at least some reduction in their PTSD symptoms, based upon the EAL experience. All of the veterans (31 of 31) reported very positive perceptions with respect to acquiring new or enhanced self-mediation coping skills during the EAL session, and 87.1 percent (27 of 31) of the veterans reported reduced PTSD symptoms during the EAL session (Duncan, Critchley, & Marland, 2014). That the therapy worked well for some is encouraging. That it didn't harm anyone is also good news. Since patient expectations can and do have an enormous influence on treatment outcomes (Greenberg, Constantino, & Bruce, 2006), it would have been enlightening to discover if the patients' conditions improve because they had the expectation that equine assisted learning would be helpful.

The popular press loves animal stories and if they can serve to improve human mental health, all the better (Lancendorfer, Atkin, & Reece, 2008). There are a great many other resources that continue to feed a somewhat uncritical appetite. Even well-meaning organizations promote and propagate research into the well-being that animals deliver to humans. Sometimes experiential knowledge tells you what you need to know, like the fact that animals do help to calm, focus and support humans. That is not at issue and in its various forms, HAI is an effective and promising method in relieving stress and distress on a large scale (Crossman, 2016). The questions surrounding the "How" remain largely unanswered. The Human Animal Bond Research Initiative (HABRI), a non-profit foundation describes itself as a rallying point for a growing assembly of companies, organizations and individuals committed to supporting scientific research to substantiate that humans and pets share a special, mutually-beneficial connection. HABRI also describes itself as the world's most comprehensive online library housing more than 27,000 entries, including full-texts of peer-reviewed journal articles, books, white papers, videos and research that all advance science that demonstrates the positive roles pets and animals play in the integrated health of individuals, families and communities (www.HABRICentral.org). Conversely, there has been a paucity of rigorous scientific research examining the mechanisms that cause the positive results of animal-assisted interactions (Crossman, 2016; Anestis, Anestis, Zawilinski, Hopkins & Lilienfeld, 2014; Herzog, 2015). Because of widely and enthusiastically reported benefits, the field is open to an intuitive acceptance sometimes leading to an inadvertent bias in research and publication (Herzog, 2011; Anestis et al., 2014, Crossman 2016). Studies of meta-analysis have been criticized for mixed and contradictory findings Chur-Hanson, Stern, & Winefield, 2010), a lack of scientific rigour in methodologies, too small study samples and a lack of control groups to make any conclusive

statements about the effects of HAI on distress in the long term (Crossman,2016; Herzog, 2011). Without answering how animal interaction benefits humans, which humans and under what circumstances, research will not be able to sufficiently inform practitioners or policy makers (Crossman, 2016).

Discussion

‘When one tugs at a single thing in nature, he finds it attached to the rest of the world.”
– John Muir

I realize now that perhaps I began this journey of enquiry perhaps somewhat naively. The relationship I had forged with this member of another species, about which I knew nothing, seemed extraordinary and exceptional. I did believe I had some special level of communication with this horse and that I had a privileged interspecific communication. Cascading questions led me to consider less ego-centric explanations. Not to say I withdraw my original belief that I encountered and communed with the other. I did and continue to marvel and celebrate the relationship as something extraordinary, but perhaps a bit less mysterious and miraculous. I befriended and rehabilitated this ‘dangerous monster’ of a horse without really knowing anything about the species. How was I able to do that which those who had spent their lives around horses were unable to do, and why? This research project followed the trajectory of my own equine encounter. I began as I finish with wonder and fascination and acceptance of an extraordinary and life altering chance meeting. We must continue to celebrate how horses help and heal humans, but also the process that assesses and evaluates the effectiveness of this human/horse interaction. That benefits accrue is self-evident. But scientific investigation is still in its early stages (McCardle, 2011). The interest in the benefit of horses in therapeutic settings and assisted

learning modalities continues to grow. The results, while promising have not been sufficiently tested and remain inconclusive without more rigorous designs, especially in comparison with established effective treatments (Selby &Smith-Osborne, 2013; Crossman 2016)). Also, the whole field of equine assisted learning/therapy (the acronyms seem endless) remains somewhat disorganized without rigorous standards and protocols (Gergely, 2012). Some of the more popular varieties include: equine-facilitated learning (EFL), equine-facilitated therapy (EFT), equine-facilitated psychotherapy (EFP), equine facilitated mental health (EFMH), equine-assisted experiential therapy (EAET), equine assisted counselling (EAC), equine-assisted learning (EAL), and equine-assisted psychotherapy (EAP). They all differ in their theoretical basis, certification, licensing procedures, and methodology of practice in reducing stress and improving mental health.

Then there are the animals. Research has not been able to determine if the effects of HAI on animals are as beneficial as those reported by humans. Since this is an interactive relationship we should know if there is a connection between the animal's happiness and the reduction of distress in the human (Crossman 2016), and under what circumstances might it be harmful to the animal.

I like hanging around Duke and have stopped asking 'what does it mean'. Meaning is what it is to humans. To me it means a calm, mindful meditative oasis with another being I have been able to reach in some way. Duke's behaviour communicates to me that he enjoys my company as well. It's clear my influence and our relationship has had a positive effect on him and altered his general mistrust of all humans as well.

Drawing from my three disciplines, my field work, and my encounter with the Other, I draw some conclusions but even more questions. Until scientists can devise new and different protocols to investigate the mechanisms through which the benefits of HAI, specifically equine assisted therapy and learning are delivered and determine how the animal is affected as well, we will continue to base our conclusions more on conjecture than concrete findings. Is it in fact the animal itself that brings about changes in stress or attitude? Or is the animal acting as a catalyst and conduit to greater trust in the therapist, teacher or facilitator? Could it perhaps be the social interaction itself that creates the sense of well-being? There have been experiments demonstrating the success of robots visiting geriatric hospital rooms and cheering patients (Jøranson, Pedersen, Rokstad & Ihlebæk, 2015). These clients, without social contact or stimulation, have coddled and been comforted by robotic animals as successfully as patients who have been exposed to actual animals. And if animals' beneficial effect is so ubiquitous can we say with certainty that pet owners are calmer, happier and healthier than non-pet owners? If that is so, why then are shelters packed to overflowing with abused and abandoned animals?

It's ironic that I've become so fascinated with interspecies communication after spending over almost forty years as an investigative journalist trying to unravel human communication, most often covering the fallout from when communication breaks down. Because I met a horse I now wonder if perhaps there are some lessons to be learned in that space between human cognition and equine sensation. Perhaps making a connection with an animal from another species can help the *human* animal to rethink and reimagine new kinds of collaboration. By doing so might it not enable us to connect with an aspect of ourselves and others? I believe that is *exactly* what happened between me and this horse who has led me on this fascinating journey of discovery. I crossed barriers and my own very human inclination to categorize and generalize.

Trust and respect brought me close to a unique singular; not an animal, a species, or even a horse, but Duke. There were 20 other horses in the barn but I only have eyes for Duke. Matthew Calarco (2015) explains that it is only when we are able to authentically perceive "a singular Other" (p.31), that we are able to engage ethically with the irreducible uniqueness of the other. Only then are our assumptions and preconceptions blown apart. Only then will we be able to face the challenge to change our perspective and ways of doing things. It is this affirming response to the "call of the Other" which is so transformative (p.32). A chance encounter with a strange animal, a leviathan of a horse, caused me to question a powerful reaction and attraction to a member of another species. My ethical transformation did not suddenly spring from my own rationality and autonomous set of principles, but was a direct result of my authentic engagement with the Other. This encounter was the catalyst for a change in thinking; about a species I had never before considered, and the acceptance of a challenge I had also not considered. Jacques Derrida insists we revisit our inherited hegemonic ideas about animals and animality and advocates decentering humans in binary opposition, to begin thinking about how we might relate to both humans and non-humans outside a violent hierarchy. One answer might be to look beyond categories, and see the other not as being less than, but being different. I see Duke as an "irreplaceable living being that one day entered my space" just as Derrida's cat entered his space (p.40), and "we address each other across and through difference and radical otherness "(p.40). How does an authentic connection

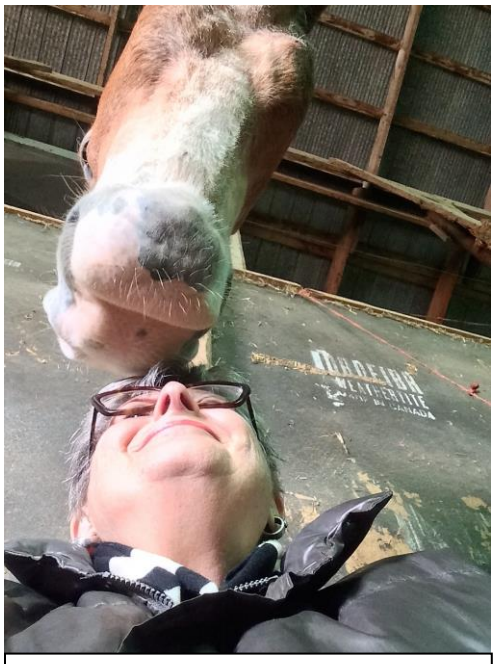

Image 10. Perspective - Selfie

to another singularity affect the well-being of another? For two years I have been looking for answers for why I keep returning to Belgian Haven to spend time with a horse! I assumed our connection could be demonstrated through some physiological empirical evidence that would help me explain this improbable, unlikely relationship. I couldn't understand that just respecting and celebrating the benefits of this relationship and our connection was enough. I needed to prove that which in the end I could not. It seems the lesson of Clever Hans was lost on me as well. When Hans and his owner were dismissed as frauds, a truth was uncovered that sadly eclipsed a phenomenon, and a whole new avenue for investigation was missed. Hans may not have been able to add and subtract but he was so incredibly alert, aware and sensitive that he could read the slightest signal that he had come to the correct answer. Clever Hans was smart. He just wasn't smart in the way everyone thought. And just because I was unable to prove that our hearts beat as one does not disprove a bond beyond scientific formulation. Duke and I are connected, just not in the way I thought I could measure and objectively prove. Our heart rates didn't explain the mechanism or the benefits of our interaction. Acceptance did. The horse-human bond, like any other, can be more reciprocal if respect, trust and fairness are clearly communicated (Keaveney, 2008). This is something 'horse people' have learned through years of practical experience. Empirical fact is part of a lived experience, not apart from it. Perhaps we and these animals are capable of a more nuanced, caring and mutually beneficial relationship (Keaveney, 2008).

Image 11. Duke and Hana at Belgian Haven.
Photographer: Dan McCormick

The unanswered question remains. How to enhance the impact of Human Animal Interaction by understanding the processes through which HAI reduces distress, and the circumstances under which it is most effective at doing so (Crossman,2016). This will require rigorous research designs, well-designed randomised controlled trials and an appreciation of the need to standardise and document equine-assisted interventions and outcomes in future research…and perhaps better questions.

"Faith" is a fine invention
For Gentlemen who ***see!***
But Microscopes are prudent
In an Emergency!

-Emily Dickenson

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Appendix A – Informed Consent Form

Physiological and Behavioural Changes in Horse-Human Interaction

Researchers: Dr. Suzanne MacDonald and Hana Gartner, Department of Psychology, York University

Purpose of the Research: The purpose of this study is to assess if -and to what extent- human emotions and biorhythms change when participating in equine-assisted activities.

What You Will Be Asked to Do in the Research: You will not be asked to do anything beyond what you have signed up for with the Dreamwinds Equine Facilitated Learning Centre, except to wear a Fitbit (a wireless activity tracker that measures data such as heart rate) around your wrist. You will also be asked to complete a short exit survey based on your experiences during the session.

Risks and Discomforts: We do not foresee any risks or discomfort from your participation in the research.

Benefits of the Research and Benefits to You: The emotional and physiological effects that the equine-assisted session has on you will help researchers understand how horses impact humans. These data will be used to improve equine-assisted learning techniques, and to advance our basic knowledge of horse-human communication.

Voluntary Participation: Your participation in the study is completely voluntary and you may choose to stop participating at any time.

Withdrawal from the Study: You can stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating, or to refuse to answer particular questions, will not affect your relationship with the researchers or York University. In the event you withdraw from the study, all associated data will be immediately deleted.

Confidentiality: All information you supply during the research will be held in confidence and you will remain anonymous to the researchers. If you would like a copy of the results of the study when it is complete, please leave your email address with Tracey before you leave. Your data will be safely stored and backed up and only the researchers will have access to this information. The data will be archived for seven years, and then completely deleted. No names or email addresses will be connected to your data.

Questions About the Research This research has been reviewed and approved by the Human Participants Review Sub-Committee, York University's Ethics Review Board, and conforms to the

standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, York Research Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal Rights and Signatures:

I,_____, consent to participate in "Physiological and Behavioural Changes in Horse-Human Interaction" conducted by Dr. S. MacDonald, and Ms. Hana Gartner. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent."

Signature

Date

Participant name

Signature

Date

Principal Investigator name: Dr. S. MacDonald

Appendix B

Participant Questionnaire:

1. Have you had any significant experience with horses?

2. From 1 – 5, how would you rate your fear and or discomfort level being around horses, with 5 being most afraid and uncomfortable.

3. Has this experience made you more or less fearful of horses?

4. Did you feel anxious during the session? If so, describe one or two moments that you felt particularly stressed.

5. What did you learn about yourself that you can use outside of the arena?

Appendix C - Supplementary Materials

Horse-Pull Video

https://www.dropbox.com/sh/xpf7t9zyj86pm1n/AAB0Bh_Ie-AgUlOcnXE7cxlua?dl=0

Duke-Hana Selfies 2016-2017

https://www.dropbox.com/sh/4qwekjrxgicyf8t/AAC3JQDqmrXX_8PzvoHw3knDa?dl=0