Applied Animal Behaviour Science 139 (2012) 96–104

Contents lists available at SciVerse ScienceDirect

Applied Animal Behaviour Science

journal homepage: www.elsevier.com/locate/applanim

Co-variations between perceived personality traits and quality of the interaction between female riders and horses

Inga Astrid Wolframm[a,*], Ruud Gerardus Johannes Meulenbroek[b]

[a] University of Applied Sciences Van Hall Larenstein (WUR), Droevendaalsesteeg 2, Postbus 411, 6700 AK Wageningen, The Netherlands
[b] Donders Institute for Brain, Cognition and Behaviour, Radboud University Nijmegen, The Netherlands

ARTICLE INFO

Article history:
Accepted 14 March 2012
Available online 7 April 2012

Keywords:
Horse–rider interaction
Personality traits
Equine personality

ABSTRACT

The current study seeks to investigate the relationship between perceived equine and rider personality traits on the one hand and quality of horse–rider relationships on the other. An Internet questionnaire examined the self-perceived personality traits of 2525 horse–female rider dyads that indicated to have a low, medium or high-quality horse–rider relationship. The questionnaire was split into three parts, part 1 focused on personal details, while parts 2 and 3 investigated perceived personality traits of the rider (15 items) and the horse (15 items). In order to determine relevant personality components contained in the rider and horse personality questionnaires, principal components analyses (PCA) were performed. The following personality components could be identified for the rider: "excitability", "liveliness", "consideration" and "leadership". For the horse, relevant components consisted of "emotional reactivity", "intelligence", "gregariousness", and "willingness to work". Partial correlations were used to investigate relationships between horse and rider personality components, while controlling for the effect of length of ownership and competitive level. Weak positive partial correlations were found between the personality components of "liveliness (rider)" with "intelligence (equine)" [$r = 0.16$, $n = 1674$, $P < 0.0001$] and "gregariousness (equine) [$r = 0.1$, $n = 1674$, $P < 0.001$]; "excitability (rider)" with "emotional reactivity (equine)" [$r = 0.14$, $n = 1674$, $P < 0.0001$]; "leadership (rider)" with "intelligence (equine)" [$r = 0.1$; $n = 1674$; $P < 0.0001$] and "willingness (to work) (equine)" [$r = 0.1$, $n = 1674$; $P < 0.0001$]; "consideration (rider)" with "gregariousness (equine)" [$r = 0.11$; $n = 1674$; $P < 0.0001$] Our findings suggest that self-perceived personality traits in the rider at least in part co-vary with perceptions of horse temperament, and, as a consequence, are likely to affect quality perceptions of horse–rider interaction.

1. Introduction

Research into the impact of personality components on different aspects of life, such as relationships, employment preferences or recreational activities, has seen a surge in popularity in recent years (Gattis et al., 2004). The idea that personality components might affect and predict the quality of interpersonal relationships has been of particular interest (Baumeister and Leary, 1995; Epstein and Baucom, 2002; Karney and Bradbury, 1995). Early researchers in the field of relationships have noted that personality factors play an important role in predicting relationship satisfaction (e.g. Bradbury and Fincham, 1988) and some have gone as far as categorically stating that personality affects relationships (Asendorpf and Wilpers, 1998).

In equestrian sports, riders form close relationships with horses and it has been said that in order to perform optimally rider and horse need to operate "as one" (Brandt, 2004; Meyers et al., 1997). On a daily basis the horse–rider dyad is required to perform a variety of tasks together, ranging from maintenance activities, such as feeding and grooming, to more complex activities under saddle.

* Corresponding author. Tel.: +31 625 151 543; fax: +31 317 486 280.
E-mail address: inga.wolframm@wur.nl (I.A. Wolframm).

0168-1591/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
doi:10.1016/j.applanim.2012.03.006

Effective communication between horse and rider undoubtedly depends to some considerable degree on the rider's level of experience and skill, especially with a view of reacting to unforeseen movements or reactions from the horse (Visser et al., 2008). However, not all riders are equally skilled, and yet there exist many functioning combinations among less experienced riders. To date only a limited number of studies have investigated psychological components of horse ownership, including horse–rider interaction (Pretty, 2000; Visser et al., 2008). In a review of research on the rider–horse relationship, Hausberger et al. (2008) note that there is a lack of knowledge regarding the effects of rider behavior on horses' reactions, including performance. Yet anecdotal evidence suggests that some horse–rider combinations seem to form a harmonious unit almost instantly, while others do not seem to be able to get along, regardless of skill, expertise or, in some cases, time spent together. While the horse, as a reactive animal, is not likely to demonstrate the same intricacies of personality traits as riders, research has shown that animals also display different "personality traits". Studies by Momozawa et al. (2003, 2005) investigating caretakers' assessments of horses via questionnaires have identified dimensions such as anxiety, novelty seeking, understanding, trainability and affability. Others reported additional dimensions such as flightiness, willingness to perform (Visser et al., 2001); and fearfulness or gregariousness (Wolff et al., 1997). More recent research by Lloyd et al. (2007, 2008) identified six trait dimensions of dominance, anxiousness, excitability, protection, sociability and inquisitiveness. Given that these different types of equine personality traits are likely to interact with rider personality traits, it may be reasonable to assume that the quality of the horse–rider relationship, much like rider interactions, is at least in part also subject to interactions between the different personality traits displayed by horses and riders (Hausberger et al., 2008).

Previous studies have shown that when selecting a horse, riders base their ultimate choice on aspects of athleticism, conformation and equine temperament (Buckley et al., 2004; Hennessy et al., 2008). A number of studies investigating equine temperament have found that emotionality (neuroticism) was generally correlated negatively to learning (Heird et al., 1986; LeScolan et al., 1997) and also caused riders to experience heightened levels of arousal (Wolframm and Micklewright, 2010). However, studies by Hausberger et al. (2004) found that show horses showed greater levels of emotionality than leisure horses. A study by Lloyd et al. (2008) argues that artificial selection procedures in modern horse breeding have produced personality traits in horses that serve the varying requirements of their usage. In draught horses, for example, low levels of excitability and anxiousness might be considered an advantage (Lloyd et al., 2008), while racing thoroughbreds would need particularly high levels of reactivity (McGreevy and Thomson, 2006).

While some evidence exists on which type of equine personality traits might be beneficial for different equestrian disciplines, very little is known regarding the extent to which rider personality traits co-vary with the perception of the horse–rider relationship. When acquiring a horse, most riders arguably hope for a good (i.e. satisfying and harmonious) interaction with their horses, which allow them to engage in the different equestrian activities of their choice. In reality however, horse–rider combinations may not always be perceived as ideal, both from a performance or a communicative point of view (Hausberger et al., 2008; Hennessy et al., 2008). Many riders for example have horses they regularly perceive as difficult or as not meeting their demands, but that they are still attached to for other reasons. Ultimately, there are also horse–rider combinations that are considered not suitable, where communication between horses and riders does not proceed smoothly, and either the horse, or the combination becomes a danger to themselves or others. The principle of "ethical equitation" stipulates that riders have a moral responsibility to deal with horses bearing in mind their optimal welfare (McGreevy and McLean, 2010). Such responsibility should necessarily extend to determining which personality traits are conducive to harmonious horse–rider relationships. Considering both high level of injuries in equestrian sports and increasing amounts of equine wastage due to horses being deemed "unrideable" or "unmanageable", determining whether different types of horse and rider are better suited to each other seems particularly important. In the present study we therefore seek to investigate the extent to which equine and rider personality components co-vary and are related to the perceived quality of horse–rider relationships. Specifically, the current study attempts to operationalize horse and rider personalities in a simple, user-friendly manner, using the five-factor model of personality as a basis.

2. Materials and methods

2.1. Participants

A Dutch Internet questionnaire (attached in Appendix A) examining personality components in horse–rider relationships of different quality was published online for completion by riders. For the purpose of this study, riders were defined as people who rode and handled horses.

2.2. Procedure

The study was advertised on several horse-related websites in the Netherlands. A short introductory text advised riders interested in participating that the purpose of the study was to develop a better understanding as to how personality components in horse and rider contribute to the quality of their relationship. They were invited to participate by clicking on a link, leading to the Internet questionnaire, which was composed of three parts (see Appendix A). The first part contained questions related to detailed information about themselves and their horse, including age, sex, whether they participated in ridden competition, highest level of competition (to provide an approximation of ability), horse's age, breed, sex and length of ownership. Participants were also asked to rate the perceived quality of the relationship with their horse on a 3-point scale. Each score represented a commonly expressed sentiment defining the quality of the relationship, with 1 = "horse of a lifetime", 2 = "sometimes better,

sometimes worse" and 3 = "never again". For the purpose of this article we will refer to the quality of the relationship as follows: 1 = good, 2 = mediocre, 3 = poor. The second and third part of the questionnaire focused on personality components for horse and rider. In order to encourage as many participants as possible to complete the questionnaire, it was decided to limit the number of items in each part of the equine and rider questionnaire to 15. Prior to completing either part 2 (rider personality) or part 3 (equine personality), participants were asked to not think too long about their answer, and were reminded that there were no right or wrong answers. All subsequent items were worded to include the phrase "in general or generally" when referring to behavior, e.g. "How assertive are you in general?" or "How does your horse generally behave during stressful situations?" to denote personality traits that are relatively stable over time and across different situations.

2.3. Rider personality inventory

The Five Factor Model of Personality (FFM; Goldberg, 1993) is one of the most commonly used models to assess personality, including self-assessments conducted through Internet questionnaires (see e.g. Buchanan et al., 2005). The FFM is based on the premise of trait theory and stipulates that persons may be characterized using individual differences that are relatively stable across situations and time, affecting cognitions, emotions and behavioral expressions (Eysenck and Eysenck, 1985). It is hierarchical in nature, encompassing broad, higher order factors of personality factors neuroticism, extraversion, openness to experience, agreeableness and conscientiousness, which, in turn are composed of more specific, lower order "facets" of personality, such as anxiety, angry-hostility, or self-conscience (all relating to the higher order factor of neuroticism) (Costa and McCrae, 1992). For the second part of the questionnaire riders were asked to rate their own personality on 15 items, with 3 items describing each one of the 5 personality domains of the FFM [Neuroticism, Extroversion, Openness to Experience, Agreeableness and Conscientiousness] (Costa and McCrae, 1992). A list of descriptors for each personality domain is included in Table 1. Each item was rated on a 5-point scale with opposing personality descriptors at either end of the scale to facilitate ease of completion of the questionnaire. Participants were encouraged to answer spontaneously, and advised that there were no right or wrong answers.

2.4. Equine personality inventory

As indicated by Morris et al. (2002) using existing rider personality assessments to measure equine temperament allows for a more direct comparison and ultimately better understanding of relevant traits. An equine inventory measuring personality was consequently designed based on the FFM (Goldberg, 1993) and drawing on previous research investigating the effect of equine personality on rider performance (Wolframm and Micklewright, 2010). Seeing that a number of the scales of the FFM (i.e. neuroticism, extraversion, openness to experience, agreeableness and conscientiousness) use descriptors difficult to apply to horses, it was necessary to first determine which personality descriptors might be suitable for describing equine personality traits. We therefore first examined common descriptors of the five factors of personality (Goldberg, 1993) to make an initial selection of suitable adjectives to describe equine personality. We then drew on previous scientific literature describing equine temperament (Morris et al., 2002; Visser et al., 2001, 2002; Wolframm and Micklewright, 2010), secondary literature (Paalmann, 1998), laymen press and personal experience to make the final selection of adjectives, resulting in three adjectives to describe each equine temperament domain (see Table 1). To mirror the rider personality inventory, items were scored on a 5-point scale which included descriptives of opposing characteristics on either end of the scale, again, to ease understanding of what was meant by the personality items.

Table 1
FFM domains and descriptors for riders and horses.

FFM personality domains	Rider traits	Equine traits
Neuroticism	Excitable	Anxious
	Emotional	Stressed
	Concerned	Excitable
Extraversion	Assertive	Gregarious
	Risk-taking	Dominant
	Cheerful	Temperamental
Openness to experience	Emotional	Imaginative
	Adventurous	Curious
	Imaginative	Clever
Agreeableness	Trusting	Trusting
	Altruistic	Loving
	Accommodating	Cooperative
Conscientiousness	Competent	Focused
	Dutiful	Careful
	Performance-orientated	Predictable

2.5. Data scoring and statistical analysis

In order to determine relevant personality factors contained within both rider and horse personality inventories, a data reduction technique (principal components analyses (PCA)) was conducted, transforming the original variables into smaller sets of linear combinations. Cronbach alpha values were subsequently calculated to determine the internal consistency of each scale. All data were analyzed using IBM Statistical Programme for Social Scientists 19.0. A significance level of $P < 0.05$ was set unless specified otherwise.

2.5.1. PCA of equine personality questionnaire

PCA of the 15 items of the equine personality questionnaire was performed to reveal components with eigenvalues exceeding 1. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy value was 0.779, meeting the minimum requirement of 0.6 (Tabachnik and Fidell, 2001) and the Bartlett's Test of Sphericity was significant with $P < 0.0001$. Factor analysis may therefore be considered appropriate. The analysis revealed four relevant

components, explaining 22.59%, 15.18%, 10.34% and 9.89% of the variance respectively. Using Cattell's scree test and Varimax rotation, all four main components were retained for further investigation, explaining 57.92% of the total variance.

2.5.2. PCA of rider personality inventory

PCA of the 15 items of the rider personality questionnaire was performed to reveal components with eigenvalues exceeding 1. The KMO Measure of Sampling Adequacy value was 0.722, and the Bartlett's Test of Sphericity was significant with $P < 0.0001$. Factor analysis was also considered appropriate. For rider personality the analysis also revealed four components, explaining 17.46%, 12.96%, 11.97% and 7.58% of the variance respectively. Using Cattell's scree test and Varimax rotation, all four main components were retained for further investigation, explaining 49.97% of the total variance.

Equine temperament questionnaires were also scored manually. Relationships between rider and equine personality traits were evaluated using partial correlation controlling for length of ownership and level of experience.

2.5.3. Correlational analysis and multiple analysis of variance

For each of the indicated quality levels of the horse–rider relationships, partial correlations were calculated to investigate relationships between horse and rider personality components, while controlling for the effect of length of ownership, competitive level, and the age of participants. Strength of correlations was defined as follows: ±1.0 to ±0.5 (strong); ±0.5 to ±0.3 (moderate) and ±0.3 to ±0.1 (weak) (Tabachnik and Fidell, 2001). We further conducted a multiple analysis of variance investigating equine sex, breed and relationship interactions on perceived equine personality scores. Again, all data were analyzed using IBM Statistical Programme for Social Scientists 19.0. A more stringent alpha level of $P < 0.001$ was set in order to compensate for a non-normal, negatively skewed distribution of the data, as advised by Tabachnik and Fidell (2001) who report this to be common problem with data in the social sciences. An adjusted alpha level of $P < 0.00025$ was used to determine significance following post hoc Bonferroni analysis.

3. Results

3.1. Participants

Following an examination of the data for missing values and subsequently removal of any incomplete responses, the final data-set comprised 2678 participants (2525 females; 123 males; 30 unknown). Due to the extremely skewed distribution of female vs. male riders (95.35% vs. 4.64%) it was decided to continue only with the analysis of the data relating to females. In fact, this result considerably exceeds previously reported male–female distributions of 80% female vs. 20% male (Meyers and Sterling, 2000). We therefore felt that focusing only on the female data would be appropriate. In order to facilitate readability, we will continue to refer to "female riders" as "riders" throughout the remainder of the manuscript. It should be noted that all results refer to data from female participants only. Data were subsequently screened for missing data, and only complete data sets retained, leaving a total of 2512 female data sets.

The age range of participants was distributed as follows: ≤18 = 273 (10.9%); 19–25 = 643 (25.6%); 26–35 = 640 (25.5%); 36–45 = 572 (22.8%); 46–55 = 321 (12.8%); 56–65 = 60 (2.4%); ≥66 = 3 (0.1%). Participants reported their competitive skill level as follows: No competitive level, meaning that riders only rode recreationally = 650 (25.9%); Dutch "B" level (entry level) = 376 (15.0%); Dutch "L" (novice level) = 549 (21.9%); Dutch "M" (medium level) = 402 (16.)%); Dutch "Z"(advanced medium level) = 364 (14.5%);Dutch "ZZ" (advanced level) = 115 (4.6%); national level (competing at national championships) = 31 (1.2%); international level (competing at international championships) = 25(1.0%) (KNHS, 2011). Riders also reported participation in the following equestrian disciplines: Pure show jumping = 64 (2.5%); Pure dressage = 1230 (48.9%); Show jumping and dressage combined = 382 (15.2%); Eventing (including dressage and show jumping) = 161 (6.4%); Western riding = 90 (3.6%); Endurance = 27 (1.1%); Recreational: 338 (13.5%); Other: 220 (8.7%).

3.2. Participants' horses

Participants' reported to have owned their horses 5.17 ± 4.38 years and their horses to be 8.44 ± 4.88 years of age. They owned 1202 mares, 1228 geldings, and 82 stallions. Frequency and type of breed were distributed as follows: 76 thorougbred-type horse (pure and mix) (3%); 91 Arabian type horses (pure and mix) (3.6%); 1509 warmblood horses (of different breeds) (60.1%); 96 American bred horses (of different breeds) (3.8%); 54 Spanish-type horses (of different breeds) (2.1%); 284 cold-blooded horses (of different breeds) (11.3%); 276 ponies (11%) and 126 other (5%).

3.3. Female rider personality inventory

The four components relating to female rider personality were tested for internal consistency and labeled according to item content. Component 1 of the female rider personality inventory included the attributes of excitable, emotional and concerned and was defined as the rider personality scale "excitability". Component 2 included the descriptors of, risk-seeking, adventurous and impulsive was termed "liveliness". Component 3 was composed of altruistic, accommodating and dutiful and was defined as "consideration". Component 4 contained achievement orientated, assertive and competent and was defined as "leadership" (see Table 2). The internal consistency of each component was once again measured using Cronbach alpha. The Cronbach alpha coefficient for each scale reached 0.53 for "excitability", 0.59 for "liveliness", 0.42 for "consideration"; and 0.50 for "leadership". The large data set was assumed to outweigh the somewhat low internal consistencies, and all female rider personality components were considered for further analysis.

Table 2
Perceived personality components in horse and rider.

Self-perceived rider personality components	Perceived equine personality components
Emotional instability	Emotional reactivity
Excitable	Anxious
Emotional	Stressed
Concerned	Excitable
Liveliness	Intelligence
Risk-taking	Imaginative
Adventurous	Dominant
Impulsive	Clever
Consideration	Gregariousness
Accommodating	Affectionate
Altruistic	Sociable
Dutiful	Curious
Leadership	Willingness (to work)
Assertive	Focused
Competent	Cooperative
Achievement orientated	Sensible

3.4. Equine personality components

The four components relating to equine personality were also tested for internal consistency and labeled according to item content. Component 1 included the attributes of anxious, stressed and excitable and was defined as the equine personality scale "temperament". Component 2 contained the descriptors of affectionate, sociable and curious and was termed "character". Component 3 included imaginative, dominant, and clever and was defined as "intelligence". Component 4 was composed of cooperative focused and sensible and was defined as "willingness (to work)" (see Table 2).

The internal consistency of each component was measured using Cronbach alpha. The Cronbach alpha coefficient for each scale reached 0.81 for "temperament", 0.65 for "character", 0.53 for "intelligence; and 0.46 for "willingness (to work)". Once again, the large data set was considered to outweigh the somewhat low internal consistencies for intelligence and willingness (to work). All components relating to equine personality were used for further analysis.

3.5. Correlations between female rider and equine personality

Partial correlations were used to explore the relationship between equine personality factors "emotional reactivity (equine)", "intelligence (equine)", "willingness (to work) equine", "gregariousness equine" and rider personality factors "excitability (rider)", "liveliness (rider)", "consideration (rider)", "leadership (rider)" for good, mediocre and poor relationships separately while controlling for length of horse ownership and rider competitive level.

3.5.1. Relationships between horses and female riders perceived to be good

Small positive partial correlations were found between the personality components of "liveliness (rider)" with "intelligence (equine)" [$r = 0.16$, $n = 1674$, $P < 0.0001$] and "gregariousness (equine) [$r = 0.1$, $n = 1674$, $P < 0.001$; "excitability (rider)" with "emotional reactivity (equine)" [$r = 0.14$, $n = 1674$, $P < 0.0001$]; "leadership (rider)" with "intelligence (equine)" [$r = 0.1$; $n = 1674$; $P < 0.0001$] and "willingness (to work) (equine)" [$r = 0.1$, $n = 1674$; $P < 0.0001$]; "consideration (rider)" with "gregariousness (equine)" [$r = 0.11$; $n = 1674$; $P < 0.0001$] An inspection of the zero-order correlations suggested that the controlling variable of competitive level had a limited effect on the relationship between "leadership (rider)" and "willingness (to work) (equine)" [zero-order correlation: $r = 0.12$, $P < 0.0001$), with a positive correlation between competitive level and "willingness (to work) (equine)" [$r = 0.13$; $P < 0.0001$].

3.5.2. Relationships between horses and female riders perceived to be mediocre

Positive partial correlations between the personality components "liveliness (rider)" and "gregariousness (equine)" with $r = 0.1$, $n = 823$, $P < 0.01$ as well as between "consideration (rider) and emotional reactivity (equine) with $r = 0.11$; $n = 823$, $P < 0.01$ were nearing significance. The inspection of the zero-order correlation suggested no effect of the controlling variables.

3.5.3. Relationships between horses and female riders perceived to be poor

No significant correlations were found between horse and rider personality components. This may be due to a very small number of participants ($n = 15$) who indicated to have a poor relationship with their horse.

3.6. Main and interactive effects between equine sex, breed, discipline and quality of relationship on perceived equine personality

In the multivariate test, a main effect was found for relationship [$F_{8,4518} = 5.29$; $P < 0.0001$] and equine sex [$F_{8,4516} = 3.83$; $P < 0.0001$]. No additional main or interactive effects were statistically significant.

3.6.1. Relationship and personality

When the effect of the quality of the relationship on the dependent variables was considered separately, the equine personality component to reach statistical significance was willingness to work (horse) [$F_{2,2261} = 13.99$; $P < 0.0001$]. Bonferroni post hoc tests detected significantly higher willingness to work (horse) scores in good compared to mediocre (10.93 ± 2.08 vs. 9.58 ± 2.03; $P < 0.0001$) and poor relationships (10.93 ± 2.08 vs. 8.07 ± 2.43; $P < 0.0001$).

3.6.2. Equine sex and personality

The equine personality component of gregariousness (horse) reached statistical significance when considering the effect of equine sex separately [$F_{2,2261} = 7.86$, $P < 0.0001$]. Bonferroni post hoc tests detected significantly lower scores in mares than in geldings (11.69 ± 2.65 vs. 12.49 ± 2.14, $P < 0.0001$) or stallions (11.69 ± 2.65 vs. 12.78 ± 1.97, $P < 0.0001$).

4. Discussion

The study aimed to investigate which equine and rider personality components co-vary with the (rider–perceived) quality of horse–rider relationships. Due to the extreme imbalance between male and female respondents to the study, we decided to focus the analysis purely on female riders. To that purpose, a model based on the Five Factor Model of Personality (Goldberg, 1993) was designed and our assessment results were evaluated by means of PCA.

Findings indicate that co-variations of personality traits between horse and female riders differ depending on the perceived quality of the relationship. In horse–rider combinations that were considered harmonious, a number of weak correlations between perceived horse and rider personality constructs were found, regardless of the length of the relationship, age or skill level of the rider. In relationships perceived as "mediocre" two correlations between horse and rider personality were nearing significance, while no correlations were found in poor relationships. Current findings seem to provide some evidence that personality traits are important when attempting to determine which elements govern functioning horse–rider relationships (Hennessy et al., 2008). An interesting element of the findings is that correlations were highly significant yet weak. While we have made every effort to control for confounding variables, such as age, level of skill indicated through competitive level and length of relationship, while also investigating the impact of breed, horse gender and discipline, there may be additional aspects that influence the results. Previous positive or negative experience with horses, fine motor skill of the rider which often is indicative of rider ability and goes beyond competitive level, changes in rider (or horse) mood, joint action characteristics or indeed talent of the horse, were not included in the study but may well impact on the strength of covariances.

Regarding individual pairings of personality constructs, findings indicate that in functioning relationships, riders who score high on the personality construct of "excitability" also perceive their horse to be highly emotionally reactive. Less sensitive riders on the other hand perceive horses they like best as calmer and more relaxed. Riders scoring high on the personality construct of "liveliness" indicate to have mediocre to good relationships with horses that, in their view, display personality traits of "intelligence", e.g. imaginative, clever, and dominant. The personality construct of liveliness is composed of the descriptors "adventurous", "risk taking", and "impulsive", identifying a high scorer as seeking excitement and stimulation (Costa and McCrae, 1992), which might make them inclined to perceive their preferred horses to be challenging in their behavior. In fact, the correlation match between equine and rider personality traits was one of only two correlations found in mediocre relationships, providing some indication that even when there are no other co-variations in personality traits, rider liveliness and equine intelligence provide the basis for a "semi-successful", i.e. mediocre relationship.

The rider personality construct of "consideration" and the equine construct of "gregariousness" also correlate, indicating that riders seeking harmonious relationships prefer affectionate horses, while riders who are self-centered and ready to fight for their own interest are likely to prefer horses who prefer to remain by themselves and do not seek as much physical contact. Riders who considered themselves to be more competent and assertive, and thus scoring higher on the construct "leadership" considered their relationships most satisfying with horses they perceived to be high on "intelligence" and "willingness (to work)". Interestingly, when investigating the main effect of the quality of the relationship on equine personality scores, "willingness (to work)" was the only construct to differ significantly. It is possible that this is one personality characteristic that riders unanimously value in their horses. In relationships perceived to be mediocre, one additional pairing between consideration (rider) and emotional reactivity (horse) was nearing significance. Seeing that this particular pairing was not detected in functioning relationships, it provides some evidence that highly considerate riders do not form harmonious relationships with overly reactive horses.

One of the key tenants of this study, and perhaps also of horse–rider relationships in general, relates to the fact that riders rate their own personality and that of their horses, and this is not, or only in part, an objective reflection of personality components, but may also be influenced by other sources. Findings irrespective of personality co-variations indicated that rider rated mares to be less gregarious than either geldings or stallions. The question that arises is whether that really is the case or whether these findings are due to a common misconception found in the equine sector that denotes that "mares are more difficult". Furthermore, the high scores on the construct of equine willingness (to work) were thought to be associated with harmonious, i.e. "good" horse–rider relationships. Whether this is due to the fact that riders feel that because their horses are willing to do their bidding and that is why they rate the relationship as good, or because they relate the relationship as good, and thus feel they also need to score the horse as cooperative, will need to be determined in future research.

It may be therefore that female riders, due to their own personality traits, *interpret* behavior of their horses in a certain way. Riders who are easily excitable and concerned may interpret any reaction of the horse to its immediate environment as "anxious" or "stressed", while riders who by their very nature are more relaxed and level-headed in their outlook may rate such behavior as less severe. Secondly, riders may project their own wishes on what they think their horse should be like. In an attempt to truly "connect" to the horse, they may feel that a matching of personality traits will ensure a lasting bond. The notion that horse owners set out to create a functioning bond with their horse might also be supported by the fact that only 0.5% of participants admitted to having a poor relationship. Lastly, the personality of people in general and riders in particular shapes their behavior, their actions and subsequent reactions. Seeing that the relationship between riders and horses are based on non-verbal communication (Brandt, 2004; Hausberger et al., 2008) it is also possible that equine behavior is a *reflection* of rider behavior. The way riders rate their horses therefore is how they see their

horses behave, disregarding the possibility that their horses merely *react* to their own behavior. Regardless of these limitations however, it needs to be noted that the perceptual world of riders is the one that they operate in. This means that the way riders perceive their horses' personality is also likely to influence their own reactions towards them. Therefore, from both a welfare and performance point of view, it is vital that riders develop greater awareness of their own behavior towards their horses and the effect it may have on their horses' behavior in turn. Furthermore, when "labeling" their horses in a positive, or, more importantly, negative way, riders should first question whether that particular label has arisen perhaps more from their own personality than equine temperament.

4.1. Limitations

When designing this type of study, the danger arises that completion of one set of questions relating to personality might influence the responses to items in the second questionnaire. Riders might have been encouraged to rate their horses' personality in much the same way as their own, explaining the "matching" of personality traits. However, seeing that congruent personality traits of horse and rider only appeared for "good" relationships, with one exception for "mediocre" relationships, such a sequential effect is likely to be negligible. Furthermore, the current study investigates only the perceptions of female riders. Additional research needs to explore how male riders perceive their horses' personality and how this might affect subsequent interactions.

An additional limitation of this study relates in particular to the difficulty of accurately assessing equine temperament. Riders scoring their own horses will almost always be biased with a view to previous experiences with that particular horse; previous experiences with other horses causing comparisons; and elements of rider personality, which may affect their own perception of certain temperament traits. However, allowing an independent rater to assess the horse is unlikely to lead to reliable results, as an independent rater will not know the horse as intimately as the rider. Possibilities for independent analysis of equine temperament include, for example, novel object tests (Visser et al., 2001, 2002). Seeing that these types of study designs only test the horse in certain experimental settings, which are far removed from the demands of a competitive situation, they are also unlikely to yield the desired results. At this point, current findings should therefore be interpreted with caution, bearing in mind the tendency for rater bias, both in view of riders themselves and in view of their horses.

Lastly, the study design required a large number of correlations to be carried out. Every effort was made to avoid a Type 1 error, with alpha levels set stringently and potentially controlling variables being included in the analysis. Nevertheless, further research is required to validate or refute current findings.

5. Conclusion

In conclusion, our findings suggest that self-perceived personality traits in female riders at least in part co-vary with their perceptions of horse temperament, and, as a consequence, are likely to affect quality perceptions of horse–rider interaction. Considering that more correlating personality constructs could be found for good rather than mediocre or poor relationships seems to suggest that the quality of a relationship might influence in turn the perception of personality. Future research needs to validate current findings and should incorporate third-party perceptions of personality components in horse–rider combinations in order to verify rider perception of their own horses.

Appendix A. Original questionnaires of horse and rider personality

Survey rider personality

Below you find a number of questions relating to characteristics, which describe human personality. Please rate your own personality. Do not think about your answers for too long. There are no right or wrong answers.

		1	2	3	4	5
1	How easily excitable are you generally?	Calm				Overly sensitive, tense
2	How open are you to fantasy are you generally?	Pragmatic, live in the present				Creative, visionary
3	How assertive are you in general?	Timid, reticent				Assertive, determined, stands up for oneself
4	How much do you generally like to take risks?	Little need for excitement				Enjoys excitement and arousal
5	How accommodating are you in general?	Competitive, aggressive				Cooperative, meets others half-way, adaptive
6	How cheerful are you generally?	Sober, dry				Cheerful, lively
7	How emotional are you in general?	Ignores emotions, business-like				Experiences and expresses intense emotions
8	How achievement-orientated are you in general?	Little need for success, indifferent				Ambitious, achievement-driven
9	How adventurous are you generally?	Conservative-conventional, prefers usual habits				Prefers something new, likes variability and change
10	How trusting are you in general?	Distrustful, careful regarding others				Trustful, also regarding others
11	How impulsive are you in general?	Controlled, self-possessed				Unbridled, excessive
12	How altruistic are you in general?	Egocentric, focused on self				Tries to be there for others

13	How competent do you generally feel?	Uncertain, doubtful	Persuasive, knowledgeable
14	How dutiful are you in general?	Unreliable, flighty	Conscientious, reliable
15	How concerned are you in general?	Copes well with stress, relaxed	Vulnerable, sensitive

Survey horse personality
Below a number of questions relating to the personality of your horse.

		1	2	3	4	5
1	How does your horse generally react to stressful situations?	Copes well with stress, relaxed				Sensitive, highly strung
2	How curious is your horse in general?	Not curious, reticent with regards to novel situations				Curious, continuously exploring
3	How dominant is your horse in general?	Submissive				Dominant
4	How sociable is your horse in general?	Likes to remain on its own				Focused on horses and people
5	How temperamental is your horse generally?	Slow, lazy				Fiery, full of energy
6	How imaginative is your horse generally?	Does not take “own initiative”				Full of “ideas”, comes up with new “tricks” regularly
7	How anxious is your horse generally?	Not scared, sober				Scared easily, anxious
8	How sensible is your horse generally?	Not sensible or careful (e.g. when show jumping) rushes				Sensible and careful (e.g. when jumping) looks after itself
9	How clever is your horse generally?	Unintelligent, learns slowly				Very intelligent; learns quickly (also negative behaviors)
10	How trusting is your horse generally?	Mistrusting, follows hesitantly				Trustful, follows without hesitation
11	How excitable is your horse in general?	Calm, relaxed				Excitable, sensitive
12	How affectionate is your horse generally?	Irritable, grumpy				“loving”, seeks affection
13	How focused is your horse generally when working?	Not focused, easily distracted				Focused, not easily distracted
14	How cooperative is your horse generally?	Uncooperative, does not work with a person				Cooperative, works with a person
15	How predictable is your horse generally?	Unpredictable, reactions are difficult to foresee				Predictable, reactions are easy to foresee

References

Asendorpf, J.B., Wilpers, S., 1998. Personality effects on social relationships. J. Pers. Soc. Psychol. 74, 1531–1544.

Baumeister, R.F., Leary, M.R., 1995. The need to belong: desire for interpersonal attachments as a fundamental rider motivation. Psychol. Bull. 117, 497–529.

Bradbury, T.N., Fincham, F.D., 1988. Individual difference variables in close relationships: a contextual model of marriage as an integrative framework. J. Pers. Soc. Psychol. 54, 713–721.

Brandt, K., 2004. A language of their own: an interactionist approach to rider–horse communication. Soc. Anim. 12 (4), 299–316.

Buchanan, T., Johnson, J.A., Goldberg, L.R., 2005. Implementing a five-factor personality inventory for use on the Internet. Eur. J. Psychol. Assess. 21 (2), 116–128.

Buckley, P., Dunn, A., More, S., 2004. Owners' perceptions of health and performance in pony club horses in Australia. Prev. Vet. Med. 63, 121–132.

Costa, P.T., McCrae, R.R., 1992. Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO FFI) Professional Manual. Psychological Assessment Resources, Odessa, FL.

Eysenck, H.J., Eysenck, M.W., 1985. Personality and Individual Differences: A Natural Science Approach. Plemum, New York.

Epstein, N.B., Baucom, D.H., 2002. Enhanced Cognitive-Behavioral Therapy for Couples: A Contextual Approach. American Psychological Association, Washington, DC.

Gattis, K.S., Berns, S., Simpson, L.E., Christensen, A., 2004. Birds of a feather or strange birds? Ties among personality dimensions, similarity, and marital quality. J. Fam. Ther. 18 (4), 564–574.

Goldberg, L.R., 1993. The structure of phenotypic personality traits. Am. Psychol. 48, 26–34.

Hausberger, M., Bruderer, C., LeScolan, N., Pierre, J.-S., 2004. Interplay between environmental genetic factors in temperament/personality traits in horses (*Equus caballus*). J. Comp. Psychol. 118, 434–446.

Hausberger, M., Roche, H., Henry, S., Visser, E.K., 2008. A review of the rider–horse relationship. Appl. Anim. Behav. Sci. 109, 1–24.

Heird, J.C., Whitaker, D.D., Bell, R.W., Ramsey, C.B., Lokey, C.E., 1986. The effects of handling at different ages on the subsequent learning ability of 2-year-old horses. Appl. Anim. Behav. Sci. 15, 15–25.

Hennessy, K.D., Quinn, K.M., Murphy, J., 2008. Producer or purchaser: different expectations may lead to equine wastage and welfare concerns. J. Appl. Anim. Welf. Sci. 11 (3), 232–235.

Karney, B.R., Bradbury, T.N., 1995. The longitudinal course of marital quality and stability: a review of theory, method, and research. Psychol. Bull. 118, 3–34.

KNHS, 2011. Algemeen Wedstrijdreglement. Koninklijke Nederlandse Hippische Sportfederatie. Ermelo. http://www.knhs.nl/objects/00022770.pdf.

LeScolan, N., Hausberger, M., Wolff, A., 1997. Stability over situations in temperamental traits of horses as revealed by experimental and scoring approaches. Behav. Process. 41, 257–266.

Lloyd, A.S., Martin, J.E., Bornett-Gauci, H.L.I., Wilkinson, R.G., 2007. Evaluation of a novel method of horse personality assessment: rater-agreement and links to behaviour. Appl. Anim. Behav. Sci. 105, 205–222.

Lloyd, A.S., Martin, J.E., Bornett-Gauci, H.L.I., Wilkinson, R.G., 2008. Horse personality: variation between breeds. Appl. Anim. Behav. Sci. 112, 269–383.

McGreevy, P.D., Thomson, P.C., 2006. Differences in motor laterality between breeds of performance horse. Appl. Anim. Behav. Sci. 99, 183–190.

McGreevy, P.D., McLean, A.N., 2010. Ethical equitation: capping the price horses pay for rider glory. J. Vet. Behav. 5, 203–209.

Meyers, M.C., Bourgeois, A.E., LeUnes, A., Murray, N.G., 1997. Mood and psychological skills of elite and sub-elite equestrian athletes. J. Sport Behav. 22, 399–409.

Meyers, M.C., Sterling, J.C., 2000. Physical, hematological, and exercise response of collegiate female equestrian athletes. J. Sports Med. Phys. Fitness 40, 131–138.

Momozawa, Y., Onon, T., Sato, F., Kikusui, T., Takeuchi, Y., Mori, Y., Kusunose, R., 2003. Assessment of equine temperament by a questionnaire survey to caretakers and evaluation of its reliability by simultaneious behaviour tests. Appl. Anim. Behav. Sci. 91, 321–335.

Momozawa, Y., Kusunose, R., Kikusui, T., Takeuchi, Y., Mori, Y., 2005. Assessment of equine temperament questionnaire by comparing factor structure between two separate surveys. Appl. Anim. Behav. Sci. 92, 77–84.

Morris, P.H., Gale, A., Duffy, K., 2002. Can judges agree on the personality of horses? Pers. Indiv. Differ. 33, 67–81.

Paalmann, A., 1998. Training Showjumpers, 2nd ed. J. A. Allen and Company Limited, London.
Pretty, G.H., 2000. Understanding the enmeshment in equine and rider relationships: how riders think about the horse in their attributions of performance success. Aust. J. Psychol. (Suppl. 107).
Tabachnik, B.G., Fidell, L.S., 2001. Using multivariate statistics, 4th ed. HarperCollins, New York.
Visser, E.K., Van Reenen, C.G., Blokhuis, M.Z., Morgan, E.K., Hassmén, P., Rundgren, T.M., Blokhuis, H.J., 2008. Does horse temperament influence horse–rider cooperation? J. Appl. Anim. Welf. Sci. 11 (3), 267–284.
Visser, E.K., Van Reenen, C.G., Hopster, H., Schilder, M.B.H., Knaap, J.H., Barneveld, A., Blokhuis, H., 2001. Quantifying aspects of young horses' temperament: consistency of behavioural variables. Appl. Anim. Behav. Sci. 74, 241–258.
Visser, E., Van Reenen, C., Van der Werf, J., Schilder, M., Knaap, J., Barneveld, A., Blokhuis, H., 2002. Heart rate and heart rate variability during a novel object test and a handling test in young horses. Phys. Behav. 76, 289–296.
Wolff, A., Hausberger, M., LeScolan, N., 1997. Experimental tests to assess emotivity in horses. Behav. Process. 40 (2), 209–221.
Wolframm, I.A., Micklewright, D., 2010. Pre-competitive arousal, perception of equine temperament and riding performance: do they interact? Comp. Exerc. Phys. 7 (1), 27–36.