



Repeatability and reliability of scores from ridden temperament tests conducted during performance tests

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ABSTRACT

Current scores for equine personality traits assessed during performance tests are characterised by high means and inadequate variation, hampering genetic selection for these traits. A number of temperament and related behaviour tests have been developed in order to make assessment of equine personality more objective. However, rarely these tests have been validated for their use as a selection tool. Thus, as a first step the aim of the present study was to integrate a temperament tests into horse performance tests, in order to assess variability and repeatability of horses' reactivity under the rider and the reliability of the judges' assessment thereof. The temperament test was comprised of three novel stimuli, including a visual stimulus (BALL), a visual and tactile stimulus (GATE), and a visual and auditory stimulus (CANS). A total of 224 mares and stallions were subjected to the test during their participation in station performance tests for riding horses, and 133 of these horses were subjected to the test a second time either 2–3 weeks or 18 weeks after the first test. Horses were ridden in the test by professional riders, and their reactions to the stimuli were evaluated each by two judges and the rider using scores on a scale from 1 (task not concluded) to 10 (completely calm but attentive horse). Mean scores (\pm SD) ranged between 6.6 ± 2.4 (GATE) and 7.8 ± 2.1 (BALL), demonstrating lower means and considerably higher standard deviations than the same horses' scores from present evaluation of the trait labelled temperament (8.1 ± 0.9) or related personality traits (e.g. character: 8.3 ± 0.8). Using variance components from mixed model analysis, inter-observer agreement between the two judges was for the individual stimuli very high (0.95 (BALL), 0.96 (GATE), 0.89 (CANS)), and there was likewise high agreement between the judges' and the riders' combined scores (0.93). Repeatabilities of horses' scores were 0.72 (BALL), 0.75 (GATE), and 0.69 (CANS). Correlations to traits from the present evaluation of personality were low or non-existent, indicating that these traits are not a reflection of anxiety or fear reactivity as assessed by novel object tests. Horses' improvement in judges' combined scores from first to second test was not ($P > 0.1$) influenced by differences in time between tests, but differed between breed-types and individual riders. Also, not surprisingly, the higher horses' scores in the first test were, the lower their improvement in the second test was (-0.45 ± 0.06 per additional score in the first test). Temperament tests using novel stimuli presented to horses under a rider may be a practical and valid tool for improving the current assessment of equine personality traits during performance tests. Considering a combination of absolute scores and horses' improvement in scores of repeated tests, rather than measuring only absolute scores yields relevant information about horses' personality, and at the same time it may prevent owners from deliberately training their horses for low reactions to the test-stimuli.

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1. Introduction

Personality traits, and in particular the trait temperament, are considered to be important attributes in riding horse breeding (Koenen et al., 2004). For example, in German riding horse breeding four performance traits (each of the basic gaits and show-jumping ability), rideability and as much as four different personality traits are evaluated. The latter are labelled “character”, “temperament”, “willingness to work”, and “constitution”, and they are evaluated based on the overall impression judges obtain of individual horses during routine riding and handling procedures of performance test training. In fact, buyers of both leisure and sport horses refer to personality traits as the key characteristics when selecting a horse for their individual purposes (Rumpf, 2011). Perhaps as a consequence, even with sport horse breeds such as the Trakehner horse, all personality traits and rideability are valued considerably higher by breeders than any other performance traits such as the gaits or conformation (Teegen et al., 2008). However, as outlined earlier (Górecka-Bruzda et al., 2011a; Pasing et al., 2011; Pasing and König von Borstel, 2012) the present evaluation of personality traits in horse breeding suffers from a number of problems such as insufficient definition of the traits and individual scores, overlapping definitions with other personality traits, and limited numbers of horses evaluated for this trait, resulting in potentially biased scores with high means and low standard deviations. These circumstances hinder a meaningful selection for this trait, and thus impede any substantial genetic improvement of personality traits. However, particularly with regard to horses, the accurate evaluation of such personality traits is relevant, given the high potential for accidents resulting in often severe injuries to rider and horse (Lloyd, 1987; Bixby-Hammett and Brooks, 1990; Chitnavis et al., 1996), and which are commonly a result of horses’ fear reactions (Keeling et al., 1999). Thus, fear reactivity, together with the closely related startle response (Brown et al., 1951) and anxiety (Davis et al., 1987), may be the most important dimension of equine temperament from a practical perspective. During present performance tests, fear reactivity is evaluated only indirectly as one of the components of the subjectively assessed personality trait labelled “temperament”. A potential way to improve the current evaluation of the trait temperament in breeding horses could be the introduction of specific temperament tests focussing on the assessment of anxiety or fear reactivity into regular performance tests. Temperament tests have been successfully applied for research purposes in a wide range of species, including cattle (e.g. Boissy and Bouissou, 1995; Hoppe et al., 2010; Gibbons et al., 2011), pigs (e.g. Yoder et al., 2011; Brown et al., 2009; Appel et al., 2011), sheep (e.g. Bouissou and Vandenheede, 1995; Désiré et al., 2006), rodents (e.g. Flint, 2002; Plappert and Pilz, 2002; Henderson et al., 2004), poultry (e.g. Richard-Yris et al., 2005; Richard et al., 2010; Nordquist et al., 2011), fish (e.g. Kastelein et al., 2008; Vaz-Serrano et al., 2011), and horses (e.g. Visser et al., 2001; Lansade and Bouissou, 2008; König von Borstel et al., 2011a). A few studies specifically investigated the possibilities of implementing temperament tests into horse performance tests (Janiszewska et al., 2004;

Górecka-Bruzda et al., 2011b). However, generally these tests were conducted in free-running or led horses, but not under a rider, whose interaction with the horse may result in partially different reactions (König von Borstel et al., 2011a). In practical horse breeding, so far a few breeding programs such as the Hessen, Freiburger, or KWPN (Beuing et al., 1998; Baumgartner et al., 2009; Visser et al., 2009) adopted the approach of using novel-object based temperament tests, although some use the results from the test primarily for marketing purposes, rather than genetic evaluation of the trait (Christmann, 2005). This differential use of temperament tests points towards the basic problem with temperament tests: test-outcomes can be deliberately influenced by habituating the horses to the test-stimuli (e.g. Christensen et al., 2008; König von Borstel et al., 2010; Leiner and Fendt, 2011). Thus one of the main criticism regarding temperament tests is that genetic evaluation of those trained horses could be biased, because temperament scores or tests can only evaluate the individuals’ reactions in the present situation and stage of life, which may have been deliberately manipulate by training. However, the same applies to other performance traits such as free-jumping (Santamaría et al., 2006) or the evaluation of gaits. Indeed, many breeding associations offer training sessions to prepare horses for free-jumping events. Also, heritabilities in the range of 15–50% for traits such as the basic gaits, free-jumping or dressage/show-jumping competition performance (Bruns, 1981; Preisinger et al., 1991; Gerber Olsson et al., 2000; Ducro et al., 2007) indicate that the environmental component is just as large for these performance traits generally considered to be objective, as it is for personality traits (e.g. heritabilities of 23–28% for behaviour during veterinary examinations (Oki et al., 2007)). Therefore, in spite of the abovementioned problems, temperament tests in horses have some merit. The aim of the present study was to test the suitability of a temperament test conducted under a rider for application during horses’ regular performance tests. In particular this objective included the investigation of variability and repeatability of ridden horses’ responses to three novel stimuli as well as the assessment of inter-observer reliability. Obtaining estimates for the magnitude of these parameters from a population sample is an important step in evaluating the suitability of these parameters for selection purposes. Values close to zero for any of these parameters would indicate that selection attempts would be difficult or in vain in the given population and under the given circumstances. In addition, the possibility to use horses’ improvement between first and second test rather than the absolute strength of reaction was evaluated regarding its suitability as a selection parameter.

2. Materials and methods

2.1. Animals and locations

A total of 224 riding horses participated in the first temperament test, and 133 of them were tested twice. Horses were either 3 ($n = 174$), 4 ($n = 32$) or 5 and more ($n = 18$) years of age, and testing ensued during their regular mare ($n = 145$) or stallion ($n = 79$) performance test at one of six

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