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RESEARCH ARTICLE

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Effect of difference in training skills on stress in horses trained by Kazakh trainers

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Abstract

This study aimed to evaluate the effect of differences in trainer skills on horse training during the early stages of riding habituation by measuring the levels of stress and changes in stress levels. Among nine untrained horses employed, five in Group A were trained by two low-skilled trainers, whereas the remaining four in Group B were trained by two high-skilled trainers using the traditional Kazakh method. Salivary α-amylase concentration was measured as a biomarker of stress immediately before and after each riding session during the training period. In the duration of riding and mooring times to the total riding habituation time for each horse, no significant difference was observed between the two groups. In contrast, the mean total stress and mean final stress were significantly lower in Group B than in Group A, and the mean total change in stress before and after riding habituation was significantly higher in Group B. Differences in trainer skills were evidenced as differences in training methods to suppress the total stress levels through differences in the application of stress burden during the training of individual horses.

KEYWORDS
Kazakhstan, riding habituation, stress, training skill, α-amylase

1 | INTRODUCTION

Approaches based on ethology, behavioral psychology, cognitive ethology, and neurophysiology are considered useful for understanding the learning behavior of domestic horses during the early stages of training (McBride et al., 2017). In addition, specialists in ethology, cultural anthropology, and archaeozoology have attempted to express in a scientific context the structure of "taming" as a key factor in achieving and maintaining domestication from the perspective of animals undergoing riding habituation and the state in which the trainer recognizes "taming."

Several studies have reported the stress response of horses while performing and training for equestrian events, their relationship with the rider, and the effect of these two factors on learning (Becker-Birck et al., 2013; Linden et al., 1991; McLean & Christensen, 2017; Romness et al., 2020). However, very few studies have scientifically evaluated the acquisition of "taming" in the early stages of riding habituation. Schmidt et al. (2010) observed a high stress response based on cortisol levels and heart rate measurements when harnessing a 3-year-old horse at an early training stage, whereas Kimura et al. (2018) evaluated the timing of "taming" acquisition during the early training period of Mongolian horses based on changes in salivary α-amylase levels by using the neuromodulator noradrenaline as the stress marker.

In this study, the effect of differences in the skills of trainers engaged at an early stage of riding habituation was analyzed on horses, based on their stress levels and changes therein, to evaluate the acquisition of "taming." To ensure that the horses were untrained, they were trained immediately after being captured from groups of horses grazing annually. In addition, for the technical differences between trainers to be clear, it is necessary to have a cultural background in which the technical differences can be clearly evaluated through training technology contests, whereas the Kazakh herders inherit the pastoral culture. Kazakh herders and horses met these requirements. Data were collected, and interviews were conducted during the early training of untrained horses that is performed by Kazakh herders as their daily management work.

2 | MATERIAL AND METHODS

The horse-training process was not an experiment designed for this study. Instead, it was conducted through participatory observation and interviews during the routine activities for early training to select the proper horse for riding in the traditional equine production and rearing in Kazakhstan. Thus, this study was exempt from the university's Animal Experiment Committee evaluation. This study was conducted in accordance with the Declaration of Helsinki.

2.1 | Horses, trainers, and training method

Nine untrained Karabair horses (2–6 years old), mostly used for meat, milk and riding, were used for the study: five owned by the Zholbaristy Farm in Uzynagash, Almaty Region (two males, one female, two geldings; Group A), and four owned by the Kanat Farm in Akadyr, Karaganda Region (two males, two geldings; Group B). The horses are generally managed by year-round grazing in single-male groups and fed hay during the severe winter months. These horses had no experience of being tamed by humans at their current age, such as attendance during the milking of maternal horses. The horses in Group A were trained by two low-skilled male amateur trainers who belonged to the herding community but had little experience in horse habituation, whereas those in Group B were trained by two experienced and high-skilled male professional trainers who had won the Kazakh National Competition for training untrained horses. The procedure of early training was follows (Figure 1). The grazing groups belong targeted horses were herding and rounded up to the small enclosure (approximately 10 × 5 m); then the targeted one was captured using a lasso. After which a bridle with a pelham bit was attached in the enclosure carefully by two trainers, the saddle with stirrups was attached in the rangeland out of the enclosure; as soon as the attachment, riding habituation was started in a relatively flat rangeland without fences. The training area was approximately within 400 m diameter. In addition to the riding periods, the horses were moored in the enclosure during the day and spent the night in a winter stable. All these processes, which are a part of traditionally inherited and commonly used training methods, were performed daily using the same methods for both groups. Riding habituation involved walking, trotting, and galloping, during which the trainer generally observed the obedience of the horse to instructions involving the rein and legs as well as its sweating among other factors. Basically, the walking and trotting were performed in the first session of riding habituation, from then the galloping also performed in the after session. A series of riding habituation sessions were terminated when taming was considered successfully acquired at an early stage. The judgment of habituation completion and final session was decided by each trainer. Therefore, the number and period of riding differed among the horses. Riding and mooring times were recorded for a series of riding habituation sessions.

2.2 | α-Amylase analysis

α-Amylase concentration immediately after a riding habituation session has been considered as an indicator of "taming" when it reaches a level similar to or below that measured immediately before riding (Kimura et al., 2018). Therefore, in this study, the α-amylase activity (1) immediately before riding and (2) immediately after the completion of riding during training was measured in saliva samples (Figure 1).

Saliva was collected using a chip sheet (Nipro salivary amylase monitor; Nipro salivary amylase chip). If the amount of saliva is not proper to analyze, the error message will be showed. The propSalivary amylase hydrolyzes α-2-chloro-4-nitrophenyl-galactopyranosylmaltoside (Gal-G2-CNP) present in chip sheet to produce 2-chloro-4-nitrophenol (CNP). The changes in the intensity of reflected light from the CNP produced in the chip sheet were measured and converted to the corresponding amylase activity level. α-Amylase concentration is correlated with the secretion of noradrenaline, which mediates emotional and mental stress responses and is closely related to memories of fear and memory deletion (habituation) (Myers & Davis, 2007). Thus, it was considered appropriate for use as a stress indicator in habituation.

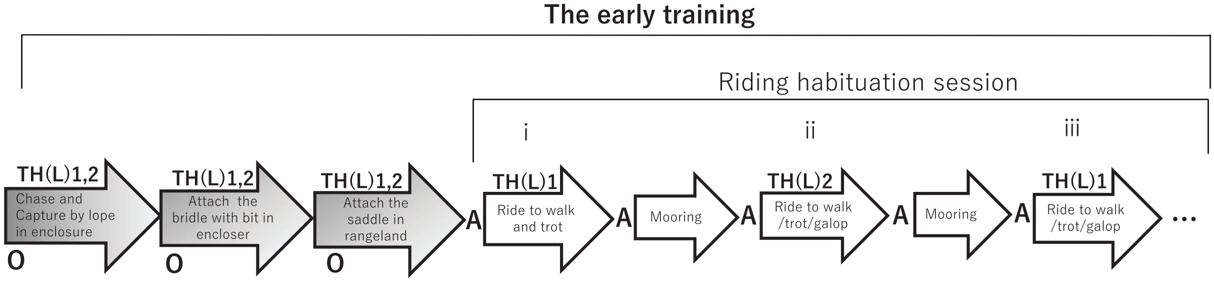

FIGURE 1 Procedures of the early training of Kazakh trainers and the collecting data by authors. TH (L)1,2: training by two high/low skilled trainers, TH (L)1/2: training by first/second high (low) skilled trainer, O: observation by authors, A: timing of collecting salivary samples for α-amylase analysis by authors, i–iii: serial number of riding session.

2.3 | Statistical analysis

The *F*-test was used to compare the duration of the total training time, the total riding time, and the total mooring time to the mean total training time and the salivary α-amylase concentrations before and after riding habituation between Groups A and B to indicate the mean total stress, mean final stress, and mean total change in stress.

3 | RESULTS

The mean total time of the riding habituation session for Groups A and B were 2871 min (±1158.7 SD) and 2725 min (±1288.3 SD), respectively. No significant difference was observed between the two groups with regard to the mean riding and mooring times to the mean total training time (Table 1).

During the habituation process, the trainer terminated a series of riding habituation sessions when taming was considered to have been acquired at an early stage of the process, based on the understanding of instructions and obedience or the state of sweating. The number of ridings differed between individual horses, ranging from two to four in Group A and two to six in Group B (Tables 2a and 2b).

Furthermore, the mean total stress (total concentration of α-amylase before and immediately after each riding) and mean final stress (concentration of α-amylase after the completion of all training processes) were significantly lower in Group B than in Group A ($p < 0.05$; Figure 2), whereas the mean total change in stress (total differences of the concentration of α-amylase before and after riding session: the sum of absolute values of pre-ride α-amylase levels minus post-ride levels for each horse) were significantly higher in Group B ($p < 0.05$; Figure 2).

4 | DISCUSSION

No significant difference was observed between the two groups regarding the times of total riding and mooring periods to the total training period for each horse. This suggests that the series of training processes in these groups followed the method commonly used in the region, despite differences in trainer skills.

TABLE 1 Duration of the riding habituation session of the early training of Kazakh trainers

	Mean total training time	Mean total riding time (ratio to total training time)	Mean total mooring time (ratio to total training time)
A Low-skilled trainers	2871 ± 1158.7 (SD)	371 ± 205.5 (12.9%)	2500 ± 1128.5 (87.1%)
B High-skilled trainers	2725 ± 1288.3	340 ± 232.1 (12.5%)	2385 ± 110.1 (87.5%)

Notes: Total training time (min.): from the first session to the end of the last session, excluding the mooring time. Total riding time (min.): total riding time during all sessions. Total mooring time (min.): total mooring time during all sessions. A: $n = 5$, B: $n = 4$. There were no significant differences between the groups for each duration.

TABLE 2A Concentration of α-amylase (Ku/l) before and after riding sessions during early training by low-skilled trainers

Riding	SESSION i		SESSION ii		SESSION iii		SESSION iv	
B/A	Before	After	Before	After	Before	After	Before	After
①	20	3	16	17	80	17	34	39
②	4	6	19	22	72	61		
③	6	21	113	90	33	59		
④	16	16	93	69				
⑤	39	27	30	51	15	18		

Note: ①–⑤: number of individual horses, i–iv: number of riding stages, Before/After: immediately before/after each riding session in the early training.

TABLE 2B Concentration of α-amylase (Ku/l) before and after riding sessions during early training by high-skilled trainers

RIDING	SESSION i		SESSION ii		SESSION iii		SESSION iv		SESSION v		SESSION vi	
B/A	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
⑥	3	3	4	10								
⑦	9	13	2	2	4	2	5	34	5	13		
⑧	11	44	75	35	8	46	10	15	10	6	12	2
⑨	5	82	185	8								

Note: ⑥-⑨: number of individual horses, i–vi: number of riding stages, Before/After: immediately before and after each riding session in the early training.

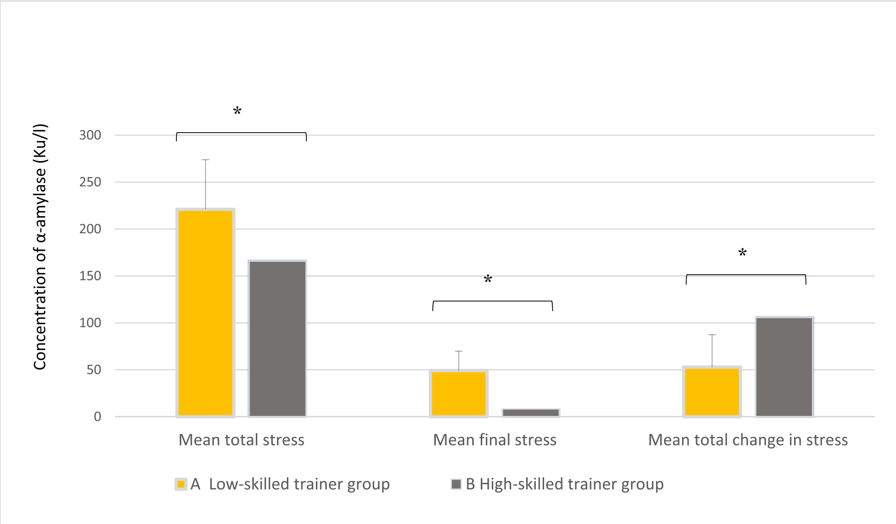

FIGURE 2 Comparison of α-amylase concentrations during riding habituation based on differences in training skills. Total stress: total concentration of α-amylase before and after each riding session during early training. Fina stress: concentration of α-amylase immediately after the final session. Total change in stress: total difference between the concentration of α-amylase before and after each riding session during early training. *p < 0.05

The technical tendency of high-skilled trainers, such as ensuring a low final stress level and avoiding stress burden, resulted in clear differences in stress level before and after riding. This finding is similar to that from a study on the riding habituation of Mongolian horses, in which a decrease in stress levels was observed immediately after riding when the habituation process was terminated after recognizing "taming" (Kimura et al., 2018). Meanwhile, low-skilled trainers were observed to terminate training without acquiring sufficient taming, and the decrease in the mean final stress level was more than that in horses trained by high-skilled trainers.

The significantly lower mean final stress in the high-skilled trainer group was assumed to be owing to the trainer's evaluation of clear taming at the final stage compared with that in the low-skilled trainer group demonstrating the difference in training skills. In addition, the significantly high mean value of the total change in stress in Group B indicates that high-skilled trainers increased stress to high levels by riding harshly in the habituation process, resulting in a tendency toward greater differences in stress levels before and after riding. This was followed by the adjustment of stress burden toward the final stages of the habituation process, ensuring the decrease in stress to low levels immediately before termination.

For sweating in horses, McCutcheon and Geor (2000) described that adaptations that can improve heat dissipation and thereby reduce the rate of increase of core temperature include an earlier onset of sweating (lower sweating threshold) and higher sweating rates (SRs) for a given core temperature (increased sweating sensitivity) and that the enhancement of this mechanism requires a repetitive and sustained increase in deep temperature and intensive interval training. It points out that it is induced by the rider by longer periods of exercise at higher intensities. It may be possible to consider that Kazakh trainers use "sweating," which is not induced in general grazing condition, as a sign of the rider's training load or as a measure of habituation.

Two studies that used plasma cortisol as a biomarker suggested that differences in rider skills had no effect on the stress response in trekking horses (Ono et al., 2017), and similarly, differences in trainer skills had no effect on the exercise and behavior of the horses (Strunk et al., 2018); however, both these studies discussed trained animals, and therefore, the results are not comparable to those of our study.

In conclusion, in the traditional riding habituation of untrained horses by Kazakh herders, differences in trainer skills were found to have an effect on the nervous system stress response of horses. The decrease in the mean total and final stress levels during the habituation period, as well as the mean total change in stress before and after each riding session, was particularly large in the group of horses trained by high-skilled trainers. This demonstrates that the differences in the trainer's skills were expressed as differences in habituation methods, which included applying different intensities of stress burden while suppressing the total stress level.

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CONFLICT OF INTEREST

Authors declare no conflict of interests for this article.

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REFERENCES

Becker-Birck, M., Schmidt, A., Wulf, M., Aurich, J., Wense, A., Möstl, E., & Aurich, C. (2013). Cortisol release, heart rate and heart rate variability, and superficial body temperature, in horses lunged either with hyperflexion of the neck or with an extended head and neck position. *Journal of Animal Physiology and Animal Nutrition*, *97*, 322–330. https://doi.org/10.1111/j.1439-0396.2012.01274.x Epub 2012 Feb 9.

Kimura, R., Masuda, M., & Purevsuren, B. (2018). Structure of riding habituation from the viewpoint of salivary amylase concentration in Mongolian horses. *Animal Behaviour and Management*, *54*(1), 58. (in Japanese).

Linden, A., Art, T., Amory, H., Desmecht, D., & Lekeux, P. (1991). Effect of 5 different types of exercise, transportation and ACTH administration of plasma cortisol concentration in sport horses. *Equine Exercise Physiology*, *3*, 391–396.

McBride, S. D., Parker, M. O., Roberts, K., & Hemmings, A. (2017). Applied neurophysiology of the horse; implications for training, husbandry and welfare. *Applied Animal Behaviour Science*, *190*, 90–101. https://doi.org/10.1016/j.applanim.2017.02.014

McCutcheon, L. J., & Geor, R. J. (2000). Influence of training on sweating responses during submaximal exercise in horses. *Journal of Applied Physiology*, *89*, 2463–2471. https://doi.org/10.1152/jappl.2000.89.6.2463

McLean, A. N., & Christensen, J. W. (2017). The application of learning theory in horse training. *Applied Animal Behaviour Science*, *190*, 18–27. https://doi.org/10.1016/j.applanim.2017.02.020

Myers, K. M., & Davis, M. (2007). Mechanisms of fear extinction. *Molecular Psychiatry*, *12*, 120–150. https://doi.org/10.1038/sj.mp.4001939 Epub 2006 Dec 12.

Ono, A., Matsuura, A., Yamazaki, Y., Sakai, W., Watanabe, K., Nakanowatari, T., & Hodate, K. (2017). Influence of riders' skill on plasma cortisol levels of horses walking on forest and field trekking courses. *Animal Science Journal*, *88*, 1629–1635. https://doi.org/10.1111/asj.12801

Romness, N., Fenner, K., McKenzie, J., Anzulewicz, A., Burattini, B., Wilson, B., & McGreevy, P. (2020). Associations between owners' reports of unwanted ridden behaviour and in-hand behaviour in horses. *Animals*, *10*, 2431. https://doi.org/10.3390/ani10122431

Schmidt, A., Aurich, J., Möst, E., Müller, J., & Aurich, C. (2010). Changes in cortisol release and heart rate and heart rate variability during the initial training of 3-year-old sport horses. *Hormones and Behavior*, *58*, 628–636. https://doi.org/10.1016/j.yhbeh.2010.06.011 Epub 2010 Jun 23.

Strunk, R., Vernon, K., Blob, R., Bridges, W., & Skewes, P. (2018). Effects of rider experience level on horse kinematics and behavior. *Journal of Equine Veterinary Science*, *68*, 68–72. https://doi.org/10.1016/j.jevs.2018.05.209

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