

MODERN ASPECTS OF HORSE WELFARE

Katarzyna Olczak, Iwona Tomczyk-Wrona

National Research Institute of Animal Production,
Department of Horse Breeding, 32-083 Balice near Krakow

Abstract

The World Organisation for Animal Health (OIE) defines animal welfare as "the way an animal copes in the conditions in which it lives". As science advances and knowledge is acquired, the image of horse welfare is changing in the eyes of society. Nowadays, more and more emphasis is placed on emotions and positive experiences of animals. Objective welfare assessment protocols have been developed to help breeders/owners and caregivers assess and improve the standard of living of horses. Improvement of living conditions, zootechnical and veterinary care, minimization of stress, enrichment of the environment not only provide animals with appropriate living conditions, but also translate into the improved training efficiency and production indicators. Thanks to the development of science, the theory of dominance has been abolished, the implementation of which in horse training is considered harmful, there are more and more debates about the use of the whip in races, more and more attention is paid to the care of hooves, from which lameness often begins. Behavioral protocols for assessing well-being and indicators of pain after facial expression are being developed. All people working and dealing with horses on a daily basis should constantly expand their knowledge and strive together to gradually improve the standard of living of horses. In this article, we cite some of the most important aspects of well-being in light of the latest scientific findings, encouraging readers to further deepen their knowledge.

Keywords: horses, equestrianism, welfare, science

Introduction

Modern knowledge and evolving human consciousness have influenced the evolution of the concept of well-being, which now transcends the commonly known five freedoms (Mellor, 2016). The World Organisation for Animal Health (OIE) defines animal welfare as "the way an animal copes in the conditions in which it lives". In contrast, Mellor (2016) draws attention to the fact that animals should have a **"life worth living"**, by experiencing positive life experiences, while negative ones should be minimized. Caring for the welfare of horses begins as early as from conscious selection (Jönsson et al., 2014; Seierø et al., 2016), through appropriate care (Mellor, 2016), to ensuring longevity of horses (Jönsson et al., 2014, Seierø et al., 2016; Solé et al., 2017). Awareness of the importance of these factors is crucial to ensure not only a decent life for horses, but also influences the economic indicators of breeding and their sporting achievements (Jönsson et al., 2014; Solé et al., 2017). The concept of animal welfare is a very broad issue, consisting of many factors (Pritchard et al., 2005) that comprehensively affect the quality of animal life by improving well-being and health, reducing stress, and thus increasing their productivity (efficiency, usability).

Over the past dozen or so years, equitation science has developed rapidly, many of which concern horse welfare, debunking harmful myths and promoting a learning theory as a basis in horse training. The learning theory summarises and explains, among other things, the processes of conditioning, such as classical (Pavlov's) conditioning and the well-known example of dogs that started salivating at the sight of light (Rescorla, 1988), and the basic techniques of behavioural modification. Correct understanding of the square of reinforcements and punishments (Table 1) facilitates the effective and ethical training of horses without overinterpretations associated with dominance. Hartman et al. (2017) emphasize that the still popular dominance theory encourages and justifies harsh training methods and punishments, thereby compromising the welfare of horses. The learning theory and recognition of optimal stimulation for learning processes in horses are crucial both for safety (humans and horses) and for maintaining the psychological comfort of horses (Hartmann et al., 2017; Fenner et al., 2019). Popularizing the learning theories and reliable scientific experiments and putting them into practice is the goal of the International Society for Equitation Science (ISES), which brings together scientists, breeders and riders from around the world.

Table 1. The quadrant of reinforcement and punishment (International Society for Equitation Science 2018)

	Reinforcement	Punishment
	Zwiększa prawdopodobieństwo wystąpienia lub intensywność zachowania Increasing the likelihood or intensity of a behaviour	Zmniejsza prawdopodobieństwo wystąpienia lub intensywność zachowania Decreasing the likelihood or intensity of a behaviour
Pozytywne (dodanie) Positive (addition)	Dodanie bodźca apetytywnego (miłego) w celu nagrodzenia prawidłowej reakcji The addition of a pleasant stimulus to reward a desired response	Dodanie bodźca awersyjnego w celu ukarania niepożądanego reakcji The addition of an aversive stimulus to punish an undesired response
	<i>Przykład:</i> Koń przychodzi na zawołanie i otrzymuje marchewkę by nagrodzić jego odpowiedź. <i>Example:</i> The horse approaches when called for and receives a carrot to reward the response.	<i>Przykład:</i> Koń podchodzi do pastucha, impuls prądu jest karą za dotknięcie. <i>Example:</i> The horse comes up to an electric fence and receives a current pulse to punish touching the fence.
Negatywne (wycofanie) Negative (subtraction)	Odjęcie bodźca awersyjnego, by nagrodzić prawidłową reakcję The removal of an aversive stimulus to reward a desired response	Odjęcie bodźca apetytywnego, by ukarać niepożądaną reakcję The removal of a desired stimulus to punish an undesired response
	<i>Przykład:</i> Napięta wodza jest utrzymywana, aż koń się zatrzyma, a usunięcie napięcia nagradza prawidłową reakcję. <i>Example:</i> Rein tension is applied until the horse stops and the removal of the tension rewards the correct response.	<i>Przykład:</i> Koń grzebie nogą, więc smaczki zostają wycofane. <i>Example:</i> The horse paws and so food is withheld.

People who deal with and interact with horses on a daily basis should take care of expanding their own competences, follow the latest scientific discoveries and jointly introduce gradual changes in order to improve the standard of living of horses. In this article, we want to introduce the issue of well-being in relation to the modern knowledge and taking into account the latest discoveries of scientists. The concept of 'well-being' should be strictly defined and supported by scientific evidence, so that its assessment is as objective as possible. We will try to illustrate how important all its elements are, while encouraging you to deepen your knowledge, because each of these components could be described in a separate article.

Definition

Due to the breadth of the issue, it is very difficult to formulate the concept of 'well-being' scientifically. One definition is that it is a state in which an animal can adapt to its living conditions, another one defines well-being as "the physical and mental state of an animal in relation to its attempts to cope with its surroundings" (Broom, 1986). Both the assessment of physical and psychological signs of discomfort in horses continues to evolve with the development of horse science. For example, the assessment of the facial expressions of a horse's muzzle is only slowly being applied in practice. These definitions already point to the great responsibility that lies with humans in relation to the maintenance, use, as well as rearing and breeding of horses. Modern society sees itself as increasingly ethical and progressive. The culture, ethics and acquisition of knowledge are contributing to an increasing commitment to a high level of animal welfare (Siegford et al., 2010). Nevertheless, it should be remembered that the treatises of philosophers and the assumptions of some religions indicating the perception of animals as sentient beings were written even before our era (Morris, 1995). On the other hand, people who are unfamiliar with the horse physiology and who tend to anthropomorphise can negatively affect the actual level of horse welfare. Examples of such behavior include keeping horses in stables in winter, overfeeding and restricting movement. The scientific approach differs somewhat from individual beliefs and philosophies of life, relying primarily on sound research. The resulting objectivity is not detached from ethics, as most majority of research is directed towards improving equine welfare.

An important element is the approach of individuals to the assessment of well-being. From an economic point of view, striving for the best results (m.in trained, training), everyone should care about an objective assessment of the horses kept in a given place. The results of the well-being assessment should under no circumstances be directed towards criticism. The purpose of the evaluation is to make farmers/breeders/owners aware of the level of animal welfare in a given place. Clearly illustrated feedback should highlight the positive factors prevailing on the farm and indicate the elements which, if implemented, will not only increase the level of animal welfare, but also translate into increased productivity and effectiveness at work (AWIN, 2015).

Indicators

Research on horses and horsemanship is increasingly focusing on identifying and using welfare indicators based on the animals' behaviour and emotional state, rather than those based solely on resources (e.g. performance, meatiness) (Randle and Waran, 2019). Hence, in this article, behavior is included as the first indicator of well-being, despite the fact that creating an objective system for assessing well-being based on behavior still requires a huge amount of work (Randle and Waran, 2019).

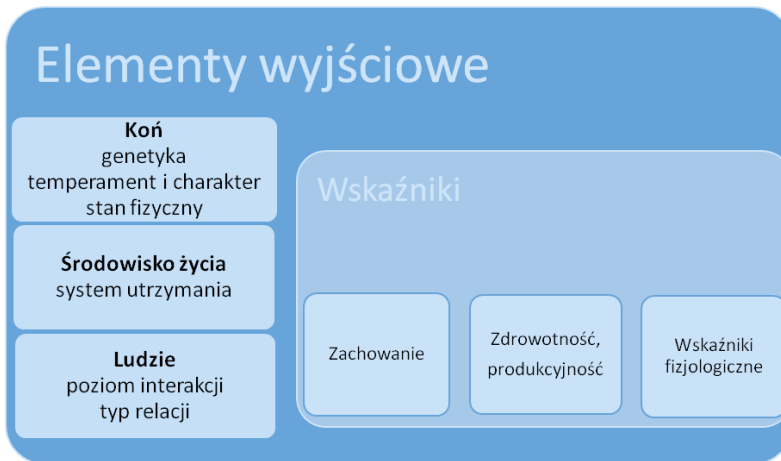


Fig. 1. Three outputs affecting horse welfare, and three indicators to help verify its level (AWIN 2015)

1. Behavior change is the first symptom of a problem (Young et al., 2012). The development of abnormal behaviour and stereotypy (Cooper et al., 2005), signs of stress or pain (Gleerup et al., 2015) may be the earliest indicators of reduced well-being. These are often very subtle signals that may go unnoticed or are ignored. This is particularly the case when such signals occur in a larger number of animals because they are considered the norm.

2. Another measure is health and productivity. These indicators include an assessment of body condition, physical appearance, health, morbidity, and – as an indirect indicator – mortality in a given population. In addition, usability statistics are taken into account (Pritchard et al., 2005).
3. Physiological measures are, for example, heart rate, cortisol levels and complete blood count. These indicators provide relatively objective data (Schmidt et al., 2010). However, they are not measured on a daily basis, and the decision to perform measurements is usually initiated by the indicators described in the previous points. The exception is scientific research, in which physiological indicators are monitored without prior health prerequisites.

The proper care and maintenance of horses requires the routine attention of qualified professionals, including blacksmiths and veterinarians (Beaver, 2019). Negligence is mainly due to a lack of knowledge and not from deliberately ignoring problems. Hall et al. (2013) also indicate that well-defined behavioral indicators would be helpful.

Protocols for assessing well-being

The empirical assessment of well-being is based on an objective evaluation of indicators developed on the basis of previous scientific publications. Assessment protocols for individual elements of well-being have been developed to be reliable, objective and scientifically supported (AWIN, 2015). It should be borne in mind that current definitions of animal welfare are based on a comprehensive assessment and concern mental and physical health, therefore the welfare assessment should include an assessment of the emotional states of animals (Tomczyk-Wrona, 2005a, c). The breadth of the issue means that its assessment should also be multifaceted and based on a number of different measures or standards, where each parameter should be evaluated separately (Viksten et al., 2017).

Horses are a unique species among farm animals because they are kept for various purposes, such as sports, racing, recreation, tourism, breeding, therapy and meat production. Therefore, the approach to assessing the welfare of those animals should take into account their use. Assessing the housing and body condition of horses may be the simplest element to evaluate. Methods for determining the body weight of horses were introduced in ancient times, and today there are several developed and systematized procedures (Wagner and Tyler, 2011), and it is also worth considering the breed of horses when estimating the condition (Catalano et al., 2019). The problem arises when assessing the level of stress and discomfort of working horses during work. There are automated methods of measuring heart rate using, for example, heart rate monitors (Olczak et al., 2021), which can be used for more objective measurements when assessing well-being. However, unambiguous determination of stress on this basis is not so simple. In addition, the research is ongoing to develop automatic systems for assessing the emotions of horses using EquiFACS (The Equine

Facial Action Coding System) and neural networks (Corujo et al., 2021). Furthermore, an experiment by Andersen et al. (2021) showed that automated pain assessment in horses was more precise compared to human assessment. Unfortunately, the unprofessional positions of activists who issue subjective opinions, not supported by protocols or scientific knowledge, often anthropomorphizing animals, often contribute to a decrease in the level of well-being, also having an impact on public opinion. Therefore, it is extremely important that the assessment of well-being is as objective as possible and supported by reliable work of scientists. European protocols and equine welfare assessment codes can be helpful before the automated evaluation methods mentioned above come into force. Among other things, the OIE (World Organisation for Animal Health) has developed a code of welfare for working horses, and AWIN (The European Animal Welfare Indicators Project) is a broad project to assess the welfare of horses from basic needs, through behavioral tests, assessment of human response, including the introduction of a scale for assessing facial expressions.

Efforts should be made to implement the similar assessment systems in Poland, develop information brochures/applications to make breeders/athletes/horse owners aware of how to recognise distress, discomfort and pain in horses.

The most important criteria for assessing the welfare of horses:

Criterion	Examples of problems
Behaviour	Limited movement, no social contact, inability to chew (too little roughage), occurrence of stereotypes, etc.
Morbidity, veterinary care and biosecurity	Infections, respiratory problems, poisoning, metabolic diseases, vaccinations, deworming, introduction of new individuals into the herd without veterinary control and quarantine, etc.
Mortality	Accidents, overloads, lack of veterinary care, inappropriate use, incurable diseases
Body condition	Malnutrition, obesity, lack of musculature, dull coat, weak hooves, etc.
Horse-man relationship	Fear, flight, aggression, resistance, anxiety, apathy helplessness, withdrawal, etc.
Herd relations	Isolation, excessive aggression, withdrawal, matching groups, etc.
Zootechnical care	Lack of regular health checks, no cleaning, excessive noise, uncleaned boxes, etc.

Lameness and blacksmith care	Inadequate planing, lack of treatment, overloading in work/training, lack of regular hoof trimming etc.
Work preparation and accessories	Too early deployment for work, too intensive training, mismatched rider weights, forceful solutions, mismatched equipment, abrasions, back pain, too tight noseband, etc.
Feeding and watering	Lack of access to roughage, too much concentrated feed, lack of access to water, etc
Heat stress	No shelter/shade or water etc.
Protection against extreme cold	Lack of wind protection, too limited feeding in winter
Protection against injuries and predators	Inadequate fences, protruding elements, dangerous objects on the property, etc.

Many of these criteria overlap or one follows from the other. However, all of the above are crucial in the daily use and maintenance of horses (AWIN, 2015; Mellor et al., 2020). The aforementioned systems of automated assessment of emotions and pain in horses seem promising (Andersen et al., 2021; Corujo et al., 2021), which, in combination with these indicators, can contribute to the development of reliable and objective forms of assessing the level of horse welfare.

Behaviour and well-being

Minero and Canali (2009) point out that a key aspect of horse maintenance is the knowledge of their behavior by owners, grooms, trainers, riders, blacksmiths, breeders, etc. Without this knowledge, users will not be able to meet the natural needs of horses and guarantee them a high level of welfare.

Horses that are not able to fully cope with the conditions in which they find themselves often begin to manifest stereotypical behavior. These are behaviors that are repeated routinely without targeting a specific goal. Their function is to try to calm the animal. It is a form of coping with the environment and relieving stress, so horses should not be punished for such behavior. There are several techniques to combat stereotypes, but the basis is to try to eliminate the source of the problem, not to mask it. Stereotypical behaviour is an indicator of reduced well-being. They can be caused by many factors, such as too little space, lack of social contacts, inadequate nutrition, etc. (Hanis et al., 2020).

The problem arises in practice, where, on the one hand, low awareness of people, lack of ability to recognize the first signs of pain and stress, and on the other hand, daily exposure to animals and "normalizing" of irregularities contribute to the incorrect assessment of the welfare of horses by people who take care of them on a daily basis. Lesimple and Hausberger (2014) showed that, with clear

stereotypes present in 23% of the horses observed (85 horses out of 373), caregivers identified a problem in only 8% of individuals (29 horses). For more subtle behaviors, the disparity between caregiver ratings and follow-up results was even greater.



Photo 1. Expression of the muzzle associated with very severe pain (photograph taken during a colic attack). Indicators of pain: A – lowered ear position; B – head position; C – contracted muscle above the eye; D – tense facial muscles, E – flared nostrils; F – tense muzzle, tight lips. Photograph from the authors' archive.

One way to prevent boredom and stereotypes is the use of environmental enrichment, defined as the improvement of the biological functions of animals held in captivity as a result of changes in their living environment (Newberry (1995).

In other words, it is the introduction of new stimuli that primarily stimulate foraging- or exploration-oriented behaviour (Jørgensen et al., 2011). These can be special toys, new objects, smells, feed additives, or even human contact and cognitive activities in order to receive an award (Godyń et al., 2019). In addition, environmental enrichment has a positive effect on the cognitive function and well-being of animals. In the experiment of Lansade et al. (2014), horses maintained under controlled conditions (individual stalls, horses released three times a week into paddocks, fed three times a day) were compared with horses maintained under conditions with environmental enrichment (no more than 7 h in individual stalls, the remaining time they were kept in groups at pasture, varied diet, and they were presented with a variety of stimuli on a daily basis). It was observed that environmental enrichment contributed to a decrease in fearfulness, reactivity towards people and sensory sensitivity, while increasing the level of curiosity and improving learning outcomes. In addition, it was observed that environmental enrichment induces the expression of genes responsible for growth and proliferation (cell multiplication), while a poor environment activated genes associated with apoptosis (cell death) (Lansade et al., 2014). The results of this experiment show that the proper living environment not only reduces stress and well-being, but also translates into growth and health (Lansade et al., 2014; Petrosini et al., 2009).

An essential element of caring for horses is the recognition of pain. Severe lameness or skin damage is usually recognised easily. Unfortunately, the first signs of pain, which is a very important indicator of well-being, are very often so subtle that untrained observers may not notice them or, as mentioned above, take certain things as the norm. Recognizing pain by facial expressions is a promising tool that can facilitate the first understanding of the problem, so that horses can be diagnosed more quickly by specialists (Gleerup et al., 2015; Van Loon and Van Dierendonck, 2018). Working to create easy-to-use ethograms, as well as teaching people to understand behavioral indicators, is a very important aspect for improving animal welfare. A promising tool will be the implementation of automatic pain assessment (Andersen et al., 2021) for general use. Such a solution would be ideal primarily for people with little experience.

Well-being and health

Basic care and zootechnical treatments

Maintaining freedom from disease, wounds and lameness is obvious. Daily care, secured pastures and boxes are the basis for safe existence of horses. In the case of sport horses or those kept as recreational riding animals, attention to safety is usually at the highest level, whereas in the case of working or breeding horses, negligence often occurs. A big problem in the maintenance of young, slaughter and breeding horses is the correction of hooves. A significant amount of lameness comes from inadequate planing/shoeing (Popescu and Diugan, 2017).

On the one hand, the lack of regular planing can cause discomfort in movement and lead to injury, while horses unaccustomed to hoof treatments feel stress (Górecka-Bruzda et al., 2017). That is why it is so important to work regularly and accustom horses to various types of treatments and manipulations.

Zootechnical procedures are often stressful, which causes horse keepers to reach for the twitch to immobilize the animal. However, it should be remembered that everything indicates that the twitch causes pain, so it should not replace training horses to various challenges (Rørvang et al., 2020). Regular work and desensitization to zootechnical procedures should be in the first place. In the experiment of Olczak and Tischner (2013) it was shown that with regular work after just a few really short training sessions (5-10 sessions of 3 minutes each) the level of stress decreased significantly, so regular contact and training should be an indispensable element of breeding / working and keeping horses.

Lifespan

The issue of health is largely related to the length of use and mortality. Many horses that are heavily used at a young age struggle with injuries that appear quite early. This may contribute to sending such individuals for slaughter, and thus shortening their life expectancy. Wallin et al. (2000) showed that among geldings belonging to the Swedish Cavalry Horse Foundation, only 53% of individuals lived to the age of 14. Scientific publications indicate that in horses the ossification of the spine is completed only at 5–6 years of age (Bennett, 2008), shedding new light on the early use of horses. It is also alarming how many horses, often young and middle-aged, have permanent degeneration (e.g. kissing spine syndrome KSS, a specific spinal condition in which two or more spinous processes are positioned in such a way that they rub against or even touch each other). One of the five freedoms speaks of a life without pain and disease. The question is whether excessive exploitation of horses, often too young ones, which leads to permanent bodily harm, is therefore compatible with the welfare.

Conscious breeding

The conscious selection of parents in such a way as to obtain healthy offspring should be obvious from an ethical, practical and economic point of view. The development of genetic testing makes it possible to detect the carrier of genetic diseases before they manifest themselves. This is extremely important, especially in the case of recessive genes in stallions, as these diseases may not initially manifest themselves. After a few years, however, the probability of the disease will increase significantly (Reiter et al., 2020; Ropka-Molik et al., 2021). Conscious admission of the spread of lethal disease genes or genes causing painful illnesses in the population is not compatible with the idea of welfare and does not meet the requirements of the five freedoms. In addition, such actions may cause economic losses for future breeders.

Well-being of working horses

In working horses, in addition to the elements listed above, special attention should be paid to the relationship with people, the level of stress, the appropriate amount of rest and the level of fit of the equipment. According to welfare principles, the training, coaching and working of horses should be free of pain, stress and suffering. Unfortunately, there are still practices that are incompatible with these assumptions. Many of the riding and training equipment proposed and used (e.g. stiff reins, sharp mouthpieces, etc.) cause pain or the very approach to training by some trainers is based on brutality (an extreme case is, for example, the use of electric spurs, the use of which was recently detected and led to the suspension of a rider for 10 years by the FEI). For some time there have been debates about the use of the whip in horse racing. Evans and McGreevy (2011) showed that there was no correlation between the use of a riding whip during the final stages of a race and changes in speed and final finishing position. At the turn of May and June 2021, the first horse races with a ban on the use of the whip took place in New Jersey Monmouth Park (NJR Law, 2020).

One prevailing conception of training that may compromise the welfare of horses is the dominance theory, the application of which in the context of humans and horses would suggest that undesirable reactions can easily be explained by the horse trying to dominate the human (Hartmann et al., 2017). According to this doctrine, man should strive to gain supreme rank and take a leadership role to prevent and correct behavior and to achieve the obedience of the animal. Explaining everything by domination in order to gain absolute control, without taking into account the needs or level of understanding of the situation by the horse, often encourages and justifies the use of harsh training methods, punishments, often even justifying violence (Hartmann et al., 2017). These techniques often induce an escape reaction or aggression caused by fear, causing health and life risks for both horses and humans, contributing to reduced well-being (Hartmann et al., 2017; McGreevy et al., 2009). Therefore, scientists dealing with learning processes in horses pay attention to the fact that adherence to the principles of learning theory should be in the first place. Many of the adverse reactions of horses identified with the dominance are a symptom of excessive stress to which horses are exposed (Draaisma, 2017; Hartmann et al., 2017). Currently, work techniques based on positive reinforcement are gaining more and more attention, where trainers put the emotional state of horses above the effect of training (Larssen and Roth, 2022; Hendriksen et al., 2011).

A big problem of working horses is their overexploitation. It usually results from a lack of understanding of the needs, physiology and misassessment of the condition of horses. There are often situations where horses do not work during the week and on weekends they are exposed to excessive loads for which they are not physically prepared (Frazier, 2000). In addition, horses often receive low-quality training, which, combined with inconsistent or conflicting signals from inexperienced riders, escalates the problem. In the case of increasing stress levels, learning abilities decrease (Olczak et al., 2016).

The Foundations of Animal Welfare and the Five Freedoms of Animals

The development and intensification of animal production contributed to the deterioration of animal welfare conditions, which gave rise to laws regulating the protection of animals. The first modern legal regulations date back to 1600–1800 A.D. The gradual development of animal welfare activities led to the creation of the five freedoms in 1965 (Brambell, 1965), which were formalized in 1979 in Great Britain (FAWC – Farm Animal Welfare Committee).

Currently, the list of five freedoms is as follows:

- **Freedom from hunger, thirst and malnutrition** by providing access to fresh water and food that will keep animals healthy and strong.
- **Freedom from discomfort** by providing adequate shelter and resting place.
- **Freedom from pain, wounds and disease** through prevention, timely diagnosis and treatment.
- **Freedom to express natural behavior** by providing adequate space, conditions and companionship with other animals of the same species.
- **Freedom from fear and distress** by providing care and treatment that does not cause psychological suffering to animals.

As mentioned earlier, the concept of well-being is evolving and today has a much broader scope and reaches beyond the five freedoms (Mellor, 2016).

In Poland, the Animal Protection Act of 21 August 1997 regulates certain aspects of welfare and lays down minimum conditions for the maintenance of individual species. The development of scientific research on emotions and their expression, the social pressure of consumers and animal defenders creates the need to modify the systems of housing and the ways of dealing with animals in order to ensure a high standard of living. From a practical and economic point of view, the argument for improving the quality of life of horses is the fact that a high level of welfare is a prerequisite for satisfactory training effectiveness and efficient performance, including slaughter (Beaver, 2019).

Fraser et al. (1997) defined three overlapping aspects related to animal welfare. These included:

1. Physical and biological condition – means, among other things, the certainty that the animal is healthy and well-fed.
2. Psychological or mental (emotional) state - the absence of negative emotions, such as pain and chronic fear.
3. The ability to perform natural activities and live according to the natural needs.

Most of these aspects speak of freedom "from", without taking into account the positive elements of life. As science and social awareness develop, we should also focus on the positive aspects of well-being, hence the conclusion that the five freedoms are currently insufficient (Mellor, 2016; Mellor et al., 2020). One positive indicator of well-being may be play and exploitative behaviour (Godyn et al., 2019).

To quote Antoine de Saint-Exupéry: "(...) but you must not forget. You become responsible forever for what you have tamed" (de Saint-Exupéry, 2021), it is the man who is responsible for the horses he maintains (Tomczyk-Wrona, 2005b).

Summary

The approach to horse welfare should change as science develops. Mellor (2016) draws attention to the fact that the five freedoms are currently not enough for a dignified life for animals, as survival measures are still prevalent and the goal should be to provide greater opportunities for positive experiences. Thus, changes in the regulations governing animal welfare should be sought, but with the preservation of their species identity (e.g. horse – herd animal, the need for large spaces) and not adapting welfare conditions according to human needs.

References

- Andersen P.H., Broomé S., Rashid M., Lundblad J., Ask K., Li Z., Hernelund E., Rodin M., Kjellström H. (2021). Towards machine recognition of facial expressions of pain in horses. *Anim.* 11(6):1643. <https://doi.org/10.3390/ani11061643>
- AWIN (2015). AWIN welfare assessment protocol for horses. 1–80. Doi:10.13130/AWIN_HORSES_2015
- Beaver B.V. (2019). Equine welfare. *Equine Behav. Med.*, pp. 347–369. <https://doi.org/10.1016/b978-0-12-812106-1.00011-5>
- Bennett D. (2008). Timing and rate of skeletal maturation in horses, with comments on starting young horses and the state of the industry. <http://www.equinestudies.org/>
- Brambell R. (1965). Report of the technical committee to enquire into the welfare of animals kept under intensive livestock husbandry systems. London: Her Majesty's Stationary Office.
- Broom D.M. (1986). Indicators of poor welfare. *Br. Vet. J.* 142 (6): 524–526; [https://doi.org/10.1016/0007-1935\(86\)90109-0](https://doi.org/10.1016/0007-1935(86)90109-0)
- Catalano D.N., Coleman R.J., Hathaway M.R., Neu A.E., Wagner E.L., Tyler P.J., McCue M.E., Martinson K.L. (2019). Estimation of actual and ideal bodyweight using morphometric measurements of miniature, saddle-type, and thoroughbred horses. *J. Equine Vet. Sci.*, 78: 117–122; <https://doi.org/10.1016/j.jevs.2019.04.008>
- Cooper J.J., Albertosa M.J. (2005). Behavioural adaptation in the domestic horse: potential role of apparently abnormal responses including stereotypic behaviour. *Livest. Prod. Sci.* 92: 177–182; <https://doi.org/10.1016/j.livprodsci.2004.11.017>
- Corujo L.A., Kieson E., Schloesser T., Gloor P.A. (2021). Emotion recognition in horses with convolutional neural networks. *Fut. Int.* 13 (10): 250, <https://doi.org/10.3390/fi13100250>
- de Saint-Exupéry A. (2021). *Mały Książę* (The Little Prince). Ed. I, Fundacja Nowoczesna Polska (Modern Poland Foundation); <https://wolne-litery.pl/katalog/lektura/saint-exupery-maly-ksiaze/>
- Draaisma R. (2017). *Language Signs and Calming Signals of Horses: Recognition and Application*. CRC Press.
- Evans D., McGreevy P. (2011). An investigation of racing performance and whip use by jockeys in thoroughbred races. *PLoS ONE* 6 (1): e15622. <https://doi.org/10.1371/journal.pone.0015622>
- Fenner K., McLean A.N., McGreevy P.D. (2019). Cutting to the chase: How round-pen, lunging, and high-speed liberty work may compromise horse welfare. *J. Vet. Behav.*, 29: 88–94; <https://doi.org/10.1016/j.jveb.2018.05.003>
- Fraser D., Weary D.M., Pajor E.A., Milligan B.N. (1997). A scientific conception of animal welfare that reflects ethical concerns. *Anim. Welfare*, 6: 187–205.
- Frazier D.L. (2000). Who speaks for the horse – the sport of endurance riding and equine welfare. *J. Am. Vet. Med. Assoc.*, 216 (8): 1258–1261.

- Gleerup K.B., Forkman B., Lindegaard C., Andersen P.H. (2015). An equine pain face. *Vet. Anaesth. Analg.*, 42: 103–114; <https://doi.org/10.1111/vaa.12212>
- Godyń D., Nowicki J., Herbut P. (2019). Effects of environmental enrichment on pig welfare. *Anim.*, 9 (6): 383; doi:10.3390/ani9060383.
- Górecka-Bruzda A., Jaworski Z., Suwała M., Sobczyńska M., Jastrzębska E., Ogłuszka M., Sankay C., Boroń M., Jezierski T. (2017). Aversiveness of husbandry procedures for pre-weaned foals: A comparison using behavioural and physiological indices. *Appl. Anim. Behav. Sci.*, 191: 31–38; <https://doi.org/10.1016/j.applanim.2017.02.007>.
- Hall C., Huws N., White C., Taylor E., Owen H., McGreevy P. (2013). Assessment of ridden horse behavior. *J. Vet. Behav.*, 8 (2): 62–73.
- Hanis F., Chung E.L.T., Kamalludin M.H., Idrus Z. (2020). Discovering the relationship between dietary nutrients and cortisol and ghrelin hormones in horses exhibiting oral stereotypic behaviors: A review. *J. Vet. Behav.* <https://doi.org/10.1016/j.jvbeh.2020.05.012>
- Hartmann E., Christensen J.W., McGreevy P.D. (2017). Dominance and leadership: Useful concepts in human–horse interactions? *J. Equine Vet. Sci.* 52: 1–9 <https://doi.org/10.1016/j.jevs.2017.01.015>
- Hendriksen P., Elmgreen K., Ladewig J. (2011). Trailer-loading of horses: Is there a difference between positive and negative reinforcement concerning effectiveness and stress-related signs? *J. Vet. Beh.*, 6 (5): 261–266; <https://doi.org/10.1016/j.jvbeh.2011.02.007>
- International Society for Equitation Science (2018). <https://equitationscience.com/learning-theory/>
- Jönsson L., Egenvall A., Roepstorff L., Näsholm A., Dalin G., Philipsson J. (2014). Associations of health status and conformation with longevity and lifetime competition performance in young Swedish Warmblood riding horses: 8,238 cases (1983–2005). *J. Am. Vet. Med.* 244 (12): 1449–1461; <https://doi.org/10.2460/javma.244.12.1449>
- Jørgensen G.H.M., Liestol S.H-O., Boe K.E. (2011). Effects of enrichment items on activity and social interactions in domestic horses (*Equus caballus*). *Appl. Anim. Behav. Sci.* 129:100–110; <https://doi.org/10.1016/j.applanim.2010.11.004>
- Lansade L., Valençon M., Foury A., Neveux C., Cole S.W., Layé S., Cardinaud B., Lévy F., Moisan M.-P. (2014). Behavioral and transcriptomic fingerprints of an enriched environment in horses (*Equus caballus*). *PLoS One* 9 (12): e114384; <https://doi.org/10.1371/journal.pone.0114384>
- Larssen R., Roth L.S.V. (2022). Regular positive reinforcement training increases contact-seeking behaviour in horses. *App. Anim. Beh. Sci.* 105651; <https://doi.org/10.1016/j.applan-im.2022.105651>.
- Lesimple C., Hausberger M. (2014). How accurate are we at assessing other's well-being? The example of welfare assessment in horses. *Front Psychol.*, 5: 21.
- McGreevy P.D., Oddie C., Burton F.L., McLean A.N. (2009). The horse–human dyad: Can we align horse training and handling activities with the equid social ethogram? *Vet. J.*, 181: 12–18.
- Mellor D.J. (2016). Updating animal welfare thinking: Moving beyond the "five freedoms" towards "A life worth living." *Anim.*, 6 (3): 21; <https://doi.org/10.3390/ani6030021>
- Mellor D.J., Beausoleil N.J., Littlewood K.E., McLean A.N., McGreevy P.D., Jones B., Wilkins C. (2020). The 2020 five domains model: Including human–animal interactions in assessments of animal welfare. *Anim.*, 10: 1–24; <https://doi.org/10.3390/ani10101870>
- Minero M., Canali E. (2009). Welfare issues of horses: an overview and practical recommendations. *J. Anim. Sci.*, 8: 219–230.
- Morris J.D. (1995). *Nasza umowa ze zwierzętami (Our agreement with animals)*. Książka i Wiedza (Book and Knowledge), Warsaw.
- Newberry R.C. (1995) Environmental enrichment: increasing the biological relevance of captive environments. *Appl. Anim. Behav. Sci.*, 44: 229–243; Doi: 10.1016/0168-1591(95)00616-Z.
- New Jersey Riding Commission. (2020). Horse Racing – Riding Crop Prohibited Adopted Repeal and New Rule: N.J.A.C. 13:70-11.12; [https://www.nj.gov/oag/racing/rule-adoptions/R.2020%20d.112%20\(52%20N.J.R.%201934\(a\)\).pdf](https://www.nj.gov/oag/racing/rule-adoptions/R.2020%20d.112%20(52%20N.J.R.%201934(a)).pdf)
- Olczak K., Tischner M. (2013). Stress intensity in young Hucul horses during grooming and training. *U. W. H. Press Sopron*, pp. 411–414.

- Olczak K., Nowicki J., Klocek C. (2016). Motivation, stress and learning – critical characteristics that influence the horses' value and training method – a review. *Ann. Anim. Sci.*, 16 (3): 641–652.
- Olczak K., Klocek C., Christensen J.W. (2021). Hucul horses' learning abilities in different learning tests and the association with behaviour, food motivation and fearfulness. *Appl. Anim. Behav. Sci.*, 245: 105498; doi.org/10.1016/j.applanim.2021.105498
- Petrosini L., De Bartolo P., Foti F., Gelfo F., Cutuli D. (2009). On whether the environmental enrichment may provide cognitive and brain reserves. *Brain. Res. Rev.*, 61: 221–239; Doi: 10.1016/j.brainresrev.2009.07.002
- Popescu S., Diugan E.A. (2017). The relationship between the welfare quality and stress index in working and breeding horses. *Res. Vet. Sci.*, 115: 442–450; https://doi.org/10.1016/j.rvsc.2017.07.028
- Pritchard J.C., Lindberg A.C., Main D.C.J., Whay H.R. (2005). Assessment of the welfare of working horses, mules and donkeys, using health and behaviour parameters. *Prev. Vet. Med.*, 69: 265–283; https://doi.org/10.1016/j.prevetmed.2005.02.002
- Randle H., Waran N. (2019). Equitation science in practice: how collaboration, communication and change can improve equine welfare. *J. Vet. Behav.*, 29: 8–10; https://doi.org/10.1016/j.jveb.2018.12.014
- Reiter S., Wallner B., Brem G., Haring E., Hoelzle L., Stefaniuk-Szmukier M., Długosz B., Piórkowska K., Ropka-Molik K., Malvick J., Penedo M.C.T., Bellone R.R. (2020). Distribution of the warmblood fragile foal syndrome type 1 mutation (PLOD1 c.2032G>A) in different horse breeds from Europe and the United States. *Genes*, 11: 1518, https://doi.org/10.3390/genes11121518
- Rescorla R.A. (1988). Pavlovian conditioning: It's not what you think it is. *Am. Psycho.*, 43 (3): 151–161.
- Ropka-Molik K., Stefaniuk-Szmukier M., Fornal A. (2021). Innowacyjne narzędzia genetyki molekularnej jako wsparcie dla hodowli koni (Innovative tools of molecular geology as support for horse breeding). *Koń Polski (Polish Horse)*, 1: 48–53.
- Rorvang M.V., Nielsen B.L., McLean A.N. (2020). Sensory abilities of horses and their importance for equitation science. *Front. Vet. Sci.*, 7: 1–17, https://doi.org/10.3389/fvets.2020.00633
- Schmidt A., Aurich J., Möstl 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. *Horm. Behav.*, 58: 628–636; https://doi.org/10.1016/j.yhbeh.2010.06.011
- Solé M., Sánchez M., Valera M., Molina A., Azor PSölkner J., Mészáros G. (2017). Assessment of sportive longevity in Pura Raza Español dressage horses. *Livest. Sci.*, 203: 69–75; https://doi.org/10.1016/j.livsci.2017.07.007
- Siegford J., Cottee S., Widowski T. (2010). Opportunities for learning about animal welfare from online courses to graduate degrees. *J. Vet. Med. Edu.*, 37(1): 49–55.
- Seierø T., Mark T., Jönsson L. (2016). Genetic parameters for longevity and informative value of early indicator traits in Danish show jumping horses. *Livest. Sci.*, 184: 126–133; https://doi.org/10.1016/j.livsci.2015.12.010
- Tomczyk-Wrona I. (2005a). Mechanizm reakcji koni na bodźce środowiskowe (The mechanism of reaction of horses to environmental stimuli). PH: Konie – dobrostan w warunkach utrzymania (Horses – welfare in conditions of maintenance). Monography. ZWiP IŻ, pp. 27–34.
- Tomczyk-Wrona I. (2005b). Rola człowieka i metod hodowlanych oraz użytkowych w kształtowaniu się poziomu dobrostanu koni (The role of man and breeding and utility methods in shaping the level of horse welfare). PH: Konie – dobrostan w warunkach utrzymania (Horses – welfare in conditions of maintenance). Monography. ZWiP IŻ, pp. 60–62.
- Tomczyk-Wrona I. (2005c). Pozostałe obszary ochrony dobrostanu koni (Other areas for the protection of horse welfare). PH: Konie – dobrostan w warunkach utrzymania (Horses – welfare in conditions of maintenance). Monography. ZWiP IŻ, pp. 63–66.
- Act of 21 August 1997 on the protection of animals. *Journal of Laws* 1997 No. 111, item 724.
- Van Loon J.P.A.M., Van Dierendonck M.C. (2018). Objective pain assessment in horses (2014–2018). *Vet. J.*, 242: 1–7; https://doi.org/10.1016/j.tvjl.2018.10.001
- Viksten S.M., Visser E.K., Nyman S., Blokhuis H.J. (2017). Developing a horse welfare assessment protocol. *Anim. Welfare*, 26 (1): 59–65.

Wallin L., Strandberg E., Philipsson J., Dalin G. (2000). Estimates of longevity and causes of culling and death in Swedish warmblood and coldblood horses. *Livest. Prod. Sci.*, 63: 275–289; [https://doi.org/10.1016/S0301-6226\(99\)00126-8](https://doi.org/10.1016/S0301-6226(99)00126-8)

Wagner E., Tyler P. (2011). A comparison of weight estimation methods in adult horses. *Journal of Equ. Vet. Sci.* 31 (12): 706-710; <https://doi.org/10.1016/j.jevs.2019.04.008>

Young T., Creighton E., Smith T., Hosie C. (2012). A novel scale of behavioural indicators of stress for use with domestic horses. *Appl. Anim. Behav. Sci.*, 140: 33–43; <https://doi.org/10.1016/j.applanim.2012.05.008>

Approved for printing: 12 VII 2022

Katarzyna Olczak, Iwona Tomczyk-Wrona

MODERN ASPECTS OF HORSE WELFARE

SUMMARY

The World Organisation for Animal Health (OIE) defines animal welfare as "how an animal is coping with the conditions in which it lives". Together with advances in science and new knowledge, the image of animal welfare is changing within society. Today increasing emphasis is placed on the emotions and positive experiences of animals. Welfare assessment protocols have been developed to help breeders/owners and caretakers of horses assess and improve the standard of their lives. Improved housing conditions, veterinary and animal care, minimized stress, and enriched environment not only provide appropriate living conditions for animals, but also translate into improvements in training effect and production indicators. The dominance theory is now considered harmful in horse training and has been debunked. There is increasing debate on whip use in races, and increasing attention is given to the care of hooves, which is essential in lameness prevention. Behavioural welfare assessment protocols and indicators of pain based on face expression are being developed. Everyone who works with and handles horses on an everyday basis should continually expand their knowledge and join efforts to gradually raise the living standard of horses. This article presents some major aspects of welfare in light of the latest scientific findings while encouraging readers to deepen their knowledge.

Key words: horses, horse riding, welfare, science

