ANIMAL SCIENCE AND GENETICS
Published by the Polish Society of Animal Production
vol. 18 (2022), no 4, 15-31
DOI: 10.5604/01.3001.0016.1242

Research Article ***Open Access***

Dependencies between animal and environmental factors and behavioral problems in horses: a survey-based analysis

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SUMMARY

Undesirable and stereotypical behaviors may indicate abnormalities in the living environment of animals. They have a negative impact on the welfare of animals and hinder the handling and use thereof. Unfortunately, horse owners often fail to recognize the causes of behavioral problems in their animals. The aim of the study was to analyze the living conditions, type of use and individual characteristics of horses (age, sex, breed, and temperament) in relation to displaying undesirable and stereotypical behavior. The assessment was made based on 609 online questionnaires completed by horse owners from Poland (n=376), UK (n=145), USA and Canada (n=66), Australia and NZ (n=22). Undesirable and stereotypical behaviors were exhibited by 36,1% and 31,9% of the horses, respectively. It has been shown that the undesirable behaviors are influenced by e.g. access to pastures, presence of other horses on paddocks and supply frequency of roughage. The type of use of the animal was not found to be associated with behavioral problems. Referring to the individual characteristics of horses, it has been found that only temperament has an impact on the occurrence of problematic behaviors. Both undesirable and stereotypical behaviors are particularly frequently displayed by animals with a lively temperament. Horses should be kept under conditions meeting their feeding, social and locomotor behavioral needs. The evaluation of their individual traits may help to assess the risk of developing abnormal behavior and thus, to prevent it. Raising the awareness of horse keepers and breeders of the causes of problem behaviors should be an important issue.

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Received: 29.03.2022 Received in revised form: 10.10.2022
Accepted: 15.10.2022 Published online: 30.10.2022

KEY WORDS: horse, housing conditions, temperament, undesirable behavior, stereotypical behavior

INTRODUCTION

Observation of changes in animals' behavior is an important factor in the assessment of their welfare. Emerging behavioral problems may indicate abnormalities in the living environment and the necessity to adapt it to the animal's needs (Sarrafchi and Blokhuis, 2013). The environment in which horses are not able fulfill their needs may lead to behavioral changes that can often be manifested by undesirable behaviors (UB) and stereotypical behaviors (SB). Undesirable behaviors are defined as reactions occurring in the repertoire of normal horse behaviors impeding the daily handling and/or use thereof (e.g. bucking, rearing during riding) (Budzyńska, 2014). Stereotypies are defined as repetitive behaviors exhibiting no clear target and function (Clegg et al., 2008). The causes of this type of behavioral changes should be sought in health problems, stress, fear or frustration and inadequate housing conditions that do not meet the natural needs of animals. Such behaviors are often described as an attempt by the organism to cope with unfavorable environmental conditions. Keepers and breeders perceive these behaviors as defects reducing the usability value of their animals and lowering the safety of handling and working with horses (Van den Berg et al., 2015; Arena et al., 2021). The keepers' awareness of the specific needs of horses is one of the determinants of the welfare of these animals (Marsden, 2002). The failure to understand the causes of a particular behavior and misinterpretation of the animal's emotional state are reflected in the inadequate housing conditions. They in turn determine the behavioral pattern deviating from the equine ethogram (Hötzel et al., 2019).

The knowledge of equine ethology is a prerequisite for satisfying the natural needs of these animals following the species pattern (Arena et al., 2021). The horse has evolved as a fleeing herbivore (Zeitler-Feicht, 2014). Life in a herd with an established social hierarchy increases the safety of herd members, facilitates detection of threats (Apfelbach et al., 2005), creates opportunities for proper development of juveniles (Bourjade et al., 2008) and satisfies social needs. Social isolation is a particularly strong stressor in horses (Søndergaard et al., 2011, Yarnell et al., 2015). In natural conditions horses graze for 16-20 hours a day. The feeding pattern includes slow walking interrupted by stopping at attractive vegetation. Therefore, domestic horses have an innate need to cover long distances and to consume roughage slowly for many hours (Sarrafchi and Blokhuis, 2013). Unfortunately, stable housing is often associated with concentrated feed, limited access to pastures and paddocks, confinement and social isolation. This may lead to development of stereotypical behaviors and health problems (Birke et al., 2010; Rose-Meierhöfer et al., 2010; Hockenhull and Creighton, 2014).

Individual characteristics, such as age, sex, coping styles or temperament may predispose to the occurrence of unwanted behaviors. As reported by Tadich et al. (2013), in the group of thorough breds problem behaviors were more often displayed by mares and older individuals. The temperament, as the strength and speed of reaction to stimuli characteristic for a given individual, is important for the use of recreational and sport horses (Roberts et al., 2016). Animals with higher emotional excitability have a higher heart rate (HR) and lower heart rate variability (HRV) when exposed to new objects and are more difficult to handle (Visser et al., 2003). Nagy et al. (2010) have shown differences in the temperament of horses exhibiting cribbing behavior compared to horses in

the control group. Interestingly, crib-biting horses were characterized by lower level of the trait 'anxiety'. The lower level of nervousness, excitability, emotional incoherence, vigilance and timidity in stereotypical horses may be related to their passive coping behavior. Individuals of numerous species show various responses to stressors and different coping styles that reflect their personality types. Although stereotypies are more associated with proactive coping techniques , depression appears to be common response for reactive individuals (Ijichi et al., 2013). Animals displaying stereotypical behavior have lower learning abilities; this information is important in terms of the effectiveness of horse training (Hausberger et al., 2007).

The aim of the study was to analyze selected housing conditions, types of use and individual characteristics of horses versus their undesirable and stereotypical behavior. We tested the hypothesis that the emergence of problem behaviors in horses depends on exogenous factors (living conditions) and the individual characteristics of the animals (age, sex, breed, and temperament). Additionally, we checked for differences between different countries in terms of trends in maintenance conditions, management practices and usability of horses, and the general percentage of reported behavioral problems.

MATERIAL AND METHODS

Surveys are a popular method for collecting data directly from subjects on certain topics of interest (Parker et al., 2008). The aim of the study was accomplished based on the results of an online questionnaire addressed directly to horse owners. This method was chosen, as it provides abundant data on the housing conditions and the frequency of problem behaviors exhibited by horses. The survey was conducted in February/March 2020 via Google Forms and it allowed us to gain information about dependencies between selected housing conditions, types of use and traits of horses, and the occurrence of undesirable and/or stereotypical behaviors. We had prepared two versions of the survey: Polish-language, which was directed to horse owners from Poland, and English-language – for owners from other countries. Both variants consisted of the same 22 closed questions and the English-language sheet had an additional question about the country where the horse was kept. The single-choice questions (n=20) were focused on the individual characteristics of the animals (age, sex, breed, and temperament), living conditions and the use of the horse (Table 1).

Table 1
Basic issues addressed in the online questionnaire

Question category	Issues
Individual characteristics of the horse	Age, sex, breed, temperament
Housing conditions	Housing system, type of bedding, access to pastures/paddocks, turnout/no turnout before training, presence and number of other horses in the pasture, social contact in the stable (visual/physical), access to grass in the paddock, nutrition (roughage/concentrated feed/both), frequency of roughage/concentrated feed, scheme of administration of roughage and concentrated feed
Type of use	Type of use (e.g. recreation, amateur sport, sport, hippotherapy), sport discipline (sport horses), frequency of training, riding style (e.g. classic, western)
Problem behaviors	Behaviors reported by owners: UB: during handling/during use/towards other horses/other SB: weaving/cribbing/box walking/other oral or motor stereotypies/other

UB – undesirable behaviors, SB – stereotypical behaviors

The trait 'temperament' was based on horse owners' perception of their horses' reactivity during daily procedures and training. There were three options to choose from: balanced – eager to work, easy and safe to handle, not overreacting emotionally, not being overly vigilant, responding with moderate speed and strength; highly reactive – responding rapidly and vividly, reacting emotionally, with a tendency to be excessively vigilant; phlegmatic – slow and sluggish, responding slowly, not overreacting emotionally, not being overly vigilant. The multiple-choice questions (n=2) concerned the occurrence of undesirable behaviors (UB) and stereotypical behaviors (SB) that had been observed by horse owners. Respondents were familiarized with the definitions (and examples) of UB and SB that we used to categorize behaviors in the questionnaire. UB were defined as reactions occurring in the repertoire of normal horse behaviors that impede the daily handling and/or use or may lead to horse's injury. Stereotypies were defined as repetitive behaviors that are not included in the repertoire of normal horse behavior and that have no clear target or function. UB were categorized as: UB during handling (included at least one of the following behaviors: kicking, biting, digging, excessive mobility, difficulties during grooming), during use (bucking, bolting, rearing, refusal to cooperate, difficulties during tacking up), directed towards other horses (attacking, kicking, biting), and other (combinations of previous categories). In the case of SB, respondents could choose between: weaving, cribbing, box walking, other oral stereotypies (licking the box elements, tongue playing), other motor stereotypies (head shaking), and other (combinations of previous categories). The questionnaire was intended to provide information about one horse. If the owners had more

horses, they were asked to fill in an additional form. Horses under three years of age were not included in the survey because of different age of starting training and sport career (Lewczuk, 2015; Logan and Nielsen, 2021) and thus, no possibility to observe problem behaviors during use.

The research material was collected after posting the questionnaire on groups of well-known social networks for horse keepers and breeders. In total, 637 complete sheets were obtained from 20 countries. We divided them into five geographical regions: Poland (n=376), Great Britain (UK; n=145), USA and Canada (n=66), Australia and New Zealand (n=22), and "other" (n=28). The "other" category comprised other countries (Denmark (n=1), France (n=1), Ghana (n=2), Greece (n=7), Spain (n=1), Ireland (n=2), Mexico (n=1), Norway (n=2), Panama (n=1), Republic of South Africa (n=3), Sweden (n=3), Hungary (n=1), Italy (n=2), Faroe Islands (n=1)) that did not constitute a homogeneous representative group. For this reason, the data from the last category was not included in the comparison of trends in maintenance conditions, management practices, and usability of horses between different regions (the number of analyzed sheets was 609). However, all of the obtained questionnaires were taken into account during analyses of the individual and environmental factors on the occurrence of undesirable and stereotypical behaviors. The collected results were statistically processed using Statistica 13.3 Pl software. Quantitative and percentage analyses were performed for the interactions: "individual/environmental factor – occurrence of UB/SB", "geographical region – trends in housing conditions/usability and "geographical region – occurrence of UB/SB overall (total number of reported UB and/or SB)". The significance of the relationships between the variables was tested using the Pearson Chi-square test of independence for contingency tables.

RESULTS

The studied material consisted mainly of warmbloods (86,5%). The rest of the animals included ponies (12,1%) and draft horses (1,4%). The studied horses were usually between 7 and 13 years (45,7%), but there were also younger (3-6 years; 20,1%) and older horses (14-20 years; 22,9%; above 20 years old; 11,3%). The distribution of sex was as follows: mares – 48,8%; geldings – 48,5%; stallions – 2,7%. Regarding horses' reactivity, most often respondents reported owning balanced horses (55,4%) and highly reactive animals (37,8%). Horses were usually ridden 3-5 times a week (54,9%).

The age, sex and type of breed did not influence the frequency of occurrence of behavioral problems. A significant relationship was found only between the occurrence of UB and SB and the reactivity of the animals (Table 2), and the majority of the reported cases were energetic and highly reactive horses (Table 3).

Table 2

Individual and environmental determinants of undesirable (UB) and stereotypical (SB) behaviors exhibited by horses

Factor	Undesirable behaviors		Stereotypical behaviors	
	χ^2	P-value	χ^2	P-value
Frequency of paddocking	20,0901	≤0,01	6,3845	0,3815
Presence of other horses in the pasture	14,2927	≤0,01	3,9349	0,2686
Visual contact in stable	2,0038	0,1569	4,4932	≤0,05
Temperament	31,9522	≤0,001	8,1439	≤0,05
Access to grass in the paddock	5,2386	≤0,05	0,2051	0,6506
Frequency of roughage administration	15,5137	≤0,01	6,4240	0,0927

Table 3

Proportion of undesirable (UB) and stereotypic (SB) behaviors in the population of horses kept in the specified conditions

The answers	UB (%)	No UB (%)	SB (%)	No SB (%)
1. Frequency of paddocking				
Permanent access	29,8	70,2	30,4	69,6
>5 h/day	33,1	66,9	33,1	66,9
2-5 h/day	51,6	48,4	29,9	70,1
To 2 h/day	21,4	78,6	35,7	64,3
Irregular	53,9	46,1	25,6	74,4
Every 2-3 days	33,3	66,7	66,7	33,3
None	44,4	55,6	33,3	66,7
2, Presence of other horses in the pasture				
0	51,9	48,1	35,8	64,2
1-4	35,8	64,2	34,2	65,8
5-10	25,5	74,5	26,5	73,5
>10	36,2	63,8	25,9	74,1
3, Visual contact in stable				
Yes	38,0	62,0	32,5	67,5
No	20,0	80,0	6,7	93,3
4, Temperament				
Balanced	27,2	72,8	27,2	72,8
Highly reactive	49,8	50,2	38,8	61,2
Phlegmatic	32,6	67,4	34,9	65,1
5, Access to grass in the paddock				
Yes	34,1	65,9	32,2	67,8
No	47,9	52,1	29,6	70,4
6, Frequency of roughage administration				
1 x/day	41,4	58,6	17,2	87,8
3-4 x/day	42,8	55,9	27,0	63,4
2 x/day	44,1	57,2	36,6	73,0
Ad libitum	28,3	71,7	33,6	66,4

The factors listed in Table 2 were taken into account.

The answers given by the respondents from different geographical regions indicate that the problem of undesirable and stereotypical behaviors is widespread and can be observed in horses kept in various conditions and used in various ways ($p = 0,9505$) (Table 4). UB and SB were exhibited by 36,1% and 31,9% of the horses described in the questionnaires, respectively. Table 5 shows that UB such as bucking, bolting or refusal to cooperate are usually exhibited during use (30,4% of the total UB). Cases of SB that were reported particularly frequently included “other motor stereotypies” (50,7% of the total SB), i.e. box walking and head shaking.

Table 4

Proportion of undesirable (UB) and stereotypical (SB) behaviors in horses from different geographic regions overall (total number of reported UB and SB)

Country	UB (%)	No UB (%)	SB (%)	No SB (%)
Poland	35,1	64,9	32,2	67,8
UK	36,6	63,4	26,9	73,1
USA+Canada	41,1	58,9	35,6	64,4
Australia+New Zeland	40,9	59,1	36,4	63,6
Overall	36,1	63,9	31,9	68,1

The results are not significantly different at $P \leq 0,05$ ($\chi 2 = 0,7065$; $P = 0,9505$).

Table 5

Categories of undesirable (UB) and stereotypical (SB) behaviors manifested most frequently on a global scale

Category of manifested UB	% of total UB	Category of manifested SB	% of total SB
During use	30,4	Motor stereotypies other than weaving	50,7
During handling	21,7	Oral stereotypies other than cribbing	10,8
Handling+use	20,9	Other oral+other motor	7,4

UB during use: bucking, bolting, rearing, refusal to cooperate, difficulties during tacking up; UB during handling: kicking, biting, digging, excessive mobility, difficulties during grooming; UB both during handling and use: examples of two previous categories. SB categories – motor stereotypies other than weaving: box walking, head shaking; oral stereotypies other than cribbing: licking the box elements, tongue playing; both 'other' oral and 'other' motor stereotypies: examples of two previous categories.

The analysis of the dependencies between the selected individual (age, sex, breed, temperament) and environmental factors and the manifestation of UB and SB showed significant differences in the case of six factors. These were the frequency of turnout ($p = 0,0027$ for UB), presence of other horses on the paddock ($p = 0,0025$ for UB), visual contact between horses in the stable ($p = 0,0340$ for SB), temperament ($p = 0,0000$ for UB; $p = 0,0170$ for SB), access to grassy paddocks ($p = 0,02209$ for UB) and frequency of roughage intake ($p = 0,0014$ for UB) (Table 2). The type of use of the animal was not found to be associated with behavioral problems. The survey indicated that the housing conditions had an impact primarily on UB but practically did not associate with the manifestation of SB. Besides the possibility of making visual contact in the stable, there was no influence of environmental factors on SB (Table 3). However, no special relationship can be assumed in this case, as 97,1% of the horses had the ability to make eye contact with conspecifics. Contrary to predictions, there were no significant relationships of the housing system, nutrition system, possibility of physical contact with other individuals in the stable and frequency of training with the occurrence of UB/SB. Turnout before training was not shown to limit the manifestation of UB and SB. In turn, factors such as the frequency of paddocking, administration of roughage, access to grassy paddocks and presence of other horses on paddocks were associated with displaying UB (Table 2).

Irregular turnout leads to the higher proportion of UB in horse time budget. 53,9% of such individuals were found to pose handling- or use-related problems. The same problems apply to 44,4% of horses that had no possibility to move freely at all (Table 3). Interestingly, a high proportion of UB was also observed in animals staying outside for 2-5 hours (51,6% of cases). Access to pastures at 2-3-day intervals was associated with a higher frequency of SB (66,7% of cases); however, there were only nine individuals in this group. The percentage distribution of SB was at a similar level in the other variants of turnout. Releasing horses unaccompanied by other animals was definitely the least favorable situation in terms of occurrence of UB (51,9% of cases). Another important factor in horse management is access to roughage. 47,9% of horses kept on grassless paddocks were reported to exhibit undesirable behaviors. The lowest frequency of such behaviors was noted when hay was given ad libitum (28,3% of cases).

The additional statistical analysis, that aimed to compare living conditions of horses reported in survey, revealed differences in the horse management tendency in different countries (Table 6).

Table 6

Comparison of selected maintenance conditions and use of horses on a global scale with the main trends in the analyzed geographical regions

Maintenance and use conditions	Poland	UK	USA +Canada	Australia +NZ	$\chi 2$	P-value
Housing system	Box (79,0%)	Box (71,0%)	Open stable (38,4%)	Free range (68,2%)	183,084	≤0,001
Bedding	Straw (86,7%)	Sawdust (54,5%)	Sawdust (68,1%)	Sawdust (100%)	235,999	≤0,001
Paddocking	2-5 h/day (52,1%)	2-5 h/day (45,5%)	Constant access (67,1%)	Constant access (95,5%)	156,809	≤0,001
Other horses on the pasture	1-4 (52,7%)	1-4 (74,1%)	1-4 (64,8%)	1-4 (63,6%)	53,508	≤0,001
Grass in the pasture	89.3%	88,7%	79,7%	100%	8,034	0,090
Nutrition	R+CF (93,35%)	R+CF (64,1%)	R+CF (78,1%)	R+CF (77,3%)	73,170	≤0,001
Access to R	Ad libitum (42,3%)	Ad libitum (58,6%)	Ad libitum (47,9%)	Ad libitum (63,6%)	67,509	≤0,001
Access to CF	1 x/day (47,6%), 2 x/day (47,0%)	2 x/day (57,0%)	2 x/day (62,3%)	1 x/day (81,2%)	186,649	≤0,001
Order of administration of feed	R (77%)	R (80,0%)	R (79,7%)	R (72,2%)	1,348	0,853
Type of use	Amateur sport (41,2%)	Recreation (68,3%)	Recreation (47,9%)	Recreation (54,5%)	124,178	≤0,001
Riding style	Classic (96,3%)	Classic (97,7%)	Western (61,0%)	Classic (78,9%)	176,617	≤0,001
Training	3-6 x/week (56,2%)	3-6 x/week (50,4%)	3-6 x/week (53,3%)	3-6 x/week (42,1%)	49,192	≤0,001

R – access to roughage, CF – access to concentrated feed

We found significant relations between geographical regions and: housing system ($p \leq 0,001$), type of bedding ($p \leq 0,001$), frequency of paddocking ($p \leq 0,001$), presence of other horses in the pasture ($p \leq 0,001$), nutrition type; roughage or roughage+concentrated feed ($p \leq 0,001$), frequency of roughage administration ($p \leq 0,001$), frequency of concentrated feed administration ($p \leq 0,001$), usability ($p \leq 0,001$), riding style ($p \leq 0,001$) and frequency of training ($p \leq 0,001$). The dominant housing system in Poland (79%) and Great Britain (71%) is the box stable, in contrast to America, where the open stable system (animals have free access over the whole area of the building and the paddock) prevails (38,4%) and to Australia (68,2%), where the free range system (animals have free access to pastures and paddocks for 24 hours) is common due to the characteristics of the climate. The group breeding system in these countries is conducive to round-the-clock access to pastures (67,1% for USA+Canada and 95,5% for Australia+NZ). In European countries horses are usually paddocked for 2-5 hours a day (52,1% for Poland and 45,5% for UK). Straw was found to be the most popular bedding material only in Poland (86,7%). In other regions, sawdust is mainly used (54,5% for UK; 68,1% for USA+Canada and 100% for Australia+NZ). In pastures where they can graze on grass, horses are usually accompanied by 1-4 individuals in all analyzed regions (52,7% for Poland; 63,6% for Australia+NZ; 64,8% for USA+Canada and 74,1% for UK). 58,6% horses from the UK; 63,6% from Australia+NZ; 47,9% from US+Canada and 42,3% horses from Poland, typically have unlimited access to hay. In other cases it is rationed to 1-4 times a day. The dominant feeding model is based on roughage and concentrated feed, although the latter is relatively often excluded from the daily ration in the UK (35,9%), the USA (21,9%) and Australia (22,7%). However, if concentrated feed is to be administered, it is provided once (Poland – 47,6%; Australia+NZ – 81,2%) or twice a day (Poland – 47%, UK – 57%, USA+Canada – 62,3%). The vast majority of horses in the world are ridden in classic style (78,9-97,7%) and used for recreational purposes (47,9-68,3%), whereas western-style riding is popular in America (61%). The majority of saddled horses work regularly 3-6 times a week (42,1-56,2%).

DISCUSSION

The problem of undesirable and stereotypical behaviors in horses is a common phenomenon. It is estimated to affect 19,5-32,5% of these animals worldwide (Roberts et al., 2017). In the present study, we showed that UB and SB were exhibited respectively by 36,1% and 31,9% of the horses. A similar frequency of this type of behavior was reported by Hötzel et al. (2019). Based on the online questionnaire, we found that UB, e.g. bucking, bolting and refusal to cooperate, appear mainly during the use of the animal (30,4% of the total UB). Difficulties during handling such as kicking, biting or excessive mobility were reported in 21,7% of the analyzed cases. Undesirable behaviors are a serious problem as they reduce the safety of owners during grooming, saddling and riding (Arena et al., 2021) and may be the cause of horses' injuries (Knubben et al., 2008; Freire et al., 2009).

Based on the results of the survey, the most common stereotypical behaviors were motor stereotypies (other than weaving), e.g. box walking and head shaking. However, cribbing and weaving are usually the most often reported stereotypies (Hockenhull and Creighton, 2014). In contrast to many publications, we did not demonstrate a significant impact of environmental factors on the occurrence of stereotypical behaviors but mainly on undesirable behaviors. Given the global problem of behavioral disorders in horses, research in this field should be continued. As reported by Cooper et al. (2000) and Waters et al. (2002), social isolation and a stimulus-poor environment correlate with numerous behavioral problems. Yet, most horses are still kept in separate tie-stalls or

boxes (Jørgensen et al., 2011). We have shown that the dominant horse housing system in European countries is the box stable, which was also reported by Rose-Meierhöfer et al. (2010) as well as Visser and van Wijk-Jansen (2012). However, we did not find any significant relationships between the individual/group housing system and the presence of UB and SB. Van den Berg et al. (2015) showed that stereotypical behaviors also appear in horses that are kept in groups and have almost unlimited access to pastures. The problem of chewing wood or licking soil has been observed in 75% of these animals. Social deprivation is a particularly strong stressor for horses (Zeitler-Feicht, 2014). Yarnell et al. (2015) found the increased stress levels in horses kept in isolation. Søndergaard et al. (2011) reported that in the absence of physical contact, odd-toed ungulates tend to establish at least indirect interactions. Therefore, the survey results indicating the possibility of making visual (97,08%) or physical contact (63,44%) with conspecifics are a positive phenomenon. Although we did not show an association between the possibility of direct social interactions and a lower frequency of UB and SB, this type of relationship was reported by Bachmann et al. (2003).

In a study conducted by Werhahn et al. (2011), horses staying on the paddock before training not only were calmer in the boxes but also achieved better training results. However, the present study did not show an impact of turnout before training on the manifestation of UB and SB. In another study, Werhahn et al. (2012) reported that limited access to pastures resulted in increased stress levels, greater locomotor stimulation, and reduced resting time in the box stall. This is not surprising, as horses are evolutionarily shaped to move for many hours (Zeitler-Feicht, 2014). Our survey provides similar conclusions. The greatest number of undesirable behaviors is exhibited by irregularly paddocked horses and, interestingly, by animals staying outside for 2-5 hours. Probably, the absence of stable conditions associated with the time spent outside the stable is uncomfortable for many animals and results in behavioral changes. Problems with the behavior of horses kept individually in the stable all day were reported to a similar degree. Additionally, as shown by Werhahn et al. (2012), horses deprived of access to paddocks also achieve poorer training results. This is another effect of inadequate living conditions besides the diminished psychological comfort. Separate paddocking may raise concerns about aggression between animals and injuries that would exclude the horse from working under saddle. Serious fights very rarely occur in nature; however, they may occur in domestic horses due to mismanagement (Fureix et al., 2012). Additionally, the presence of other individuals is a specific social enrichment motivating the animal to start moving. Thus, it has a positive effect on both the emotional state and physical health of animals (Lee et al., 2011). In the population analyzed in the present study, there was a tendency to keep horses on pastures in a group of 1-4 animals. As we proved, individual turnout was associated with an increase in the frequency of UB. Jørgensen and Bøe (2007) observed that horses staying in paddocks in a group exhibit a richer species-specific behavioral pattern, which in turn reduces problematic behaviors.

Access to roughage is not only important in terms of the implementation of food behavior but also constitutes an environmental enrichment absorbing the horse (Jørgensen et al., 2011; Sarrafchi and Blokhuis, 2013). Nearly half of the respondents reported undesirable behavior of horses kept on grassless paddocks. As reported by Jørgensen et al. (2011), the reduction of passive behavior on the paddock can be reduced only with access to grass. If there is no grass, different roughage must be provided. The survey indicates the lowest frequency of UB when hay is administered ad libitum. Food enrichments allow elimination of boredom and frustration, thus reducing the occurrence of

problem behaviors (Zeitler-Feicht, 2014; Kozak and Budzyńska, 2017). Rochais et al. (2018) proved that hay nets and other systems slowing down feed intake significantly reduce the share of stereotypies in the time budget and improve the quality of human-animal interactions. In turn, Goodwin et al. (2002) reported that access to several types of roughage significantly prolongs the foraging time and reduces the share of non-food-related behaviors in horses. The novelty effect used by the researchers offers a possibility to eliminate stereotypical behaviors and can be successfully used in the case of animals kept in box stalls. Straw is regarded as the most popular bedding material in Poland and other countries worldwide (Kwiatkowska-Stenzel et al., 2016), which we did not confirm in the present study. Straw turned out to be used most frequently only in Poland. The respondents from the other geographical regions reported the use of sawdust. Kwiatkowska-Stenzel et al. (2016) and McGreevy et al. (1995) demonstrated that the use of other than straw bedding is associated with a higher percentage of atypical behaviors, which we did not observe in the present study.

We found no age, sex or breed effect on the occurrence of behavioral problems. Muñoz et al. (2014) formulated similar conclusions regarding the first two factors. In turn, Luescher et al. (1998) and Tadich et al. (2013) showed that the risk of exhibiting stereotypies increases with age and mares are especially predisposed to exhibit such behaviors. Moreover, Luescher et al. (1998) observed that thoroughbred horses display stereotypical behaviors much more frequently. In the present study, the temperament was significantly related to the occurrence of UB and SB. The biggest number of handling and use problems was reported by owners of lively and energetic horses, whereas quiet and balanced horses were the least problematic. The latter animals were also characterized by the lowest frequency of SB. Visser et al. (2008) proved that horses with higher emotional reactivity pose more problems during training, which may be associated with their characteristic hyperactivity. Similarly, other authors associate a lively temperament with undesirable behavior during handling and use (De Cartier d'Yves and Ödberg, 2005; Kaiser et al., 2006). The animal temperament can therefore be a useful indicator in assessment of the risk of problem behaviors. As reported by McGreevy et al. (1995) and Normando et al. (2011), the occurrence of atypical behaviors depends on the type of use of horses, but these results were not confirmed in the present study

CONCLUSIONS

In an environment that is poor in social and nutritional enrichments, the level of horse welfare declines, which is reflected in behavioral changes. In the group of horses analyzed in the present study, these problems were related primarily to the occurrence of undesirable behaviors. Since the scientific literature often emphasizes the role of housing conditions in the etiology of stereotypical behaviors, further research in this field is advisable. Furthermore, owners and breeders should take into account the individual characteristics of horses in order to ensure optimal maintenance conditions. Highly reactive animals are at increased risk of developing stereotypies and undesirable behaviors. Hence, it is important to provide adequate social, occupational and nutritional enrichments especially in the case of reactive animals. Unaccompanied and irregular release of horses to paddocks without access to grass or other roughage should be avoided. Horses should be provided with unrestricted access to this type of food. A key issue is to make horse breeders and keepers aware of the causes of abnormal behaviors, with emphasis on housing conditions as important determinants of the welfare of these animals.

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Research funding source: statutory activity by Department of Animal Ethology and Wildlife Management, University of Life Sciences in Lublin, Poland