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ANALYSIS OF FACTORS AFFECTING THE TENDENCY TO DIFFERENT BEHAVIOR OF HORSES – SURVEY RESEARCH

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Abstract

The aim of the study was to analyze the influence of breed, sex, age and the number of people using horses on potential behavior problems, by an online survey addressed to horse owners and users. The behaviors included: aggression or timidity towards people, unpredictability, stubbornness and patience towards various stimuli. The surveys showed that about 11% of the horses were aggressive towards humans, about 18% were afraid of people, 22.5% were unpredictable, over 35% tended to resist commands, and about 33% showed impatience. Neither the breed, nor sex, nor the horse age, nor the number of people dealing with/using it influenced the horse loading/unloading and transport. Additionally, mares tended to be more dominant, less friendly towards other horses, and anxious during preparation for riding; Stallions/geldings were generally more insubordinate and phlegmatic/unmotivated to work. The oldest and middle-aged horses were the least friendly towards other horses. The oldest horses were the most phlegmatic, timid and uninterested in new objects, while the youngest were the most insubordinate. It was observed that middle-aged and young horses were the most excitable and eager to overtake when led. The horses of noble or sport breeds were the most timid in the new environment. Noble/sports and primitive horses were the most phlegmatic and insubordinate. The horses handled by one or two people (with limited contact with humans) were the most excitable, the most interested in new objects and the most brave in a new environment, To sum up, greater emphasis should be put on training users in the basic welfare needs of horses, taking into account the specificity of the horse's sex, age and breed, as well as appropriate human behavior and conduct when handling these animals.

Keywords: horse, behavior, undesirable behaviors, survey research

Introduction

In the natural environment, the horse traverses large areas. Wandering results from the need to search for and constantly collect food. The horse, being a herbivore, is a potential prey of a natural predator. Therefore, the horse, thanks to its eyes located on the sides of its head, allowing for 330˚ vision, and to good hearing, has the ability to see, hear or sense an approaching predator (Kamieniak et al., 2010; Janicka et al., 2022). This allows them to make a quick defensive reaction, which is to escape. The horse is not aggressive by nature. Only when direct contact with a predator occurs does it use alternative defense methods, i.e. kicking or biting. The horse is a highly social species that lives in groups, and the herd instinct gives it a sense of security and the ability to survive in an unfavorable environment. The herd meets social needs due to the dynamic relationships between individuals and provides entertainment. Herd relationships are also an educational element, especially in the case of foals and young horses that

are just learning to function in a community (Nowicki and Zwolińska-Bartczak, 1983; Krueger et al., 2021). A herd of horses usually consists of several mares with foals and a stallion. There is a strictly defined, stable hierarchy in which each member of the herd has their own position. Various interactions may occur between individuals that allow for a change in this position, which is why the hierarchy in horses can be dynamic, especially when new individuals appear in the herd (Nowicki and Zwolińska-Bartczak, 1983; Krueger et al., 2021).

Nevertheless, the oldest and most experienced mare usually plays the most important role in the herd. She knows perfectly well where to lead the herd to find water or a place to graze. An equally important role is played by the stallion, which defends his mares against other potential competitors or predators and has the opportunity to mate during the copulation season (Nowicki and Zwolińska-Bartczak, 1983; Krueger et al., 2021). The situation was analyzed in various countries. For example, research on several herds of Icelandic ponies in Iceland showed that stallions with herds in close proximity did not often decide to behave aggressively towards competitors (only in 19% of cases). They marked the area with droppings, which resulted in avoiding the stall's territory more often than interacting with it. Aggressive behavior occurred more often in the case of a newly arrived stallion (Sigurjonsdottir et al., 2012). In turn, research by Cozzi et al. (2010) indicated that in the event of a conflict in a herd, horses have highly developed abilities to cope with the conflict by reconciling and calming down (affiliative behaviors), which contribute to maintaining herd stability, in the case of individuals both high and low in the hierarchy (Cozzi et al., 2010). Sigurjonsdottir and Haraldson (2019) found that undesirable behavior, and in particular the display of aggression, depended on the composition of the group of horses in terms of age and sex.

It is known that in prehistoric times people hunted horses. Only later, detailed knowledge of the horse's behavior allowed it to be used in other ways, e.g. in transport. Only the development of industry and mechanization ended this stage of horse use (Leopold, 1965). Horse riding contributed to increasing the mobility of people, which significantly influenced the development of civilization. The horse played a huge role primarily during military conflicts, initially pulling chariots popular in ancient times, and ending as a battle mount of medieval knights and then hussars and cavalry. In the 21st century, horses are kept and used mainly for hobby, recreational and sports purposes (Łojek and Łojek, 2015).

Modern use of the horse is very diverse. From using ponies to take care of the grass in the garden or as playmates for small children, through recreational use that improves the quality of human life, to competitive use in sports. From the beginning, man has strived to obtain an animal willing to cooperate with him. Over the years since domestication, the primal instincts of horses, such as the desire to escape from danger, have been weakened to some extent as a result of selection. These animals still exhibit them, although as a result of contact with humans over time, not in the same form as before (Łojek and Łojek, 2015; Merkies and Franzin, 2021).

Currently, a very important and desirable feature of horses is safety in the yard (Chapmann et al. 2020; Romness et al., 2020; McKenzie et al., 2021). Horses are naturally skittish. People try to adapt horses to various stimuli so that they are brave in new, unknown situations. Above all, they must guarantee certainty or a certain percentage of predictability of a desired behavior. Taking into account the different ways of use, an important feature of a modern horse should be interest in new stimuli and obedience, which translates into the willingness to cooperate with humans. Both horses and people, due to their social needs, do not seek unnecessary conflict (Graf et al., 2013; Chapmann et al., 2020; Olczak and Tomczyk-Wrona, 2022).

The most common cause of undesirable behavior is the failure to meet the natural needs of horses, which generates stress. As a result of domestication, horses have had a reduced area to roam freely in groups and search for food (Krupa et al., 2022). Research by Tkaczyk et al. (2020) indicate that during social isolation horses displayed undesirable behaviors, especially motor stereotypies, which suggested an increase in emotional excitability in these animals.

Another cause of undesirable behavior in horses is an unattractive (boring) environment and a lack of companions or friends. In nature, the horse was practically constantly moving in the herd, observing its surroundings. Nowadays, horses usually stay in the same, unchanged and limited space, sometimes for many years, they know the area of their enclosure, which gives them a certain dose of boring routine, but also a sense of security because they do not have to fear predators. Other reasons are stressful situations, fear, pain or pain-related illnesses, improper nutrition, improper fitting of riding equipment, and human themselves and human-related experiences. Stress in horses may occur as a result of various situations, e.g. confinement in a stall for most of the day, separation from the herd, lack of constant access to hay, improper feeding time, training or transport. In this respect, horses have very good memory. They can remember their experiences, both good and bad, as well as situations and people. Behavior resulting from a horse's fear can be dangerous for humans and may cause accidents or damage to infrastructure in the environment, depending on how violently the animal reacts in a given situation. If the horse's undesirable behavior is the result of pain or illness, it is a clear signal to the owner that the problem should be consulted with a specialist. A similar thing happens in the case of improper nutrition, most often when the horse does not have constant access to hay. Improper nutrition causing gastric problems may generate potential pain and stress for the animal. The situation with fitting riding equipment is very similar. Wrong equipment or inappropriate putting it on can cause pain, fear and stress. Sometimes the cause of such behavior is the person himself, whose approach, attitude and behavior may negatively influence the animal and be a potential source of undesirable behavior (Olczak and Klocek, 2014; Krupa et al., 2020; Romness et al., 2020; Hemsworth et al. ., 2021; McKenzie et al., 2021). The study by Wolińska et al. (2012) confirmed that most horses do not have negative associations with humans during their first contact in the stall, but when they started cleaning, 39% of horses showed undesirable reactions, such as pinning their ears back, spinning, pawing, trying to bite or kick or press against walls. Sometimes it happens that people find a given behavior funny, seeing nothing disturbing in it and they are completely unaware of what it may result from and what it may lead to. However, a significant number of people do notice this problem, watch their horses and try to act correctly as best as they can (Kozak and Budzyńska, 2017; Tkaczyk et al., 2020; Waiz and Gautam, 2022).

There were also beliefs that animals manifesting stereotypies learn worse and remember certain elements of training worse, although Briefer Freymond et al. (2019) negated this hypothesis because such horses were found to have no behavioral differences compared to a control group of healthy animals. However, the occurrence of stereotypy in horses indicates a significant deficit in the sense of well-being and physical and mental comfort (Marć-Pieńkowska et al., 2014).

Despite the fact that nowadays people usually try to provide horses with the best possible conditions, the question arises whether the behavior or behavioral problems are related to some factors beyond human control. It is known that differences in behavior are exhibited by individuals of different sexes, ages and races (Burattini et al. 2020; Lloyd et al. 2008; Sigurjonsdottir and Haraldson 2019). Fenner et al. (2020) conducted research using an extensive questionnaire on horse training, management and behavior. This questionnaire examined the impact of various factors on animal welfare over the past 6 months. It has been shown that behavioral problems in horses are aggravated to varying degrees by inadequate housing and training conditions (Fenner et al. 2020; Romness et al., 2020; McKenzie et al., 2021).

There are also problems with the behavior of horses in Polish equestrian and breeding centers. So far, there has been little research in this area due to the complexity of the topic. Therefore, the aim of the study was to analyze the influence of factors such as breed, sex, age and the number of people using the horse on the occurrence of potential problems with horse behavior.

Material and methods

For the purposes of the presented study, an online survey was created (Google form) addressed mainly to breeders, owners, trainers, instructors, handlers, grooms, riders and other people associated with the equestrian community. The survey was developed based on the methodology of similar research presented by Fenner et al. (2020). The survey is included in the Appendix. The survey was conducted from the end of September to the end of October 2022. The questions in the survey were closed, single-choice, multiple-choice and open-ended. They were divided into individual sections regarding the respondent and his horse. Questions about the horse were more detailed, relating to determining the horse's sex, age, breed, how the horse was used or the reason for lack of use, the number of people in contact with the horse (handlers/riders) and, in the last question, the tendency to display behavior towards the environment, handlers and first contact, which in certain situations could be burdensome or dangerous for humans. The last point in questionnaire consisted of 24 sub-items, to which the respondent answered "yes" or "no". The answers to the subitems from this question were statistically analyzed. After verification, 315 surveys were finally received for analysis. Due to the fact that not all respondents were able to provide the horse's year of birth (18 surveys) or its breed (10 surveys) or the number of people handling/riding the horse (1 survey), to analyze the impact of these factors 294, 305 and 314 surveys were used, respectively.

The results from the surveys regarding answers to questions about individual horse behaviors and their dependence on the horse's sex, age group, breed group and the number of people using the horse were subjected to statistical analysis using the SAS statistical package (SAS, 2014). To test the significance of the influence of the previously mentioned factors, the chi-square ($\chi 2$) test was used (Snedecor and Cochran, 1989), according to the following formula:

$$\chi^2 = \sum \frac{(f - F)^2}{F}$$

where*: f* – number of observations in the group; *F* – expected size of a given group.

The minimum group size requirement for this test is 5 observations in a given category, so some categories of tested characteristics had to be combined. In the case of sex, stallions (17 individuals) and geldings (127 individuals) were combined into one group, and mares formed a separate group (171 individuals). Stallions and geldings were combined according to genetic sex due to the fact that in some questions the stallions had fewer than 5 answers in a given category or one of the categories was empty (number of answers equal to 0). Leaving the stallions as a separate group would make it impossible to analyze these questions using the chi-square test.

In order to obtain the appropriate group size, the following groups were created for the age of horses by year of birth: until 2010, 2011-2015, 2016-2022. Due to the large diversity of breeds mentioned in the surveys and to create classes of an appropriate size, it was decided to combine some breeds into groups. The following breed groups were created: pure-bred Arabians with Anglo-Arabian horses and Malopolski horses, Thoroughbred with Wielkopolski and Trakehner breeds, noble/sport horses (including Polish sports horses and foreign sports horses: Mecklenburg, Westphalian, Oldenburg, Hanoverian, Rhine, Hungarian half-breeds, Noniuses, as well as Andalusian horses, Akhal-Teke, Friesian and Quarter Horse), a group of primitive horses (Polish Koniks, Hutsuls and horses of the primitive type), ponies and small horses (Shetland, Fjord, Icelandic, Welsh and Haflinger ponies, German riding ponies and horses referred to as small horses) and a group of Silesian, draft and warm-blood horses (including Silesian

horses and Polish draft horses, and foreign draft horses: Irish Cob, Tinker, Shire, as well as horses marked in as draft-like). Four groups were created to analyze the effect of the number of people handling/riding the horse. The first group consisted of horses handled and ridden by one person, the second – by two people, the third – by three people, and the last group called "4 people and more" included the answers: "4 people", "5 people" and "6 and more people" using the horse, due to the much smaller number of such responses.

Results

Demographic analysis of horse users

The first question in the survey concerned the identification of respondents. It was possible to select several answers. Most responses were provided by the horse owners themselves (262 responses or over 38% of all responses). Then followed the riders (188 answers or almost 28%) and the breeders (100 answers or about 15%). In 96 cases, the respondents marked the answer "Trainer/instructor", which constituted just over 14% of all answers. Less than 1% of the respondents (6 answers) emphasized that they were authorized to conduct hippotherapy classes, hence the appearance of an answer that was not included in the ready form. In 24 surveys (3.54% of all responses), respondents selected the answer "Groom" and in 2 cases (0.29%) they selected the answer "Stable/master", which was also not included in the survey. However, due to the possibility of selecting several answers, various combinations appeared in this question. In 14.6% of the surveys it was a combination of owner and rider, or in 10.5% owner, breeder, rider and instructor/trainer, or in 10.2% owner, breeder and rider.

The second question concerned the age of the respondent. The highest percentage, 55%, were people aged 18-23 (99 responses) and 24-29 years (72 responses). This was due to the way the survey was disseminated, via the Internet, which is mostly used by young people, and their greater interest in horse riding. Also, a large part of the respondents were people over 30 years of age. These were people aged 30-35 (47 surveys, i.e. 15%), aged 36-41 (39 surveys, i.e. 12%), and over 42 years old (35 surveys, i.e. 11%). The smallest group of respondents were people under 18 years of age (7% of responses – 23 surveys). Figure 1 shows the relationship between the age of the respondent and his role in relation to the horse.

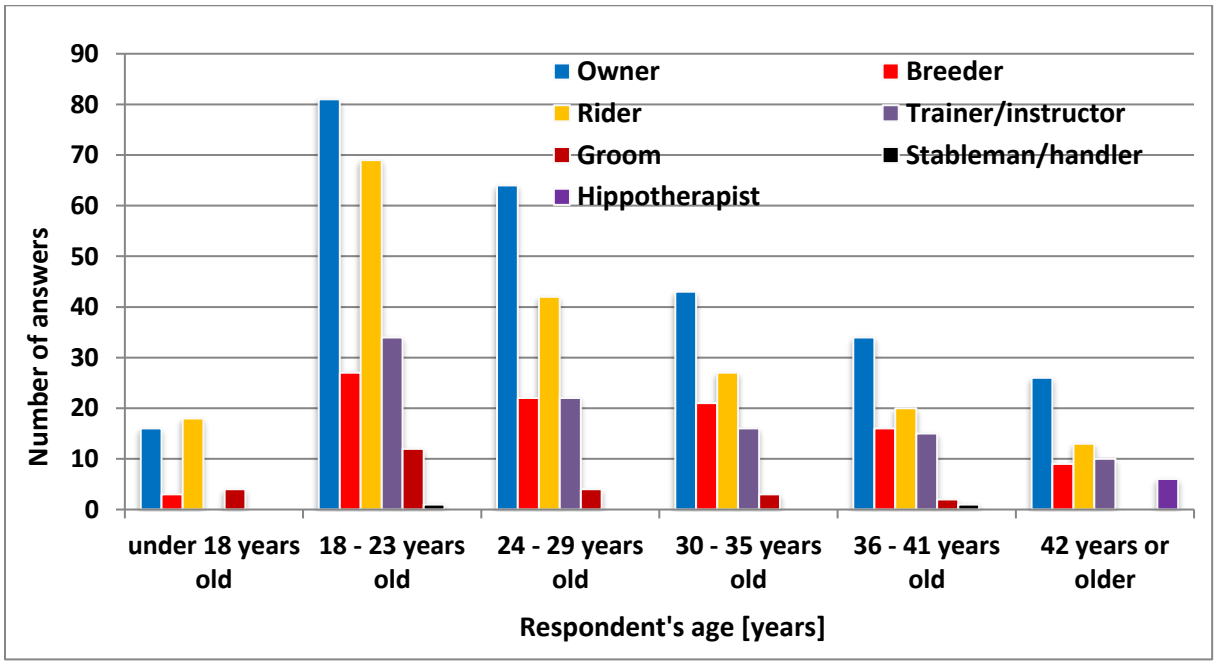

Figure 1. Declared role in relation to the horse depending on the age of the respondent

Figure 1, it can be concluded that in most age groups of respondents the largest number of people declared themselves as horse owners, followed by riders. Only in the youngest age group, under 18, riders slightly outweighed horse owners (18 and 16 responses, respectively). In this age group, there were also a small number of responses "Breeder" (3 responses) and "Groom" (4 responses) (Figure 1).

The third question concerned the respondent's level of riding skills or qualifications. In this question it was also possible to select multiple answers. There were 133 answers (42.2%) defining the level of the respondent's riding training as medium, at which the respondents claimed that they rode freely in three gaits, recreationally or practiced sports. The qualifications of "Horse Riding Instructor, Sports Instructor, Class I, II Trainer or Lecturer" were confirmed by 106 respondents (33.7%). Moreover, this answer appeared in 14.6% (46 answers) in combination with: the answers "I have a Bronze, Silver or Gold Equestrian Badge" (BOJ/SOJ/ZOJ) and "advanced level – I ride sportily, I compete in competitions". However, in 14 cases (4.4% of all surveys), having the qualifications of a "Horse Riding Instructor, Sports Instructor, Class I, II Trainer or Lecturer" was confirmed by people who also declared an average level of riding training. In 19% (60 responses) there was also a combination of the answers "advanced level – I ride sportily, I take part in competitions" and "I have a Bronze, Silver or Gold Equestrian Badge". Only 3.8% of people (12 answers) said that they did not ride horses at all.

Figure 2 shows the relationship between the respondents' declared level of riding training and their age. Figure 2 indicates that the average level of training was mainly declared by younger people, aged 18 to 29. However, respondents aged 36-41 most often confirmed that they had instructor qualifications. Among the people who declared that they did not ride horses, there were no respondents under 18 years of age, or people aged 36-41.

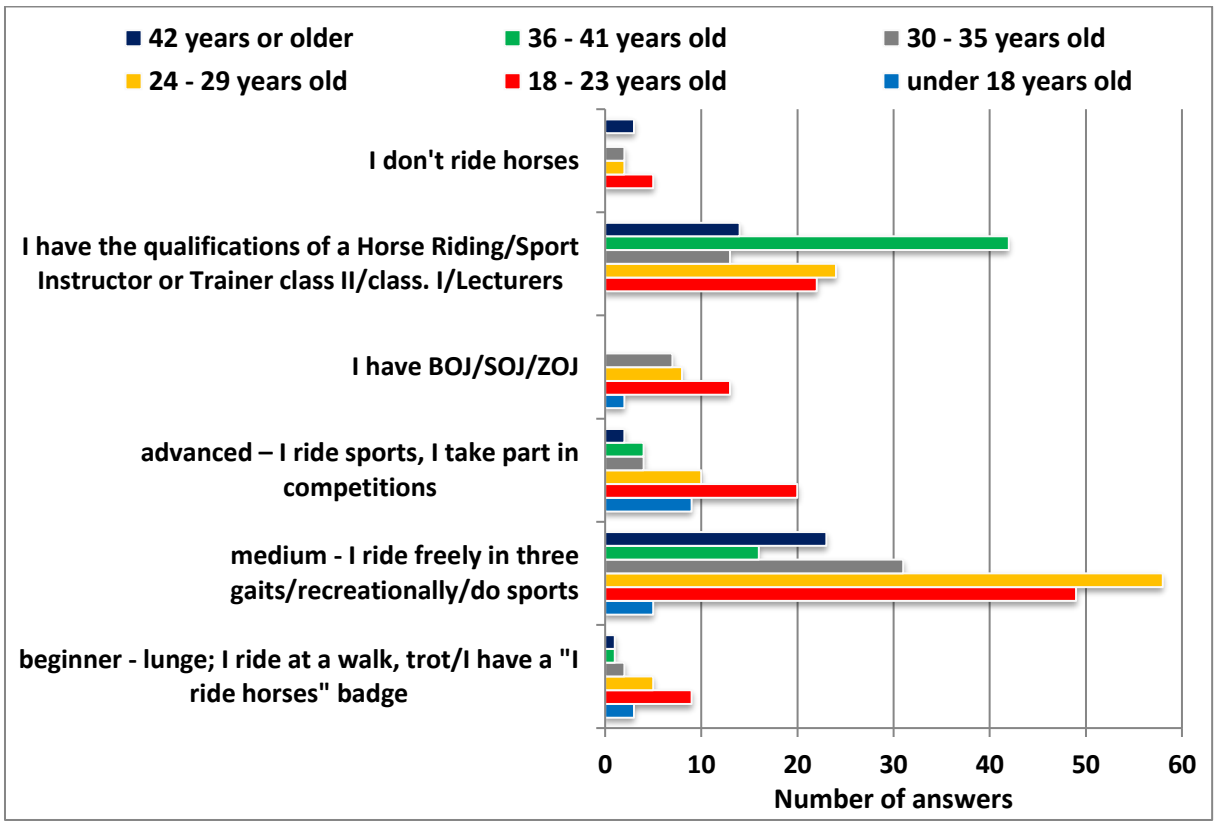

Figure 2. The age of the respondents and the level of riding skills they declared

Demographic analysis of the examined horses

The second part of the survey identified the horse. The first question in this part concerned the breed or origin of the animal. Overall, 39 horse breeds appeared and were repeated in the responses. For 10 horses, respondents did not provide its breed/origin. The largest number of responses (56 surveys, i.e. 17.8% of all) indicated the breed of the Polish sports horse, formerly the Polish half-bred noble horse. The second group consisted of 44 horses of the Malopolska breed (approximately 14% of all surveys), and 38 horses belonged to the Hutsul breed (12.1%). Silesian horses (25 responses, i.e. almost 8%) and pure-bred Arabian horses (20 responses, i.e. 6.3%), as well as Wielkopolski horses, Polish draft horses and Polish Koniks, respectively, had a fairly large share of responses in the study (5.1%, 3.8% and 3.5% of responses). In general, it can be said that Polish horse breeds had the largest share in the study (64%). In the surveys examined, there were many single mentions of foreign breeds of horses, most often German breeds of sports horses (over 4% of all responses).

The second question concerned the horse's year of birth. The largest group of horses kept by the respondents were 26 seven-year-old horses. Then six- and five-year-old horses, 20 and 23 animals, respectively. A significant group included horses with unknown year of birth (18 individuals), and five horses were born before 2000.

The third question concerned the sex of horses kept and used by the respondents. Most responses in the survey concerned mares (171, or 54%). The second group consisted of geldings. The number of them was 127. This constituted 40% of the responses, and the smallest percentage (6%, or 17 individuals) were stallions.

Figure 3 shows sex distribution of horses in breed groups.

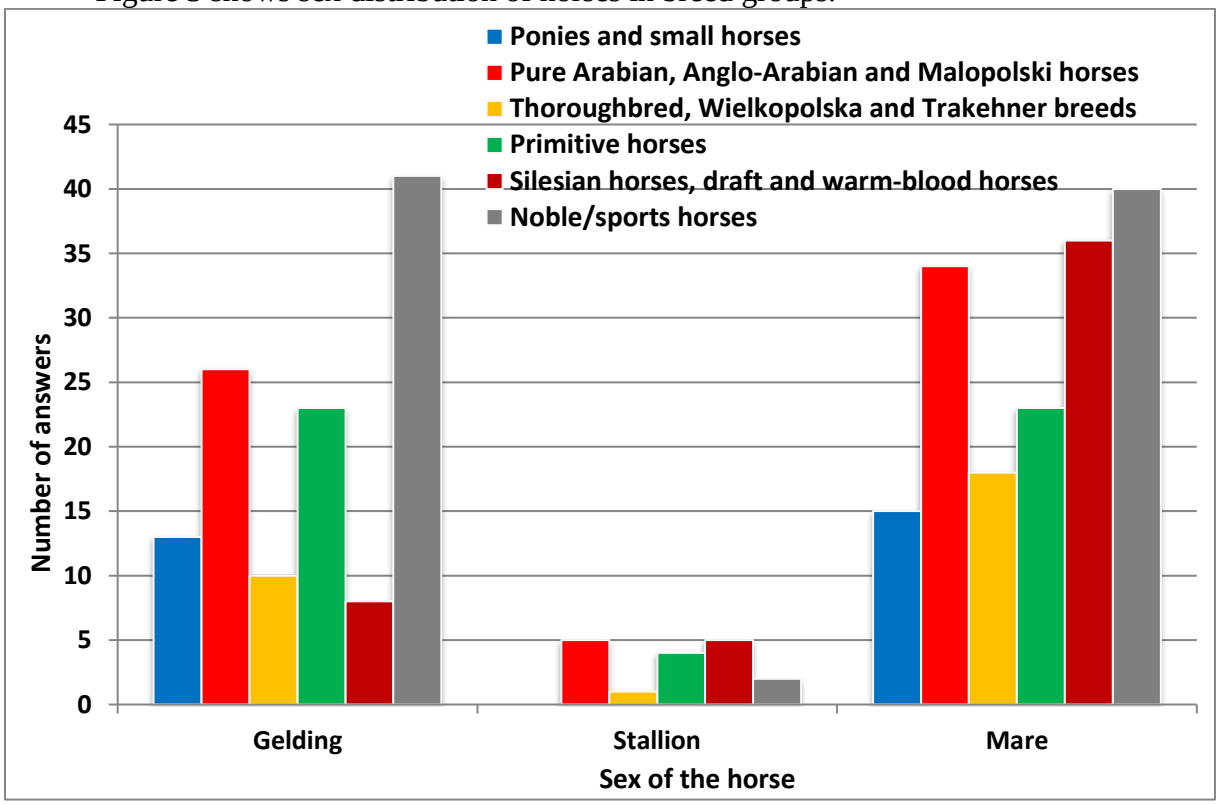

Figure 3. Sex of horses and their affiliation to a breed group

According to Figure 3 the majority of mares and geldings were of noble/sporting breeds, and there were also two stallions in this group. Another very large group were Silesian, draft and warm-blood mares. There were much fewer geldings and stallions in this group, 8 and 5 respectively. The next quite large group consisted of pure-bred Arabian, Anglo-Arabian and Malopolski horses, in which mares predominated (34 individuals), but there were also many

geldings (26 individuals). There were also five stallions in this group. However, a relatively smaller group consisted of ponies and small horses. Only 13 geldings and 15 mares, and no stallions, belonged to this group (Figure 3).

Figure 4 shows the relationship between the sex and the age group of the horses kept by the respondents. The majority of mares were young (group 2016-2022) or the oldest (born before 2010) – 53 and 51 individuals, respectively. In case of geldings, the oldest ones, born before 2010, were the most numerous (48 individuals), while the youngest were born between 2016 and 2022 (26 individuals). Also among the stallions, the youngest ones born between 2016 and 2022 dominated (11 individuals), which may indicate that the owners of these stallions are still considering their possible use in breeding or that they are still too young for castration.

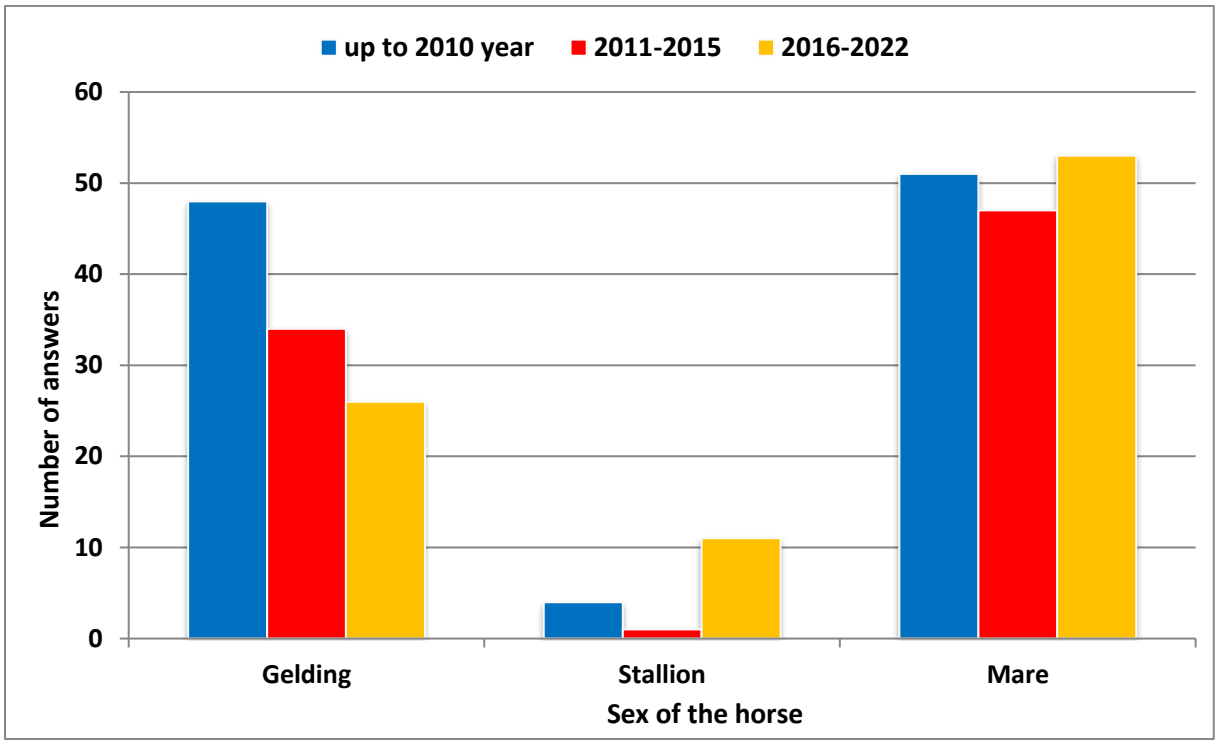

Figure 4. Sex and age group to which the respondent's horse belonged

The next question was about the use of the horse. The vast majority of horses, almost 57% (179 responses), were used for recreation. More than 24% of the horses (76 answers) did not work or were not used for various reasons, and 17.5% (55 answers) were used for sports. There were also five horses (about 2%) used in hippotherapy.

The fifth question referred to sports horses, asking about the discipline in which these horses competed. In this question, it was possible to select several answers. The analysis of the surveys showed that 48.75% of horses used for sports (39 responses) took part in show jumping competitions. Another 25% of horses (20 responses) were used in dressage. A smaller number of horses were used in the Eventing and endurance rallies, 8 and 7 responses respectively. Due to the possibility of providing several answers, various combinations of disciplines appeared. Some of the horses were used in a variety of ways, apart from the disciplines indicated in the survey, the owners mentioned that they used the horses in the emerging discipline of Working Equitation (skill competitions testing the coordination of the rider-horse pair in the field) (2 answers), as well as cavalry horses in reenactment events. historical, parades, horse pilgrimages (1 answer). However, none of the respondents used a horse in vaulting, which is also classified as a sports discipline.

The sixth question concerned the type of recreational use of the horse, if that was the type of horse use indicated by the respondents. In this question it was also possible to select multiple answers. Recreational horses were most often used in the field (135 responses, i.e. 27.2%), and then for "flat" riding in the riding arena (124 responses, i.e. approximately 25%), i.e. for gymnastic horse riding on flat terrain (allowing for small, low obstacles, so-called cavaletti), which do not excessively burden the horse. Recreational use of horses varied, with the answer “all-round/all of the above” being a common response (26 responses). Very often, respondents marked several answers, which again suggests that horses were used in different ways. The respondent also replied several times that the horse also works from the ground (6 answers, i.e. 1.21%). Work "from the ground" is a broadly understood training of a horse without mounting it, preparing it to accept a saddle or a rider, or to perform more difficult elements of dressage or improve the human-horse relationship. One of the respondents, in addition to emphasizing its versatile use, reported that the horse was used in reining (western riding competition). Two owners emphasized that the horses were being trained (ridden) with the intention of using them for recreation.

The seventh question concerned the reasons for not using the horse. In this question it was also possible to select several answers. The age of the horses was most often the reason why they not work or were not used (43 answers, i.e. 13.7%). Respondents who marked this answer usually owned horses that were too young for use/work and/or considered the young horse to be a breeding horse (the second most frequently chosen answer – 18 times). The third selected answer was health problems (12 answers or 3.8%). Another reason for not using the horse was the owner's lack of time (5 answers – 1.6%) and the lack of a suitable rider to prepare the horse for riding due to its size, skills or competences (4 answers). Four responses also mentioned the horse's behavioral problems. One respondent indicated that he had a breeding mare that was currently raising a foal, which was her main priority, but she also worked recreationally.

The eighth question concerned the number of people handling/using the horse. Most people (141, or 46% of respondents) declared that the horse was handled by one person, and generally it was the respondent himself. The second group consisted of the response "2 people" (66 surveys or 21%). In this case, two people often shared the responsibilities between themselves, or one person was only responsible for handling the horse and the other one was only responsible for using the horse. About 18% of respondents (56 responses) said that the horse comes into contact with three people on a daily basis. The share of responses in which respondents stated that the horse was used or cared for by four or more people (44 responses in total, i.e. 14% of all surveys) was much smaller and usually concerned places with a high turnover of riders, i.e. recreational stables.

The last question in the survey (question 12) concerned the horse's predisposition to exhibit behavior that, in certain situations, may be bothersome or dangerous to humans. This question consisted of 24 sub-items to which the respondent answered "yes" or "no". Figure 5 shows the structure of the answers to question 12.

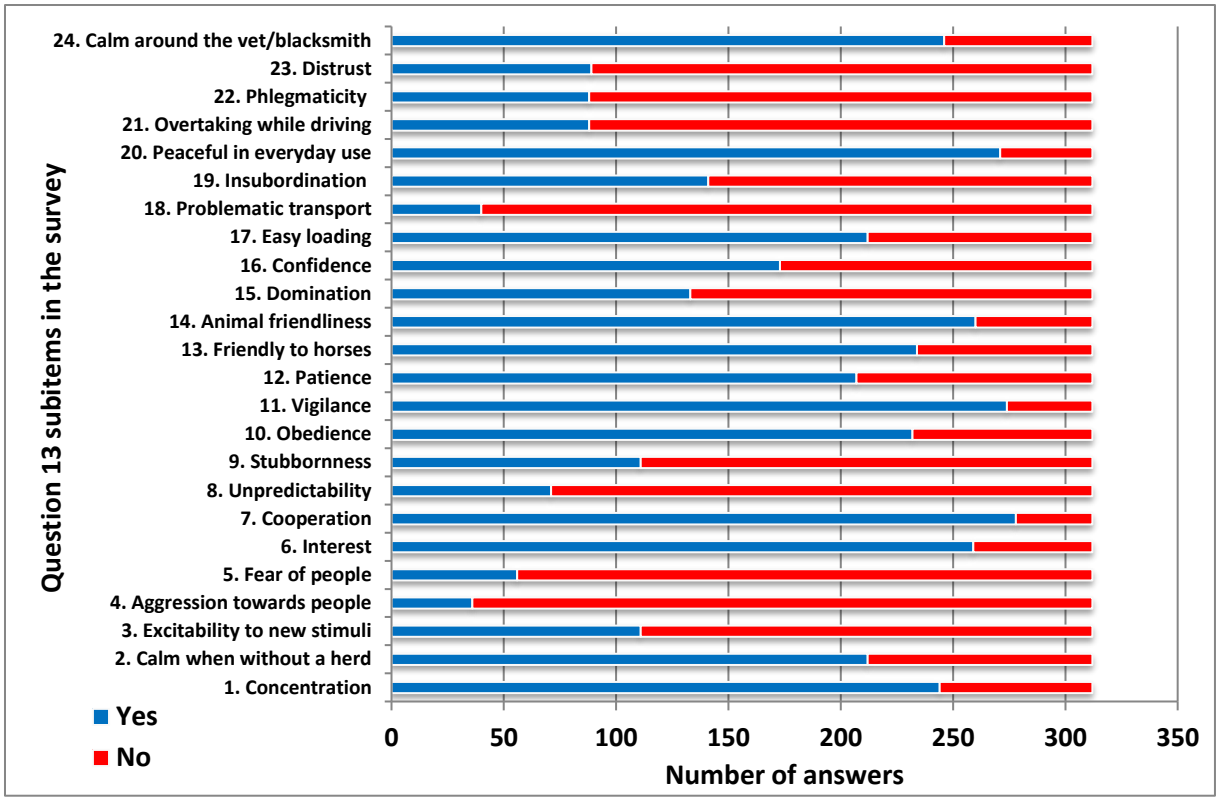

Figure 5. Structure of answers to questions about horse behavior included in point 12 of the survey

Most of the horses described in question 12 had features typical of the species (Figure 5), they were focused on the task at hand, and when left without other herd members, they were usually calm. A significant number of them did not show excitability to new stimuli, objects or noises. The horses did not show any aggression or fear towards people. 83% of horses were interested in or approached new objects. Animals willingly cooperated with humans and were usually not unpredictable. In the case of stubbornness, as many as 111 horses (35.2%) tended to resist commands. Due to the fact that horses willingly cooperated with humans, they were also mostly obedient to him. The described horses were alert to their surroundings and patient (67%). The horses were friendly towards other horses, but slightly more friendly towards other animal species. Responses regarding dominance in the pack and confidence in the new environment/surroundings were distributed approximately similarly (Figure 5). The proportion of responses shows that the horses felt more confident in the new environment and were usually less dominant. In the case of easy loading/unloading to/from the trailer, 100 horses had problems (31.7%), but only 40 horses (12.7%) had problems during transport or during travel. Insubordination achieved similar values for "yes" and "no" responses (Figure 5). Most animals were calm when cleaning, saddling or mounting. In the case of questions about overtaking while driving hand-in-hand, phlegmaticity and distrust, the results were similar (Figure 5). The horses did not tend to overtake the leader, nor were they phlegmatic or distrustful. Also, procedures performed by outsiders, especially by a veterinarian or a blacksmith, largely took place in a calm atmosphere (Figure 5).

Analysis of the influence of sex and age group on the tendency to certain horse behaviors
For most of the subitems from question 12, the effect of sex turned out to be insignificant (P≥0.05). The influence of sex on such behaviors as: friendliness towards other horses, insubordination, phlegmaticity and calm behavior during activities related to cleaning, saddling and mounting, was highly significant (P<0.01), only in the case of dominance it was significant (P<0.05). Figure 6 shows the relationship between the above-mentioned behaviors and the sex of the horses.

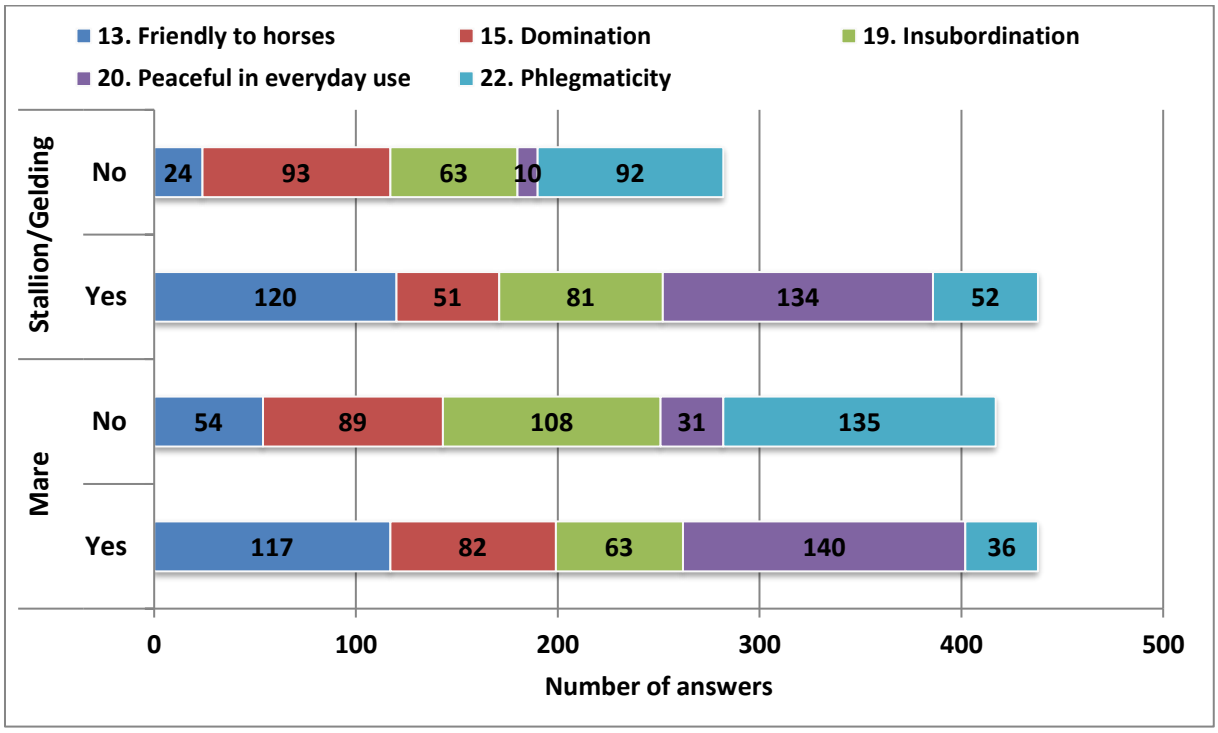

Figure 6. The influence of horse sex on the predispositions to certain behaviors

Analyzing the results from Figure 6, it can be concluded that hostile behavior towards other horses was more common in mares than in stallions/geldings ($\chi 2 = 9.33$; $P = 0.0023$). For dominance, there were also more affirmative answers in mares than in geldings ($\chi 2 = 5.05$; $P = 0.0248$). When it comes to calm behavior when handling a horse, here also more negative answers were recorded in mares than in stallions/geldings ($\chi 2 = 8.64$; $P=0.0033$). However, stallions/geldings were more likely to show signs of insubordination ($\chi 2=11.87$; $P=0.0006$) and were phlegmatic or unmotivated to work ($\chi 2=8.80$; $P=0.0030$), as indicated by a greater number of affirmative answers in this group compared to mares (Figure 6).

Also, most of the subitems of question 12 did not show a significant relationship with the age group (P≥0.05). Figure 7 shows the results regarding the influence of age group on predispositions to certain horse behaviors. The influence of the horse's age group on such behaviors as excitability to new stimuli, friendliness to other horses, overtaking when led by hand and distrust was significant (P<0.05).

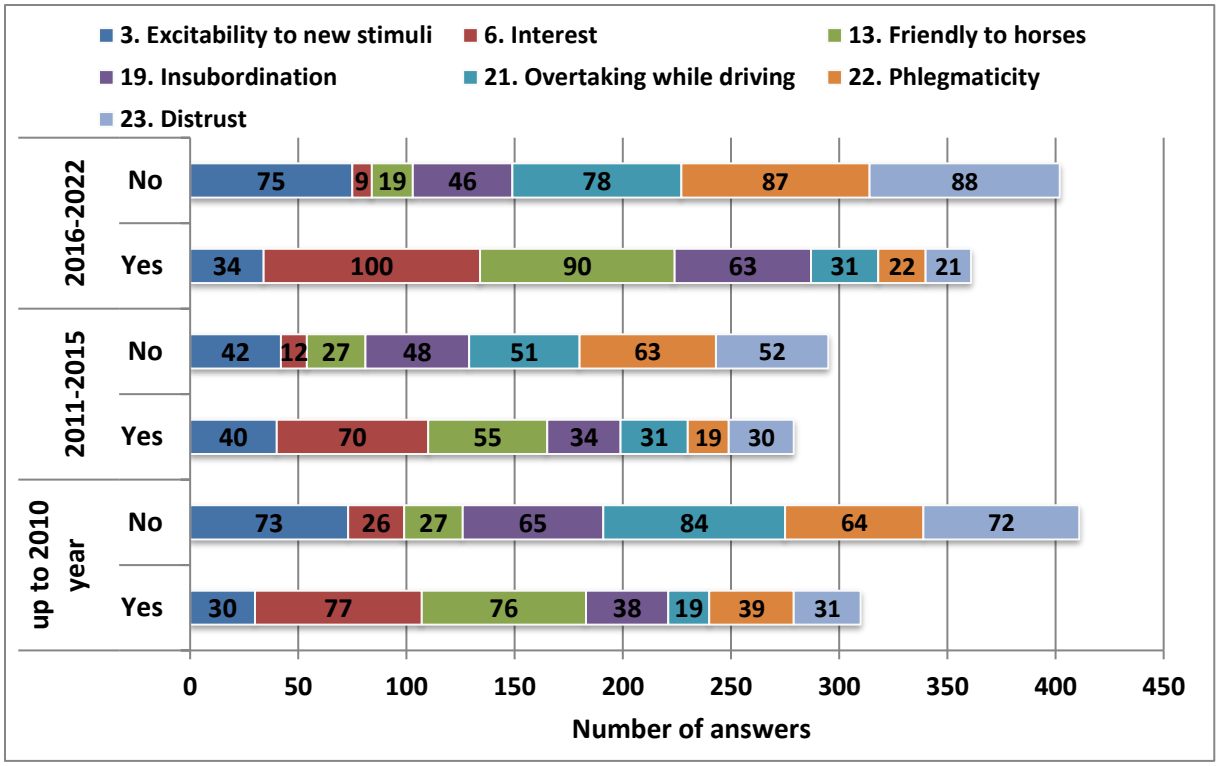

Figure 7. The influence of the horse's age group on the predispositions to certain behaviors

From Figure 7, it can be concluded that middle-aged horses (born 2011-2015) were more excitable to new stimuli ($\chi 2 = 9.04$; $P = 0.0109$). For this age group, affirmative and negative responses were almost balanced. This may mean that horses of this age work more and are therefore more exposed to new stressors. At the same time, this age group was less friendly towards other horses ($\chi 2 = 6.18$; $P = 0.0454$), which may probably be related to the workload of these animals. However, the youngest age group (horses born after 2016) was characterized by less excitability to new stimuli and greater trust in other members of their own species. However, older horses born before 2010 and middle-aged horses born between 2011 and 2015 were more distrustful ($\chi 2=7.36$; $P=0.0252$). In these horses, it may probably be related to their experience, especially contacts with people, which may not have been positive. On the other hand, perhaps these horses were exposed to isolation from their companions due to the fact that they were rarely allowed to run with other horses. Such situations always cause fights, and owners of horses, especially sport horses, are reluctant to let them out with other horses, fearing injury to their horse. However, horses from the 2011-2015 age group and the youngest, born in 2016-2022, showed a greater tendency to overtake the person leading them ($\chi 2 = 8.64$; $P = 0.0133$) (Figure 7).

The analysis of the influence of the horse's age group (Figure 7) on such behaviors as insubordination, phlegmaticity and interest in new objects showed its high significance ($P<0.01$). Older horses born before 2010 and horses born 2011-2015 showed less interest in new objects and in approaching them ($\chi 2 = 11.53$; $P = 0.0031$). The oldest horses were also less motivated to work and more phlegmatic ($\chi 2 = 9.30$; $P = 0.0096$), which could be related to work fatigue, but also to the ability to recognize the rider's level of training and adapt their own commitment to these skills. The youngest horses, born between 2016 and 2022, who had not yet had many negative experiences and who had not yet developed bad habits, were the most interested in new objects and the least phlegmatic or unmotivated to work. This age group was also the most insubordinate ($\chi 2=10.23$; $P=0.0060$), although horses from other groups also exhibited this behavior, but to a lesser extent. In old horses born before 2010 and in middle-aged

horses born 2011-2015, insubordination consisting in grabbing various objects with their mouths could be related to boredom or to an attempt to relieve stress after work (Figure 7).

Analysis of the influence of the breed group and the number of people using the horse on the tendency to certain horse behaviors

The effect of breed group on most subitems of question 12 in survey was not significant ($P \geq 0.05$). However, for such horse behaviors as self-confidence in a new environment, phlegmaticity/lack of motivation and insubordination, it was significant ($P < 0.05$). Figures 8-10 present the results regarding the influence of racial group on the tendency to be phlegmatic (Figure 8), show self-confidence in a new environment (Figure 9), and be insubordinate (Figure 10).

The greatest phlegmaticity and lack of motivation were exhibited by noble/sports horses ($\chi 2 = 14.2$; $P = 0.0145$), which may result from overloading their bodies with training and competitions. Or perhaps it is also a way of defending against the poor level of training of the rider or problems resulting from poor communication between the rider and the horse (authors' own observations, McKenzie et al., 2021). Primitive horses were also characterized by relatively greater phlegmaticity and lack of motivation (Figure 8). In this case, it can be assumed that Polish Koniks and Hutsul horses, as naturally more resourceful and intelligent breeds, quickly learn how to avoid excess work and use the acquired knowledge in contacts with humans (authors' own observations, Burattini et al., 2020, Topczewska et al., 2021).

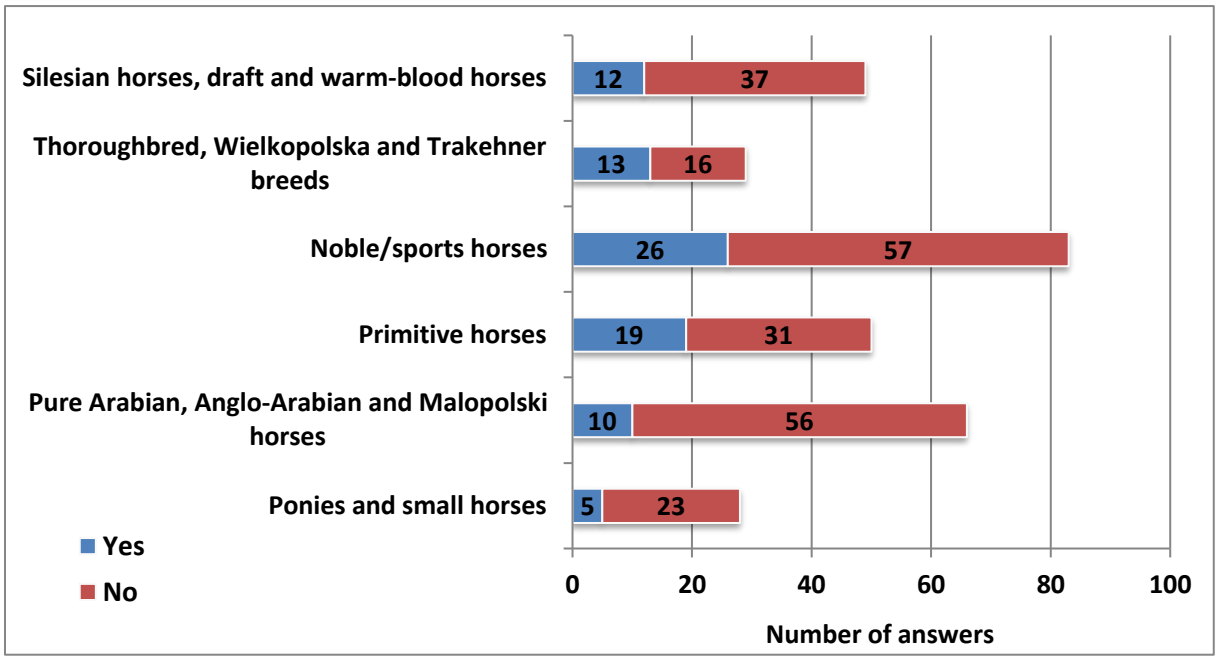

Figure 8. The influence of the horse's breed group on the predisposition to phlegmaticity

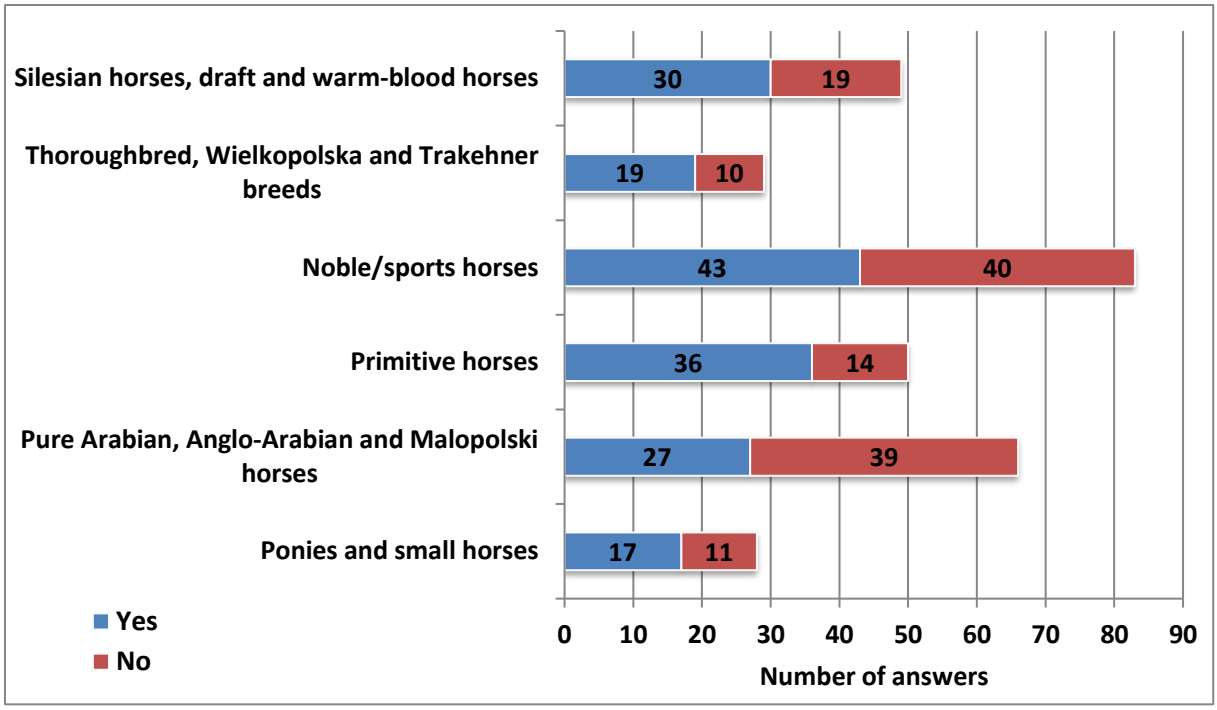

Figure 9. The influence of the horse's breed group on the predisposition to be confident in a new environment

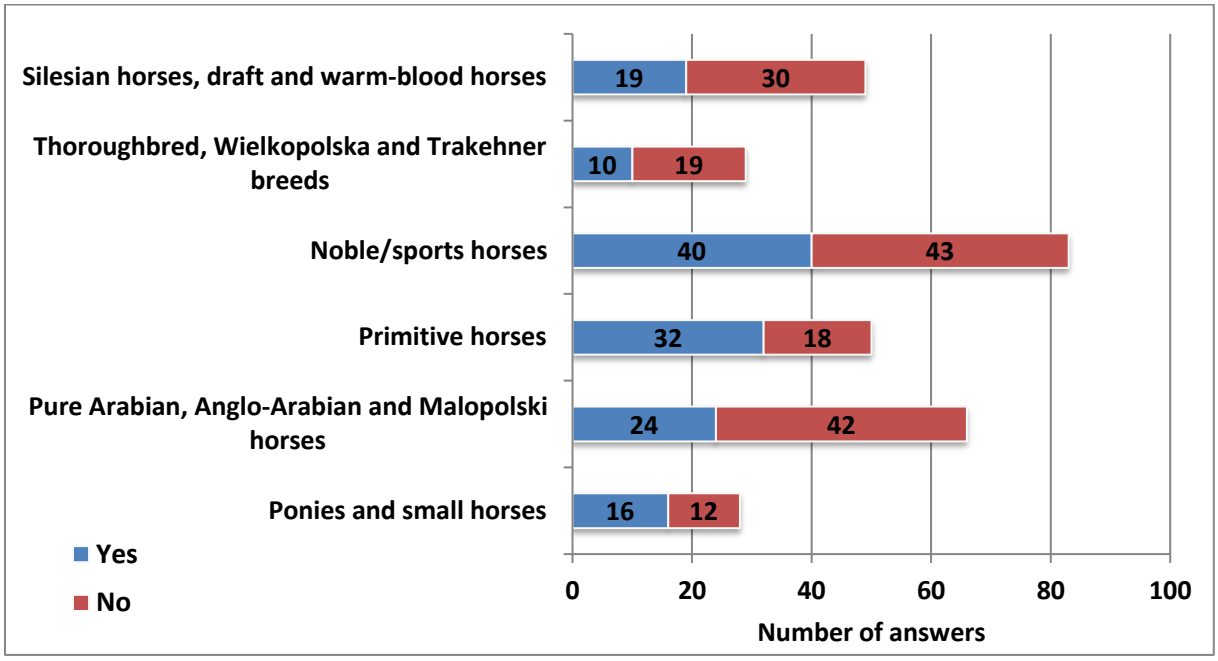

Figure 10. The influence of the horse's breed group on the predisposition to insubordination

The greatest insubordination was demonstrated by the group of ponies and small horses as well as by primitive horses (Hutsul horses and Polish Koniks) ($\chi 2 = 13.11$; $P = 0.0224$), which at the same time showed greater confidence in the new environment ($\chi 2 = 13.76$; $P = 0$, 0172). The least self-confident and timid in the new environment were pure-bred Arabian, Anglo-Arabian and Malopolski horses, as well as noble/sports horses, but also, to a slightly lesser extent, Silesian, draft and warm-blood horses (Figure 9). This second breed group was also slightly less likely to be insubordination, although in this case the responses were almost in balance (Figure 10).

The impact of the number of people using the horse turned out to be insignificant (P≥0.05) for most of the subitems from question 12. The impact of this factor on the excitability of horses was significant (P<0.05), while in the case of interest and confidence it was close to significant, therefore these two behaviors are also included in Figure 11.

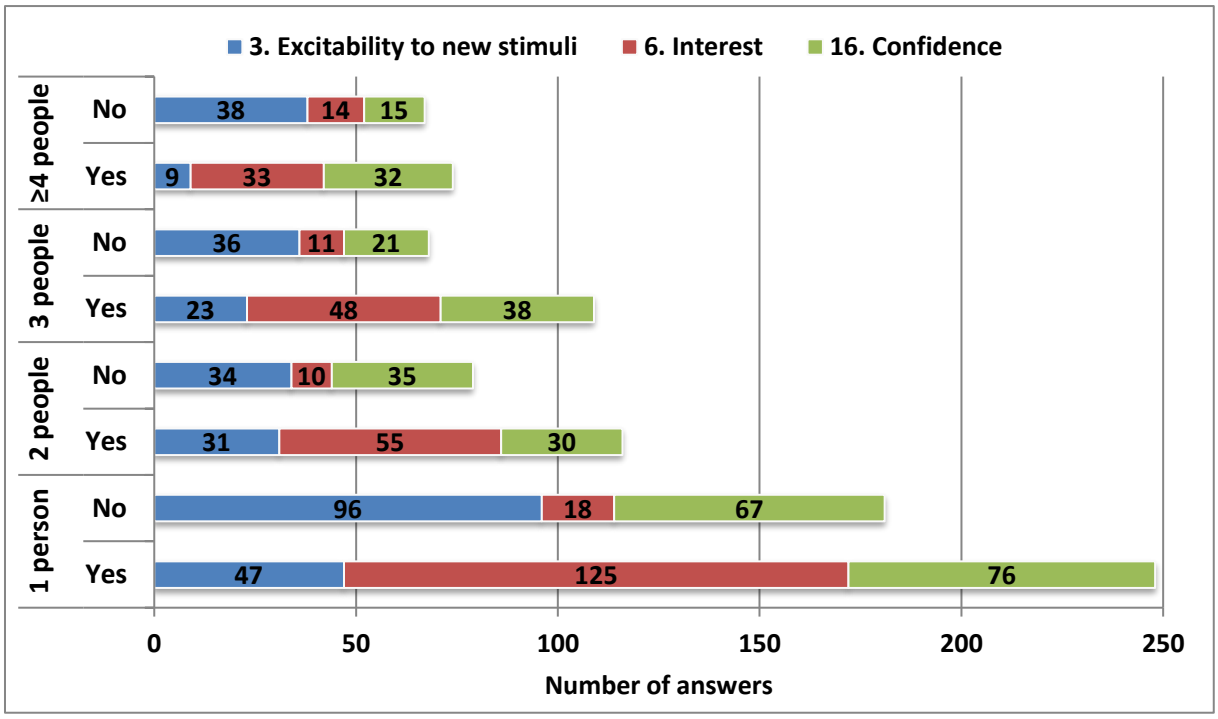

Figure 11. The influence of the number of people using the horse on the predispositions to certain behaviors

Analyzing Figure 11, it can be concluded that most excitable horses were handled by one, two or three people ($\chi 2 = 10.49$; $P = 0.0149$). Horses that had contact with more people were less sensitive to new stimuli. Probably a larger number of people around the horse causes it to become "desensitized" to new stimuli faster. Answers to questions about the horse's interest in new objects ($\chi 2=7.69$; $P=0.0528$) and confidence in a new environment ($\chi 2=7.51$; $P=0.0573$) were non-significant, but their level of significance approached the borderline. The answers to these two questions indicate that the groups the least interested in new items were first the horses handled by one person, next those handled by 4 or more people (Figure 11). In the latter group, similarly to excitability, a large number of new stimuli (objects) brought by a larger number of attendants could have caused the horse to get used to constant changes. Horses handled by two people also showed less confidence in the new environment than those handled by one person. In the case of the horse's confidence in a new environment, the proportion of responses in the group of horses handled by two people was reversed and there were more unsure than confident horses (35 to 30) (Figure 11). This was probably due to the fact that sport horses are usually handled by one or two people and are more excitable and less confident in new environments, as shown in these studies (Figures 8–9).

Discussion

Demographic analysis of horse users and their horses

Horse users were usually young or middle-aged people (18-30 years old) with average riding skills and striving to improve their sports qualifications. Owners and riders dominated among the users, with breeders being less numerous. The qualifications of "Horse Riding Instructor,

Sports Instructor, Class I, II Trainer or Lecturer" were most often held by middle-aged people (36-41 years old). Similar results were obtained by Suwała et al. (2016), who found that the largest group of horse users were respondents aged 20-50 with extensive or less experience in working with horses. The largest number of participants were recreational riders, horse owners, horse riding instructors and sports riders. A similar age structure of respondents and their riding skills were found in extensive international research by McKenzie et al. (2021). Most of the horses in this study were used recreationally. Horses used for sports took part in show jumping or dressage, and to a lesser extent in Eventing and long-distance rallies. Similar results were obtained by Suwała et al. (2016). Differently, in the study by McKenzie et al. (2021), the most frequently practiced equestrian discipline was dressage, followed by recreational riding, and then steeple chase, Eventing and show jumping.

In the presented research, the largest group were mares, followed by geldings, and the smallest group were stallions. The majority of geldings were the oldest, born before 2010, while the mares were dominated by the youngest, born between 2016 and 2022. Similar structure regarding the sex of horses was obtained by Burattini et al. (2020), while in the study by McKenzie et al. (2021) geldings dominated mares and they were on average just over 11 years old. Similarly, in the study by Romness et al. (2020), more than half of the horses examined were geldings and only 38% were mares, while less than 1% in these studies were male stallions and foals and less than 2% were female foals. Also in the study by Hemsworth et al. (2021), there were more geldings than mares, and the fewest stallions (only 5), and horses aged 5 to 20 years predominated.

Dai et al. (2021) examined the risk factors associated with problems in the behavior of horses during transport and found that activities related to loading/unloading the horse and the transport itself always generate problems and may be dangerous for both horses and staff. The present study also found horses causing problems during loading/unloading and transport, but the dependencies of these two aspects of horse behavior on any of the factors examined were not significant. However, it would be necessary to introduce, to a greater extent, illustrative training on how to accustom the horse to loading and transport calmly and stress-freely, because in this case it is also possible to act without conflict and violence.

Graf et al. (2013) examined the importance of horse personality traits for breeders and riders, concluding that the most important element of the breeding goal is to improve the character and temperament of the horse and its willingness to work. However, in recreational horses, respondents paid more attention to sensitivity, intelligence, courage and willingness to work, while in sports horses they paid more attention to nervousness, behavior in the box, reaction to the actions of a blacksmith or a veterinarian, as well as behavior towards other horses. In both cases, behavior during transport was also important for respondents. In this study, most of the behaviors mentioned in the cited work were not dependent on the factors examined, such as the age, sex and breed of the horse and the number of people caring for the horse. However, phlegmaticity, i.e. lack of willingness to work, depended on the sex and breed of the horse. Also, courage, i.e. confidence in a new environment in these studies, was related to the age of the horse, its breed and the number of people in its environment.

Analysis of the influence of sex and age group on predispositions to certain behaviors in horses

The results of the conducted research indicate that mares were more aggressive towards other horses than geldings/stallions and showed dominance more often. This behavior may have had its origins in the mares' natural role of raising offspring and maintaining order in the herd, or it may have been related to their estrous cycle. Mares were also more likely to show anxiety when grooming, saddling and mounting, compared to geldings/stallions. In turn, stallions/geldings were more insubordinate than mares, but also phlegmatic or unmotivated. However, middle-

aged horses were more excitable to new stimuli, and the youngest horses were most interested in new objects and insubordinate. Both age groups had also a predisposition to overtaking the person leading them. Middle-aged and older horses were less friendly towards other horses, more phlegmatic and distrustful. McKenzie et al. (2021) showed a significant effect of the horse's sex and age on its willingness to respond to the rider's commands and to respond to rein pressure during changes in walking speed. In turn, Burattini et al. (2020) found a significant impact of the horse's sex and the age at which the horse was trained to work under saddle on such traits as boldness and independence. These authors found that older horses were more adventurous than young ones, and horses that had been trained to work under saddle later were less bold and independent than those who started working under saddle at a young age.

Analysis of the influence of the breed group and the number of people using the horse on the predisposition to certain horse behaviors

The analysis of the influence of the breed group showed that the most insubordinate among them were ponies and small horses as well as primitive horses (Hutsul horses and Polish Koniks), which at the same time showed greater confidence in the new environment. The least self-confident breed groups in the new environment were horses of noble breeds (including pure-bred Arabian horses, Anglo-Arabian and Malopolski horses) and sports horses, but also, to a slightly lesser extent, Silesian, draft and warm-blood horses. This second breed group was also slightly less likely to be insubordinate, although in this case the responses were almost in balance. Romness et al. (2020), examining various horse breeds in Australia, found that warm-blood horses were less prone to rearing during various activities compared to crossbreeds and jumping horses. However, horses that move with five gaits (e.g. Icelandic ponies) were less prone to kicking. In turn, Burattini et al. (2020), who also studied different horse breeds in Australia, found that Australian riding horses, draft horses and ponies were more adventurous and independent than crossbreeds trained to work under saddle at an older age, while Thoroughbreds were less independent than crossbreeds. McKenzie et al. (2021) showed a significant impact of the horse's breed on its willingness to respond to the rider's commands and to respond to aids. When changing gait to a higher, American riding horses responded the worst to aids. Otherwise, apart from American riding horses, changing to a lower gait was most difficult to enforce in draft horses, Iberian breeds, ponies, warm-bloods and the Quarter breed. In turn, draft horses responded most difficultly to aids (McKenzie et al., 2021). Also Lloyd et al. (2008) examined differences between horse breeds in the UK related to behaviors such as dominance, fearfulness, tendency to get excited, tendency to defend, social behavior and curiosity and found that most breeds showed high fearfulness and tendency to get excited. The next features were social behavior and curiosity, and finally dominance and the desire to defend. These authors found that Thoroughbred horses were characterized by the highest levels of dominance, timidity, excitement, curiosity and social behavior. In contrast, Irish draft horses had low levels of dominance, excitement, curiosity and social behavior. The results obtained by Lloyd et al. (2008) are somewhat similar to those obtained in the presented study, where pure breeds (pure-bred Arabians and Anglo-Arabians) were also less confident in the new environment. However, in these studies, Silesian, draft and warm-blood horses, which have a more balanced character and calm temperament, showed greater confidence in the new environment. Topczewska et al. (2021) showed that Hutsul horses reacted with stress to repeated starts in competitions including: fitness test and the Hutsul track, with stronger reactions from horses that had already taken part in these competitions several times. In this research it was found that primitive horses, i.e. Hutsuls, can be phlegmatic and unmotivated to work, which may, to some extent, confirm the inability to get used to constant participation in competitions, because they are not usually intended for sports use.

In the presented research, the most excitable and interested in new objects were horses handled by one person, while the least confident were those handled by one or two people. A larger number of people handling the horse had a positive impact on the above-mentioned behaviors, because horses handled by 4 or more people were the least excitable and the most confident in a new environment and interested in new objects in the environment. Unfortunately, as showed by Wolińska et al. (2012), such horses often show negative reactions or aggression, such as attempts to kick or bite, during preparation for riding, mounting and riding itself. However, these studies did not demonstrate significant relationships between aggressive behavior towards humans and any of the factors examined. However, it was shown that the horse's calm behavior during grooming, saddling and mounting depended on its sex.

To sum up, it should be stated that sex, age, breed and the number of people using the horse had an impact on some of the examined horse behaviors, which was consistent with the research results of other authors. The horse's sex determined dominance in the herd, friendly behavior towards other horses, calm behavior when grooming, saddling and mounting, as well as insubordination or phlegmaticity. To some extent, the same features were repeated in the analysis of the influence of age on predispositions to certain behaviors. Age also influenced the horse's excitability or interest in new objects, but also such features as distrust and the tendency to overtake when led in hand. The influence of breed was important for the previously mentioned behaviors, such as insubordination and phlegmaticity, and for confidence in a new environment. However, the number of people taking care of the horse had a significant impact on the horse's excitability. The influence of this factor was also close to significance for interest in new objects and for confidence in a new environment.

However, there was no significant impact of the examined factors on such behaviors as aggression or fear of people, unpredictability, stubbornness or patience towards various stimuli. Although the analysis of all surveys showed that about 11% of the horses tested showed aggression towards humans, about 18% of them were afraid of people, 22.5% were unpredictable, and over 35% of the horses tested showed a tendency to resist commands and about 33% of them were not patient. The use of such horses may cause problems and lead to serious injuries, especially if they are school horses from recreational stables and the people in contact with them are less experienced and familiar with horses. On the other hand, such behavior of the examined horses may suggest that they had a lot of negative experiences with people. Therefore, more emphasis should be placed on training horse users/riding instructors regarding the basic needs of horses in terms of their well-being and the proper behavior and conduct of people when handling these animals.

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APPENDIX – Survey regarding tendencies towards various horse behaviors

1. I am:

a. Owner
b. Breeder
c. Rider
d. Trainer/instructor
e. Groom
f. Other: who?

2. Your age:

a. under 18 years old
b. 18 – 23 years old
c. 24 – 29 years old
d. 30 – 35 years old
e. 36 – 41 years old
f. 42 years and older

3. Riding skill level:

a. beginner – lunge, walk, trot/I have a badge "I ride horses"

b. medium - I ride freely in three paces/recreation/I am practicing sports

c. advanced – I ride sports, I take part in competitions

d. I have BOJ/SOJ/ZOJ

e. I have the qualifications of a Horse Riding/Sport Instructor or a Class II/Class Trainer I/Lecturers

f. don't ride horses

4. Breed/breed type of horse (mix of which breeds, if its parents are known).

5. Date of birth of the horse.

6. Sex:

a. Stallion
b. Mare
c. Gelding

7. How is the horse used?

a. sports
b. recreationally
c. w hippotherapy
d. not working/not used
e. other: how?

8. If the horse is used for sports, in what discipline?

a. dressage
b. show jumping
c. horse racing
d. eventing
e. driving
f. vaulting
g. long-distance rallies
h. western riding
i. other: what?

9. If the horse is used recreationally, how?

a. lunge riding
b. flat riding
c. show jumping
d. dressage
e. field trips
f. all-around/all of the above
g. other: what?

10. If the horse is not working/not being used, why?

a. due to age (young/old)
b. health problems
c. behavioral problems
d. is a breeding horse
e. other: what?

11. How many people use/operate the horse?

1 person	2 people	3 people	4 people
5 people	6 people	more people (how many?)	

12. Does the horse tend to...

		Answer	
1	… being focused on the task at hand?	YES	NO
2	…being calm if left alone, away from the herd?	YES	NO
3	…being excitable/scared or reacting too quickly to new stimuli/objects/noises etc.?	YES	NO
4	…being aggressive towards people?	YES	NO
5	…being fearful of people?	YES	NO
6	… being interested in or approaching new objects?	YES	NO
7	… willingly cooperate with the caregiver when being served?	YES	NO
8	…being unpredictable?	YES	NO
9	…being stubborn, resisting commands?	YES	NO
10	…being obedient/submissive?	YES	NO
11	…being attentive/vigilant to your surroundings?	YES	NO
12	…being patient with different stimuli?	YES	NO
13	… being friendly towards other horses?	YES	NO
14	…being friendly towards other animal species?	YES	NO
15	…being dominant in the herd?	YES	NO
16	… being confident in a new environment/surroundings?	YES	NO
17	... easy loading/unloading to/from the trailer?	YES	NO
18	… being problematic in transport (while traveling)?	YES	NO
19	…being insubordinate, grabbing things in his mouth?	YES	NO
20	…being calm while cleaning/saddling/mounting?	YES	NO
21	... overtaking while driving in hand?	YES	NO
22	…being phlegmatic/unmotivated to work?	YES	NO
23	…being distrustful?	YES	NO
24	…being calm during veterinarian/farrier visits and treatments?	YES	NO