



# How group turnout in grass pasture affects horse activity and behaviour

- in comparison with individual stables

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Agricultural Science programme - Animal Sciences  
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# How group turnout in grass pasture affects horse activity and behaviour – in comparison with individual stables

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## Abstract

Equine management systems significantly differ from those of other livestock, as they have a more anthropological and individualistic approach. Horses require full physical contact with conspecifics for good welfare, yet conventionally, they are housed alone in stalls where the opportunity for social contact is often limited to visual interactions only. When given the opportunity, horses will graze and travel great distances throughout the day. However, in many housing systems, they are fed high-energy concentrates and have little to no time on a pasture or paddock where they can move freely. These management factors can raise various animal welfare concerns, emphasizing the need for more knowledge on horse behavior and a review of current practices to improve management systems and ensure better animal welfare.

The aim of this study was to measure how access to a pasture would affect horses' activity and behavior compared to when they were housed in individual stalls, and whether turnout in a pasture would reduce behaviors indicative of reduced welfare. The activity of twenty individual horses was tracked using an activity tracker **for 24 hours** when they were stabled in single stalls and again for 24 hours when they were turned out in a pasture in a group. During both treatments, their behavior was assessed **for 15 minutes** based on an ethogram of discomfort behaviors. The findings indicated that after only **three weeks**, a short **two to four-hour** period in a pasture increased the horses' daily total distance moved by an average of 89% (Paired t-test:  $P < 0.001$ ) and slightly reduced stress-related behaviors in most horses, although not statistically significantly (Paired t-test:  $P = 0.188$ ). The results suggest that turnout in a pasture with conspecifics has a positive impact on horse welfare and should be encouraged in management practices.

*Keywords: Horse management, turnout, group turnout, horse behaviour, horse welfare, pasture, natural behaviour, grazing*

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# 1. Introduction

Horses have been one of the most important companions for humans throughout history, and their behavior has been observed and studied for decades. There is considerable variation in equine management systems, and factors such as culture, economy, education, and the role of the animal can influence the level of effort put into their care. While we continue to learn more about equine behavior and welfare, various guidelines are being published with the aim of educating horse owners and enhancing animal welfare. However, changes in husbandry practices occur slowly, and many ancient practices are still in effect today (Noble, 2023). Often, horses are turned out alone or in small groups for part of the day, but in most management systems worldwide, they still spend the majority of their day in individual stalls (Lesimple, 2019). Reasons for horse owners choosing to limit access to free outdoor movement and favor individual housing can include concerns about injury risk, adverse weather conditions, limited space, or simply viewing it as a more convenient option for management. Individual stalls might appear to be safe and comfortable spaces that meet the basic resource requirements for the animal. However, in reality, they can compromise horse welfare by restricting movement and opportunities for socialization. Despite the increased knowledge in equine behavior and welfare, many owners remain apprehensive about the associated risks and are hesitant to consider alternative husbandry practices (Schröer, 2010).

The fundamental needs of horses include social contact, regular access to roughage, and the opportunity for free movement. It is essential to fulfill these needs to ensure good mental and physical health (Krueger, 2021). When these basic needs are not met, the quality of life decreases, and confined animals may have no outlet for their energy. This can lead to the development of abnormal behaviors not observed in feral or wild horses (Sarrafchi & Blokhuis, 2014), such as weaving, pawing, or cribbing, as they attempt to express natural behaviors and alleviate frustration and stress (Thomas, 2004; Sarrafchi & Blokhuis, 2014). Additionally, it's worth noting that between 31-56% of leisure horses are obese (Furtado, 2020), which could be attributed to overfeeding high-energy feeds and low activity levels.

The research aimed to observe how turnout in a grass pasture in a group would, in the short term, impact horse behavior and welfare, as well as whether it would increase horse activity. Given that research by Ruet et al. (2020) had concluded that pasture access improved the welfare of horses, the hypothesis for this study was a

similar result—reduced negative behaviors. It was also anticipated that turnout would significantly increase the horses' activity.



## 2. Background

### 2.1 Social behaviour

Horses are naturally highly social animals that seek safety within a herd (Cameron, 2021). Allowing them to interact in a group rather than keeping them individually offers several advantages, such as improved social skills, reduced aggressive behaviors, and lower reactivity levels (Hartmann, 2012). Domestication has not altered their natural need for social interactions, including proximity to other horses and mutual grooming (Borda, 2023). However, the modern conventional practice of housing horses in single stalls restricts their ability to express herd behaviors. Full physical contact also appears to be essential for horses to form associative relationships (Christensen, 2002), a condition only met by 9.8% of stabled horses in Europe (Dalla Costa, 2017). One behavior that requires full physical contact is allogrooming, which has a calming and stress-reducing effect (Dierendonck, 2006). Stables with individual stalls, particularly those with solid walls separating horses, hinder such social interactions and create a semi-isolated environment, which decreases equine welfare (Yarnell, 2015). Horses housed singly are more likely to exhibit stereotypic behaviors (Heleski, 2002) compared to those in group settings, potentially due to increased stress and frustration within the management system (McGreevy, 1995). Isolated horses also display higher fecal corticosterone levels, which correlate with the intensity of isolation, indicating elevated stress levels (Yarnell, 2015).

Horses living in groups are easier to train and exhibit more positive behaviors compared to single-housed horses, who display a higher frequency of aggression toward trainers (Søndergaard, 2004; Yarnell, 2015) and other horses (Christensen, 2002). Given the choice, horses prefer to spend more time with a group than alone (Lee, 2011). When individually stabled, horses may experience a decline in their social skills. Additionally, introductions to new groups can temporarily elevate cortisol levels. It is also worth noting that the positive effects of turnout may not be sustained in the long term if horses return to solitary stabling (Ruet, 2020). Therefore, maintaining the same management system over an extended period allows each animal to adjust and benefit from it.

## 2.2 Free movement

Movement is a crucial aspect of a horse's life, and they should be kept in systems that encourage as much natural movement as possible. Their bodies are adapted for continuous motion (Correa, 2020), and in the wild, horses can roam across areas as large as 78 km<sup>2</sup> (Kelemen, 2021) and cover distances between 8.1-28.3 km per day (Hampson, 2010). In captivity, horses may spend more than 20 hours per day in stalls, with limited opportunities for movement (Lesimple, 2019). Turnout provides horses with access to free movement, which not only fulfills their behavioral need for motion but also aids in weight control and is crucial for the skeletal development of young horses (Bell, 2001). Additionally, turnout can help manage arthritis in older horses (Malone, 2002), and longer access to turnout reduces the incidence of soft tissue injuries (Reilly, 2021). Horses are naturally motivated to exercise voluntarily in a paddock rather than staying in a stall or walking on a treadmill, and they spend even more time outside if they have been deprived of exercise for as little as two days (Lee, 2011). After being turned out, horses have higher oxytocin levels and exhibit fewer stereotypical behaviors (Lesimple, 2020). Being out on a pasture also provides the animals with plenty of clean air, supporting good respiratory health. In contrast, horses in stables with individual stalls have been observed to have the highest prevalence of airborne microorganisms, which can pose health risks to both animals and humans (Wolny-Koładka, 2018). Being turned out therefore offers various health benefits for the animals.

## 2.3 Foraging

Horses are physiologically adapted to consuming small portions of low-energy, fiber-rich feeds throughout the day, often grazing for up to 16-18 hours daily (Cooper, 2005). In contrast, confined horses typically spend only around 15% of their time feeding (Correa, 2020) and are often provided with high-energy concentrates (O'Neill, 2010). Field turnout enables horses to spend more time engaged in eating, and from a management perspective, this can be more convenient than feeding them more frequently. When horses have the opportunity to forage on grass, they experience a lower prevalence of gastric ulcers (Videla, 2009), reduced risk of colic (Hudson, 2001), and a decreased likelihood of constipation (Baumgartner, 2020). Infrequent feeding is a significant factor in the development of stereotypies, and increased feeding time contributes to an improved mood in horses (Rochais, 2018). Horses kept in stables also have a significantly higher occurrence of dental abnormalities compared to pasture-kept horses whose diet consists of a mixture of grasses (Masey O'Neill, 2010).

## 3. Methodology

### 3.1 Equipment

The research was conducted at a riding school in Scotland between March and June 2023. The stable comprised several separate stone buildings, primarily external shed-row stables, with a few internal stables that had stalls ranging from 4.25 m<sup>2</sup> to 11 m<sup>2</sup>. Horses were placed in these stalls according to their size. The stalls featured solid stone walls on each side, allowing horses to see other horses when they extended their heads over the door. Additionally, each stall was equipped with an automatic water trough. The grass pasture where the horses were turned out during the latter part of the study covered just over 4 hectares, as measured using the Google Maps area measuring function. The pasture included a drinking station and four medium and large-sized deciduous trees for shelter. The temperature during the study ranged between 11°C and 20°C.

To track the horses' activity, a Tractive GPS pet tracker DOG 4 (base model TRNJA4) from 2022 was used and attached to a headcollar. This tracker continuously recorded location and activity at 2-3-minute intervals throughout the day, saving the data in the Tractive GPS phone app, version 6.11.0.

The animals' behavior in their stalls was assessed using an ethogram (Table 1), which included a total of 20 different behaviors categorized based on the Equine discomfort ethogram (Torcivia & McDonnell, 2021) and a similar study by Ruet et al. (2020) that measured behavior during turnout.

### 3.2 Animals

The 20 horses used in the study were riding school horses of different breeds, including Welsh ponies, warmbloods, cobs, and similar crosses. Seven of them were horses (over 148 cm tall), while 13 were ponies. Nine were mares, and 11 were geldings. Their estimated ages ranged from 5 to 26 years old, with an average age of about 18 years. Their body condition scores varied between levels 3 and 5 according to the British Horse Society's body condition scoring scale, which ranges from 0 to 5. All of the horses had received training to at least a basic or intermediate

level in dressage and jumping. Their usual workload consisted of maximum of two 30-45-minute easy-level riding lessons per day, with irregular days off at least once a week. They were fed hay or haylage twice per day, the amount based on their body condition.

## 4. Methods

At the study's outset, the horses had been stabled for the past five to six months and were exclusively exercised by riding. If they were not ridden, they were either lunged for ten minutes or left unexercised. An activity tracker was employed to monitor each horse for 24 hours, taking turns during March and April (from the 15th of March to the 14th of April). The activity tracker was attached to a headcollar that the horse wore throughout the entire day it was being tracked. Each horse's behavior was directly observed and recorded once for a 15-minute duration between 12:00 and 13:00 on a typical weekday, with the behaviors documented using an ethogram outlined in Table 1.

Starting from the beginning of May, the horses were turned out onto the grass pasture three times a week in single-sex groups of 10-15 horses. They spent 2-4 hours on pasture every other day between 8:00 and 12:00 in the morning, prior to engaging in any other form of exercise. After one week of turnout, the horses' activity was once again tracked for a 24-hour period in the same sequence as when they were stabled. After three weeks of turnout, their behaviors were reassessed using the same ethogram as before. Apart from turnout, all other management routines remained unchanged, signifying that on certain days, the horses did not engage in any form of exercise besides free movement on the pasture, while on other days, they were ridden or lunged.

Data collection was conducted by a familiar individual who observed the horses' behavior while positioned outside their stalls. The observer was situated close enough to have a full view of the horses' legs and facial expressions, even if they stood at the back of the stall. This proximity allowed the horses to seek contact with the observer, but the observer refrained from initiating direct interaction with the animals themselves (as illustrated in Figure 1). The 15-minute observation period started immediately upon the observer's approach. The behaviours were recorded by tallying continuous actions. For example, if the horse pawed five times without interruption and then shifted their focus to another behaviour, it counted as one instance of pawing. In the second phase, the horses were typically not turned out on the same day they were observed, and their behavior was not observed when they were wearing the headcollar with the tracker.



Figure 1 - Observer's position outside the stall during behavioural observations.

Table 1 – Different discomfort behaviours recorded for the horses, based on the Equine Discomfort Ethogram by Torcivia & McDonnell (2021).

Behaviour:	Description
Abnormal behaviours	<p>Pawing, reaching a forelimb cranially and dragging the hoof along or above the substrate while sweeping caudally, often in rhythmic series representing frustration.</p> <p>Crib-biting, chewing and biting on objects and surfaces such as wood. Wind-sucking, arching neck, contracting muscles and sucking air, releasing a gulping sound.</p>

	<p>Head bobbing, Repetitive nodding of head and neck. Not usually as rhythmic as a stereotype. Often appears to reflect frustration with persistent discomfort.</p> <p>Repetitive mouth movements, such as frequent yawning bursts and smacking and licking lips continuously</p> <p>Circling/stall walking, circling along walls of the stall before settling</p>
Aggressive behaviours	Biting, kicking, nibbling, looking with ears pinned back towards people or animals.
Dull Expression	<p>Less responsive to the environment, often with “zoned out,” worried, or glassy-eyed staring facial expression.</p> <p>Disinterest in food (over 25% of feed left uneaten).</p>
Physical Irritants	<p>Prolonged resting of leg, particularly when eating or standing alert. Leaning on objects.</p> <p>Stretching, raising and pulling neck high extending hindlimbs or curling neck.</p> <p>Autogrooming, nibbling, biting or rubbing an area of the body to another or against an object.</p> <p>Swishing and slapping tail suddenly from side to side or against the perineum.</p> <p>Strong rotational head or body shaking.</p>

Hyper-responsiveness	<p>Alert posture with elevated neck and intense observations of the environment.</p> <p>Hyper-responsiveness may indicate a low tolerance for stimuli, due to an increased stress level associated with discomfort.</p> <p>Guarding, especially cautious movement and retreat from potential disturbance. The horse may stand in the back of the stall or uncharacteristically not approach a person who enters.</p>
Vocalisations	<p>Whining or calling, a long, high-pitched vocalization.</p> <p>Squealing, a short, sharp, high-pitched vocalization.</p>

## 4.1 Data Analysis

Data was compiled in Microsoft Excel version 16.74.

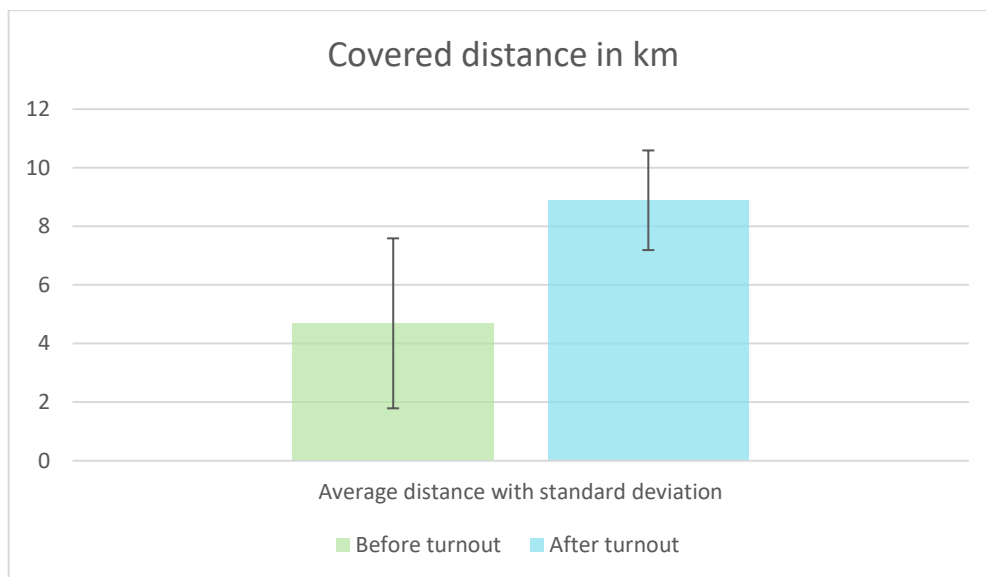
As horses were their own controls their activity and behaviour during the two treatments/parts of the study was compared using a paired t-test in Microsoft Excel 16.74.



## 5. Results

### 5.1 Activity data

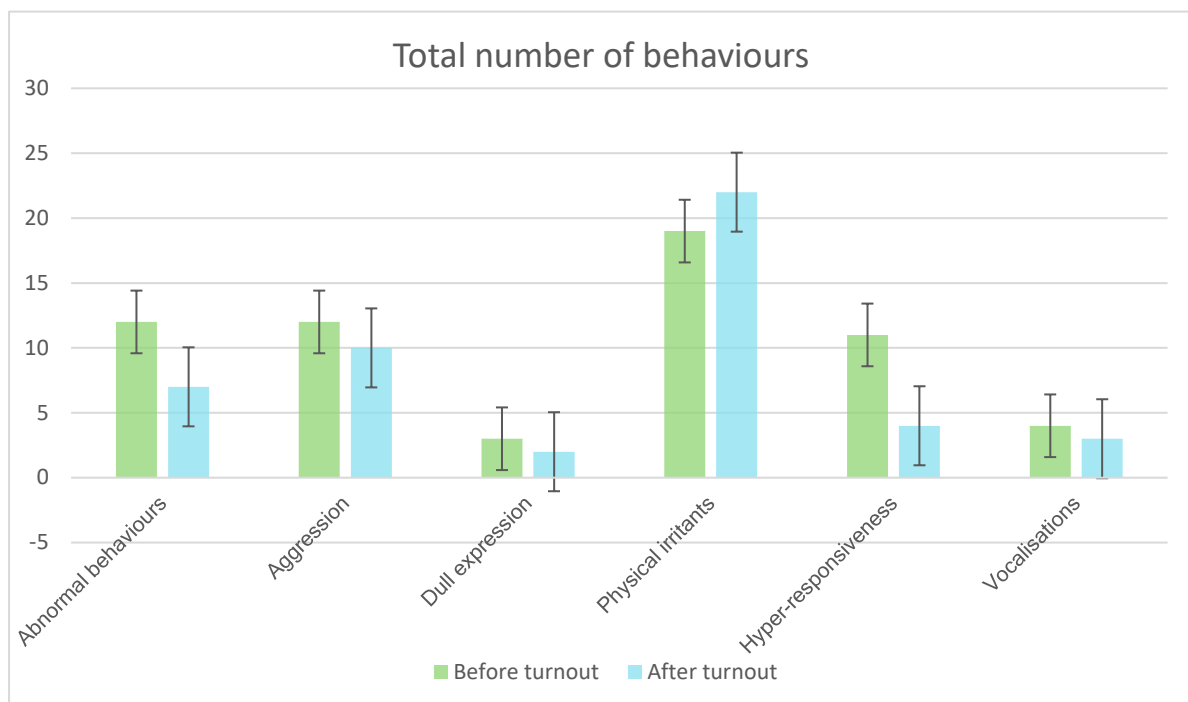
In the first part of the study, when the horses were stabled they moved between 0.1-8.4 km, 4.7 km on average. When turned out they moved between 7-14 km, 8.9 km on average. The results for both groups are visualised in Figure 2. Results of the paired-t test indicated that there is a significant difference ( $p < 0.001$ ) between the data before ( $M = 4.7$ ,  $SD = 2.9$ ) and after turnout ( $M = 8.9$ ,  $SD = 1.7$ ). This indicates that only two to four hours of turnout on the pasture increased the covered distance significantly ( $P < 0.001$ ,  $SD = 3.3$ ,  $T = 5.6746$ ). The biggest increase in covered distance was 11.1 km for horse 7. and the smallest was a decrease of 0.4 km for horse 16. (see appendix 1. for more details). On average their activity increased by 89%.



**Figure 2 - The activity data for both groups.** "Before turnout" bar shows the average distance in kilometers with standard deviation, which the 20 horses moved when they were not turned out and only exercised by riding or lunging. "After turnout" bar shows the average distance for the same group of horses when they were turned out for 2-4 hours in a grass pasture in addition to being exercised by riding or lunging.

## 5.2 Behaviour in the stall

Shortly after the horses started getting turned out, the total number of negative behaviours decreased only slightly. The paired-t test indicated that there is a non-significant, medium difference between before turnout ( $M = 10.2$ ,  $SD = 5.9$ ) and after turnout ( $M = 8$ ,  $SD = 7.5$ ),  $T = 1.5$ ,  $P = 0.189$ . Some horses did not show negative behaviours on either of the observation events, and in one case the horse increased negative behaviours after being turned out. Negative behaviours that remained frequent or increased were mostly discomfort behaviours that can be caused by cutaneous irritation or excitement. Behaviours that are more likely associated with frustration and boredom such as aggression or fearful behaviour decreased. Figure 3. shows the total number of different behaviours the horses expressed during the 300 minutes (20 x 15min) of observations, which are explained in the ethogram in table 1. After three weeks of being turned out the number of discomfort behaviours had decreased by 21.3% , from 59 to 48 total behaviours, but statistically the change is in non-significant with a value  $P > 0.05$ .



**Figure 3 - Number of behaviours.** The figure shows the total number of negative behaviours the horses expressed during the observations. The bar for "before turnout" shows the total number of observed behaviours when the horses were kept in individual stalls and only exercised by riding or lunging. The "after turnout" bar shows the number of behaviours for the same group of 20 horses when they were being turned out for 2-4 hours in addition to being ridden or lunged. The bars have standard deviation.

## 6. Discussion

Turnout facilitates essential physical and mental stimulation, allowing horses to exhibit natural behaviors such as social interactions, grazing, and free movement, all vital for fulfilling their basic needs (Krueger, 2021). Ensuring access to turnout is fundamental for responsible equine care, as it can help prevent health issues and reduce the risk of stress-related behaviors, contributing to a higher quality of life for horses while maintaining their physical and mental well-being. The results of this study indicate that horses are motivated to move freely in a group. Furthermore, it leads us to consider the potential impacts of increased free movement on the horses' rideability or handling, and whether they may exhibit changes in movement patterns over time with regular access to pasture. The controlled experimental design and integration of previous research contributed positively to our research. However, limitations include a small sample size, subjective behavioural observations, inaccuracies in activity tracker data and a relatively short turnout period. Factors affecting our results also include the horses' individual temperament and their previous experiences with turnout. Additionally, the weather and group dynamics could have played a part on their behaviour and activity. These limitations need consideration when interpreting the results and considering future research in the subject, but nonetheless, the study's findings contribute to our understanding of equine management practices and emphasize the importance of providing opportunities for natural behaviors like turnout in promoting horse welfare.

An ethical consideration in this discussion is the importance of prioritizing the physical and psychological well-being of equines in management practices. Equity and fairness regarding access to resources within equestrian establishments must be ensured to meet ethical standards. The study prompts critical reflections on whether all horses, irrespective of their status or purpose, are granted equitable access to welfare-enhancing practices. Furthermore, it challenges the societal perception regarding the need of provision of pasture or paddock access for all horses. Notably, turnout not only fosters equine welfare but also aligns with sustainable management practices. This includes initiatives to minimize environmental impact by reducing resource consumption, effectively managing waste, and conserving natural habitats. By integrating ethical considerations and sustainable practices, equine management

can strive towards a holistic approach that promotes the well-being of horses while preserving the environment.

## 6.1 Activity

The hypothesis of the study was supported, as the results clearly indicate that a short two to four-hour period in a pasture with conspecifics significantly enhances horses' freedom of movement and activity compared to when they are stabled. The horses' voluntary distance covered increased by an average of 4.2 km, rising from 4.7 km to 8.9 km, marking an 89% increase. In a study conducted by Hildebrandt et al. (2020), which employed GPS collars to track horse movement in an open stable system in Germany, their findings revealed an average daily traveled distance of 8.4 km when the horses had pasture access for a comparable duration as in this study. This underscores the importance of recognizing that horses are intrinsically motivated to move freely in addition to their structured exercise routines, a crucial consideration for improved animal welfare management. While it was challenging to confirm whether group turnout had an influence on the results, previous observations (Lee, 2011) suggest that it likely increased the horses' willingness to remain outdoors.

One limitation of the study was the slight inaccuracy in data collected with the activity tracker. In some stalls, the thick stone walls weakened the GPS connection, causing the tracker to record locations with slight errors, by overestimating the covered distance when the horses were confined. However, these inaccuracies did not occur when the horses were on the pasture with a strong signal, and they remained consistent in frequency throughout the entire study period when the horses were stabled. Thus, the results still reflect a reliable difference. Hildebrandt et al. (2020) addressed similar issues by using a special GPS tracker collar, which enabled them to eliminate data collection problems and rectify potential errors by filtering out areas inaccessible to the horses and excluding unrealistically calculated speeds.

## 6.2 Behaviour

The change in horse behavior following turnout was generally positive, although the results did not reach statistical significance, leading us to retain the null hypothesis. Initially, the horses did not display a high frequency of negative behaviors, but after experiencing turnout, they exhibited reduced frustration levels and formed better relationships with humans, displaying decreased aggression and

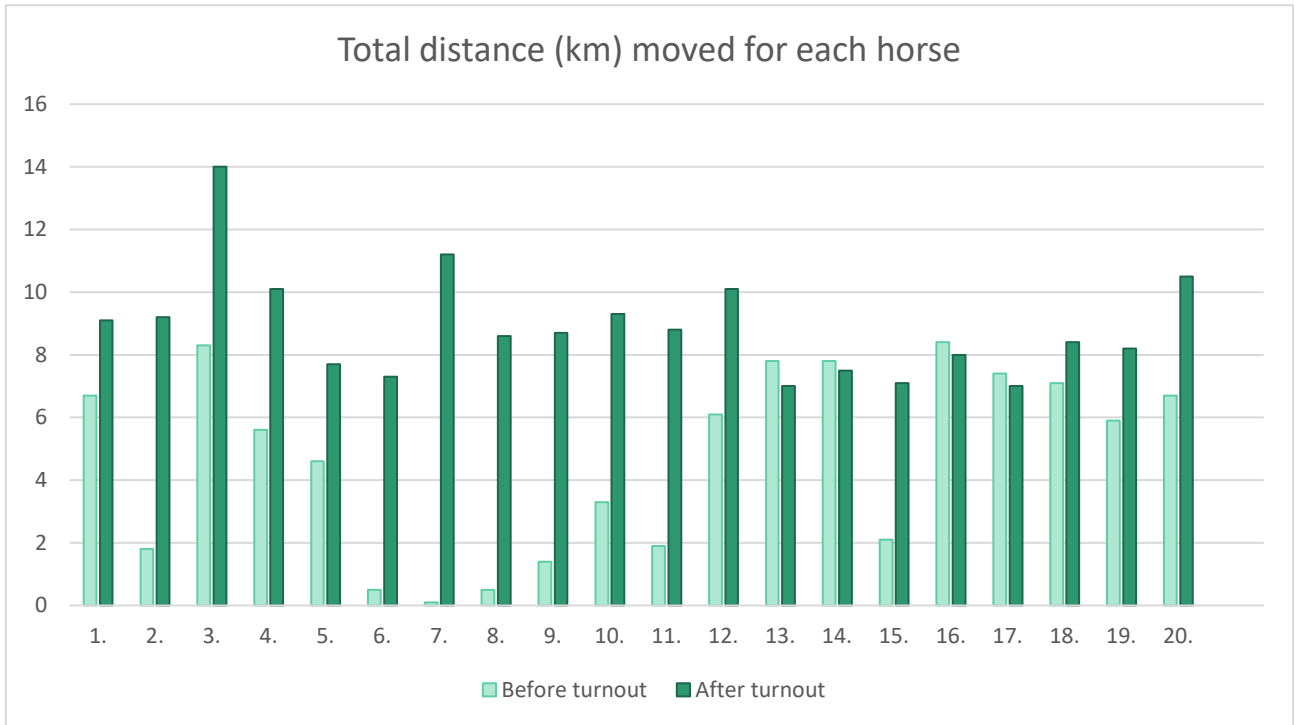
apathy. A study conducted by Ruet et al. in 2020 supported our findings, emphasizing that turnout allows more natural behaviors and improves human-horse interactions once horses adapt to pasture life. Horses demonstrating aggression, apathy, or stereotypical behaviors in confinement also appear to perceive riding sessions negatively, underlining the potential for enhanced welfare to facilitate riding and handling. While in the pasture, the horses occasionally exhibited discomfort behaviors indicative of irritants, such as allergies and insect bites. These might have resulted from exposure to different forage types or changing seasons with increased allergens and insects.

A study by Dai et al. in 2023 compared horses living in semi-natural outdoor group-housing systems to single-stabled horses, reporting similar body condition scores and water-supply hygiene levels. Outdoor-living horses displayed fewer respiratory issues, less lameness, and significantly reduced stereotypical behaviors compared to previous results from single-housed horses. Consistent with our observations, Dai et al. (2023) noted that outdoor horses were more prone to skin lesions, possibly attributed to allergies or insects. Another study by Suagee-Bedore et al. in 2021 suggested that providing horses with sufficient turnout space exceeding 320 sqm per horse contributed to stable herd structures, reduced negative behaviors, and lowered plasma cortisol levels, indicating enhanced welfare. It is possible that the positive effects of turnout may continue to accumulate over time in a pasture-based system. The outcomes of our study might have been further clarified with the inclusion of control animals that remained stabled throughout the entire research period. In terms of activity measures, our results imply that horses are more satisfied with their environment when they can leave their stalls and interact with conspecifics. Conducting more extended and comprehensive behavioral observations would have provided richer insights, but this was limited by time constraints. Future research should study deeper into the long-term behavior changes and the potential development of new behaviors as horses fully acclimate to changes in their management.

## 7. Conclusion

The study's findings provide support for the expectation that group turnout significantly enhances horse welfare, as it substantially increases equine activity levels and appears to reduce behaviors associated with compromised well-being. Turnout for a brief duration of two to four hours resulted in an average 89% increase in equine activity and a 21.3% decrease in negative behaviors. The precise cause of this positive effect - whether it stems from unrestricted movement, foraging opportunities, social interactions, or a combination of these factors - could not be confirmed. Nonetheless, considering the established knowledge and the outcomes of this research, continuous access to pasture with conspecifics is a fundamental element of responsible horse care and should be actively encouraged in stable management whenever possible.

## 8. Appendix 1



*Figure 4 - Total distance (km) moved for each horse when stabled and only exercised by riding or lunging, and after being turned out in a group on a large grass pasture for 2-4 hours in addition to riding.*

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## Popular science summary

Horses are conventionally confined to single stalls for the majority of the day, where they are deprived of many natural behaviors, including free movement, foraging, and full social interactions with their conspecifics. This deprivation can lead to various welfare issues, adversely affecting both the mental and physical health of horses and potentially giving rise to abnormal behaviors and illnesses. The primary objective of this study was to investigate whether just a short period of pasture access with conspecifics could enhance equine activity and welfare. The results demonstrate that just two to four hours of turnout led to an 89% increase in activity ( $P < 0.01$ ) compared to solely relying on riding or lunging for exercise. While behavioral observations did reveal a positive change, with a 21.3% decrease in behaviors associated with frustration, this difference did not reach statistical significance ( $P > 0.05$ ). Although it remains uncertain whether this positive effect was solely a result of turnout, access to forage, or the presence of conspecifics, it is reasonable to conclude that even a brief period of group turnout can positively impact horse welfare and should be actively encouraged in equine management practices.

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