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Original Research

Effect of Season on Travel Patterns and Hoof Growth of Domestic Horses

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ABSTRACT

Four Morgan mares and five Morgan geldings ranging in age from 5- to 12-years-old were fitted with Global Positioning System units to determine if season has an influence on travel pattern. Body and hoof growth measurements were obtained so that the influence of season on body condition and hoof growth could be determined. Waist and heart circumference, cresty neck score, and body condition score were determined in each season. The ambient temperature and precipitation was recorded for each season. Waist circumference was the greatest ($P < .05$) in the spring and summer and the least in the fall and winter. Hoof growth was the greatest ($P < .05$) in the fall and the least in the winter. The front and rear hooves grew at similar rates in all horses. Hoof growth in geldings and mares were also similar. The average distances traveled were similar across seasons; however, the horse did numerically travel more in the spring and summer compared with the fall and winter. The range of the travel pattern was influenced by season with the horses traveling significantly less in the winter, although the average travel distances were similar. In conclusion, season in temperate zones will influence body condition, hoof growth, and pattern of travel, but the total distance traveled will be similar. Further research needs to be conducted to determine the influence of season on hoof growth and travel patterns.

1. Introduction

Several body measurements of a horse change as a consequence of changes in body fat and condition including cresty neck score, girth and waist circumference, and body condition scores. Horses that depend on foraging will lose body fat during the winter months when the quality and quantity of grass are low.

Horses are used by humans for a variety of recreational activities and are considered athletes [1]. The hoof has an influence on the soundness of an equine athlete [2]. In mature horses, hoof wall grows from the coronary band at an average rate of 8–10 mm per month [3,4]. This rate can be affected by a number of different factors, including breed, age, nutrition, and environment [5–8]. Other factors that have been studied in relation to hoof growth but have not shown a consistent effect on growth rate include gender, location of the hoof, and exercise [6,7,10,11]. Limited research has shown a possible seasonal effect in Egypt [5]. No previous studies have looked at the effect of season on hoof growth in North America.

In the wild, horses spend 16–20 hours per day traveling and grazing. Herd management in domestic horses that mimics this pattern may be able to significantly affect the psychological well-being of domestic horses [11]. Knowledge of how horses travel in pastures can enable researchers to create optimal turnout schedules and properly manage fields. Both size and shape of a pasture can affect the behavior of horses in the pasture [12,13]. Global Positioning

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Table 1
Average temperature and total precipitation for each season

Season	Fall	Winter	Spring	Summer
Average temperature (°C)	47.53	29.78	52.5	70.15
Total rainfall (cm)	26.16	20.22	34.39	41.58

System (GPS) tracking has now been successfully used to measure both location and heart rate of horses [14]. In Australia, a GPS tracking system has been developed that allowed researchers to successfully track both domestic and feral horses for several days at a time [12]. Understanding travel patterns will allow barn managers to provide an ideal turnout situation for horses.

The objectives of this study were to determine if season has an effect on body measurements, body condition scores, hoof growth, distance traveled, and travel patterns of horses in nightly turnout.

2. Materials and Methods

Four Morgan mares and five Morgan geldings ranging in age from 5- to 12-years-old were used in this study. All horses were housed in box stalls or straight stalls from 9 AM to 4:30 PM and turned out in a pasture during the night. All horses were fed a pelleted grain that was 10% crude protein. In the winter months, grass pasture was supplemented with mixed orchard grass hay. All horses were used in a University lesson program, completing 60–120 minutes of riding 4–5 days per week. All horses wore shoes on their front feet and received regular trimming for their hind feet, which remained barefoot. All horses were trimmed and reshod every 4–6 weeks by their regular farrier.

For data collection purposes, the seasons were divided by calendar date. Data collection started in the fall season on September 23, 2010 and lasted until December 21, 2010. The winter season lasted from December 22, 2010 to March 19, 2011. Spring treatment began on March 21, 2011 and ended on June 22, 2011. Summer was the last treatment and lasted from June 23, 2011 to September 22, 2011.

After being shod, initial body and hoof measurements were taken on each horse. One month later, the same measurements were obtained to determine the change over the 1-month period. This was done once per horse for each season. The following body measurements were taken on each horse: girth circumference, waist circumference, cresty neck score, and body condition score. Girth circumference was measured around the horse's body right behind the elbow. Waist circumference was measured around the horse's body just in front of the hips. Body condition score was done using the Henneke body condition scoring system [15]. Cresty neck score was evaluated using palpation and appearance and was given a score from 0 to 5 [16].

In addition to body measurements, the following measurements were made on each of the four hooves: toe length, medial heel height, lateral heel height, width, and length of the distal surface. Hoof growth was measured by using a rasp to create a small groove in the hoof wall just below the coronary band. After 1 month, the distance between the bottom of the coronary band and the edge of this groove was measured.

All horses were housed in the barn during the day and turned out during the night and on the weekends. Horses were tracked once per week to attain four separate GPS readings over a 1-month period in each season. The GPS devices used were the Garmin Edge 305 series. This information can then be displayed on a computer program called Garmin Training Center (Garmin International, Inc, Olathe, KS). It is possible to graph and map these data on Google Earth.

To attach the GPS units to the horse, they were first placed in a Pelican 1010 Micro Case, which was a crush proof, waterproof plastic box that protected the unit from any damage. That case was then attached to an elastic surcingle with plastic cable zip ties. The surcingle was placed around the horse's girth, directly behind the front legs. The plastic case sat underneath the horse's abdomen, where it could not be rubbed off or damaged by other horses. The elastic surcingle was buckled, and the buckle was secured with a plastic cable zip tie. Once the GPS unit

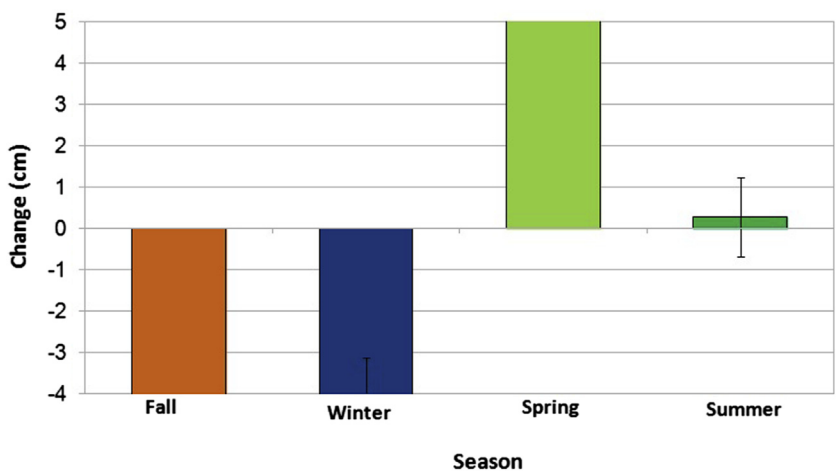

Fig. 1. Mean change in waist size in cm over a 1-month period.