

Original Research

A Comparison of Weight Estimation Methods in Adult Horses

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ABSTRACT

Weight tapes and body weight estimation formulas are routinely used to determine the body weight of a horse when a scale is not available. The established formula to estimate body weight in mature horses is $\text{weight (kg)} = (\text{heartgirth}^2 \times \text{body length}) / (11,880 \text{ cm}^3)$. Two variations of the body length measurement have been used, measuring distance from the point of the shoulder to the ischial tuberosity (Point) or to the midpoint of the distance between the widest part of the stifle and the tail when viewed from the rear (Stifle). The objective of this study was to evaluate the accuracy of a commercial weight tape and the body weight estimation formula using both body length measurements in estimating weight of adult horses. Horses ($n = 145$) were weighed on a portable livestock scale, and measured for height at the withers, heart girth circumference, and body length by using the Point and Stifle measurements. A commercial weight tape was used to estimate body weight on 110 horses. The two formula weight estimations and the weight tape estimation were significantly different from the actual weight and from each other. The mean difference between actual weight and tape weight ($n = 110$) was 65.81 kg, whereas the differences between actual weight and the formula estimations ($n = 145$) were 17.25 kg for the Point measurement and 45.26 kg for the Stifle measurement. The estimation formula using body length measurement with the ischial tuberosity endpoint most closely estimates the actual body weight of the horses.

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1. Introduction

Knowing the body weight of a horse is important in many facets of horse care, including designing feeding programs and administering medication. However, horse owners and veterinarians working in the field generally do not have access to a livestock scale for the purpose of obtaining a horse's weight. Weight tapes and body weight estimation formulas have been developed for estimating a horse's weight under these circumstances. Weight tapes are designed to estimate weight using the circumference of the horse's heart girth. Weight estimation formulas incorporate body length as well as heart girth circumference.

Milner and Hewitt [1] were among the first to compare various methods of estimating body weight, including several estimation formulas and commercially available tapes. The formula used in the present study, in which estimated weight ($\text{kg} = (\text{heartgirth}^2 \times \text{body length}) / (11,880 \text{ cm}^3)$), is commonly attributed to Hall [2]. The formula was evaluated by Carroll and Huntington [3] and found to be more accurate than that published by Milner and Hewitt [1].

Subsequent research has used the same formula, although the definition of body length has differed. The original research defined body length as the distance from the point of the shoulder to the ischial tuberosity [2,3]. Later research used the midpoint of the distance between the widest part of the stifle and the tail when viewed from the rear as the endpoint of the length measurement [4-6]. As a result, both measures of body length have been used in describing the body weight estimation formula in the popular press and other general circulation materials.

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Table 1
Number of horses by breed included in the study

Breed	Number of Horses
Appaloosa	3
Arabian	6
Belgian	1
Gypsy	2
Kentucky Mountain horse	2
Missouri Fox Trotter	5
McCurdy	1
Morgan	9
Morgan—Percheron cross	1
Mustang	2
Paint	13
Paso Fino	2
Quarter Horse	40
Quarter Horse—Arabian cross	1
Quarter Horse—Tennessee walking horse cross	2
Racking horse	1
Rocky mountain horse	3
Saddlebred	1
Spotted saddle horse	5
Thoroughbred	13
Tennessee walking horse	20
Tennessee walking horse—Racking horse cross	1
Tennessee walking horse—Spotted saddle horse cross	1
Warmblood	8
Unregistered stock-type	2

The objective of this study was to evaluate the accuracy of a commercially available weight tape and the body weight estimation formula using the two different body length measurements in estimating weight of adult horses.

2. Materials and Methods

All animal procedures were approved by the Auburn University Institutional Animal Care and Use Committee. Data were collected at seven different farms or equine events between January 2009 and September 2010.

A total of 145 horses were weighed and measured for the purposes of this study. Breeds represented in the study are detailed in Table 1. Horses aged <2 years, as defined by

the universal birth date of January 1, were excluded from the study. Mean age of horses was 10.49 ± 5.49 years, with 96 geldings, 46 mares, and three stallions represented. Ponies and pony breeds were also excluded, although several of the light horse breeds represented had individual horses that measured <147.32 cm, which is the upper height limit for ponies as defined by the United States Equestrian Federation.

Physical measurements included weight, height at the withers, heart girth circumference, and body length. All horses were weighed on a portable livestock scale. Height was determined by standing the horse square on a level surface and measuring the highest point of the withers with an aluminum height stick. A plastic measuring tape was used for body measurements. Heart girth circumference was determined by placing the measuring tape behind the elbow, and passing it in a straight vertical line over the withers and across the sternum. Body length was measured from the point of the shoulder to the ischial tuberosity (Point) and point of the shoulder to the midpoint of the distance between the widest part of the stifle and the tail when viewed from the rear (Stifle) (Fig. 1). A commercially available weight tape (The Coburn Company Inc., White-water, WI) was used on 110 horses to estimate weight by placing the tape in the same location as the heart girth measurement, following the instructions provided. The weight tape was randomly selected from a farm and equine supply catalog popular in the region of the United States where the study was conducted.

The same two investigators carried out all the measurements to ensure continuity in the placement of measuring tools. Investigators also evaluated body condition score (BCS) using a nine-point scale [7], and the two scores were averaged to generate a single BCS for each horse. A separate individual recorded all measurements, as a result of which investigators were unaware of the actual scale weight and each other's BCS assessment of the horses.

Statistical analyses were performed using the STATA software program (StataCorp, College Station, TX) [8]. Paired *t*-tests were used to compare actual weight and the three estimated weights, with significance set at $P < .05$.

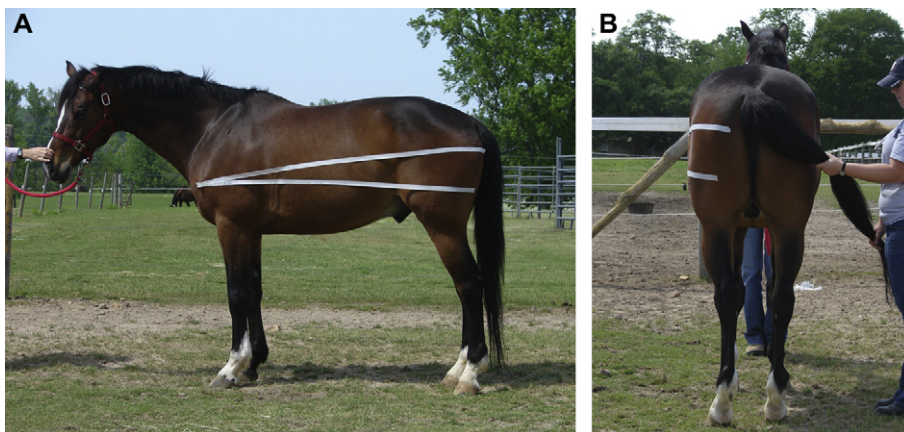


Fig. 1. Placement of measuring tape in determining body length when viewed from the side (A) and rear (B). The upper, diagonal line corresponds to the body length measurement from the point of the shoulder to the ischial tuberosity (Point), whereas the lower, horizontal line measures to the midpoint of the distance between the widest part of the stifle and the tail when viewed from the rear (Stifle).

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