THE IMPACT OF MEDIA ON PRICE PAID FOR THOROUGHBRED HORSES AT

AUCTION


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**Title**

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Steven Anderson

The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota

State University's regulations and meets the accepted standards for the degree of

**MASTER OF SCIENCE**

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# ABSTRACT

It has been said a picture is worth a thousand words, but the economic value of that picture for livestock sales transactions has not been quantified. The objective of this study aimed to evaluate the effect of the presence of media (photos and/or video) on sale prices of Thoroughbreds. Online auction sale data from two U.S. Thoroughbred auction sites were used to compare 18,221 horses that sold and 4,215 horses that failed to meet the minimum desired bid. Sellers that provided media of their horses at auction received approximately $25,000 more for weanlings, $74,000 more for yearlings, and $89,500 more for older horses versus horses without media representation. Additionally, sellers increased their ability to receive a desired sale price for their horse when media was available for prospective buyers. In conclusion, availability of media prior to sale at auction will result in a greater sale price at every life stage.

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# DEDICATION

This is dedicated to Kelli Christine Anderson and Wynn Christine Anderson.

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# LIST OF ABBREVIATIONS

RNA. ............................................................Reserved Not Attained. When a horse not does not attain the desired minimum bid price set by the seller.

PDF .............................................................Portable document format.

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# 1. GENERAL INTRODUCTION

## 1.1. Introduction

The Kentucky Derby has been called the greatest two minutes in sports. In 2024, the Kentucky Derby will celebrate its 150th anniversary of America's Classic Race (The Kentucky Derby, 2024). The roots of horse racing in America can be traced back to 1665 on Long Island (The Jockey Club, 2024). For years breeders, owners and trainers in the Thoroughbred racing industry have tried to identify horses with the ability to do work or to win races (Oklahoma State University, 2024). Because of the desire to find, acquire, and own elite horses, Thoroughbred auction companies were developed as a means to sell horses. Fasig-Tipton, America's oldest Thoroughbred auction company, started in 1898 (Fasig-Tipton, 2024), and Keeneland Sales, founded in 1936 (Keeneland, 2024), are two examples of auction companies in America. In 2022, Thoroughbred auctions in the United States (U.S.) grossed more than $1.3 billion with more than 14,000 horses being sold (The Jockey Club, 2024).

Annually, there are Thoroughbred auctions across the country (The Jockey Club, 2024). These auctions include the sale of weanlings, yearlings, two-year-olds in training, and older horses such as horses of racing age, broodmares, and/or breeding stock. The Thoroughbred horses selling in these auctions are consigned by their owners, breeders, or sales agents. Auction companies oversee the screening of quality, catalog development, the auction, and collection of proceeds from the sale. As Thoroughbred horses are consigned to a particular sale, the information about that horse is gathered and cataloged in what is called a sale catalog. The sale catalog serves as the centralized source of information about each horse that is selling in the auction. The catalog provides information such as hip number (how animals are identified in the catalog), name (color and sex is used for unnamed horses), a three-generation pedigree, and the

race record and earnings of the sire as well as the race record and earnings of the dam, 2nd dam (granddam), and 3rd dam (great-granddam). Their race records and the earnings of their progeny are also included, if applicable. This information is standard across the industry and is found in every sale catalog.

A paper printed sale catalog is distributed to potential buyers prior to the sale by the auction company. Along with the printed paper copy of the sale catalog, auction companies such as Fasig-Tipton and Keeneland publish an online version of the catalog that includes additional features. Though each auction company's online sale catalog may have a different appearance, the accompanying online version of the sale catalog contains similar information. The online version of the catalog provides a link to a PDF page of each horse in the sale that is found in the printed catalog. Information such as the hip number, the horse's name, sex, and color of the horse, the consignor, the state in which the horse was bred, and the barn in which the horse is stalled on the sale facility grounds is included in the online version of the sale catalog. This information is standard among auction companies. Along with the standard catalog information, consignors can supply pictures and/or videos of a particular horse being offered in the sale. Some companies provide icons for potential buyers to click on a photo or video link, while others provide a link called a "virtual inspection." Potential buyers utilize the information supplied in the sale catalog, as well as the opportunity to view and study the horse virtually at their own leisure before inspecting the horse in person at the sale. However, providing photos and/or videos of a horse is not required and not all horses in the sale have pictures and/or video available for viewing. Consignors have the right to set a reserve price. A reserve price is a minimum bid price a horse must achieve in order to sell to a new owner. If a horse does not

achieve that bid price in the auction, the horse does not sell and the consignor retains ownership. The industry term for this is called "Reserve Not Attained" or RNA.

According to Di et al. (2014), consumer buying decisions are impacted by the presence of photos in an e-commerce or an online buying platform. Photos help to capture the attention of consumers, as well as increase trust in the product (Di et al., 2014). The presence of photos helps the seller differentiate their products from other competitors (Xia et al., 2020). Ultimately, the presence of photos provides basic information about the product as well as capture the attention of the buyer, which in return may increase the amount of money paid for said goods (Xia et al., 2020). Providing photos and/or video of livestock increases their exposure to a target audience, thus increasing their total value. Additionally, providing the opportunity for potential buyers to view livestock prior to an auction at their own convenience could also have a positive impact on the perceived value of the livestock to the potential buyer (Cutrer, 2021).

## 1.2. Hypothesis and Objectives

By coupling an understanding that the presence of photos impacts consumer buying decisions and product preferences in an online buying platform, it is hypothesized that the presence of media impacts the prices paid for Thoroughbred horses at public auction. Therefore, the objective of this study was to analyze online Thoroughbred sale catalogs, determine which horses were accompanied by media and which ones were not, and then analyze the auction prices paid to see if horses with media available to view in the online sale catalog sold for higher prices at auction.

## 2. LITERATURE REVIEW

The objective of this literature review is to give a background on numerous subtopics, serve as the framework of information, and provide the purpose for this study. There is a lack of literature directly related to the impact of photos and/or videos within an online sale catalog and how they contribute to the sale of Thoroughbred horses. Therefore, this literature review will not cover the impact of media on the sale of Thoroughbred horses, but rather different subtopics that indirectly relate to the impact of media on the sale of Thoroughbred horses. Subtopics will include a background on the development of the Thoroughbred breed, its size and scope in the United States, an understanding of Thoroughbred sales in the U.S. (including auction companies), types of Thoroughbred sales, and valuation of Thoroughbred horses at auction. An assessment of livestock photography and the use of photos in the selling of products online and thru e-commerce will also be covered.

### 2.1. Development of the Thoroughbred

The Thoroughbred is one of the most-valued horse breeds in the world and has been regarded as a top racehorse breed for centuries (Bower, et al 2012). The three original sires that established the breed include the Darley Arabian, the Godolphin Arabian, and the Byerly Turk who were named after their owners, Thomas Darley, Lord Godolphin, and Captain Robert Byerly. These three foundation stallions were imported into England from the Middle East and Turkey between the years 1689 and 1729 and were bred to the stronger-built, native horses of the region (Oklahoma State University, 2024; The Jockey Club, 2024). The results of these matings produced offspring that could carry more weight over longer distances. These qualities were advantageous to those competing in the up-and-coming sport of horse racing (Oklahoma State University, 2024; The Jockey Club, 2024). All modern Thoroughbreds can trace their pedigrees

back to one or more of the original three foundation stallions. Additionally, 80% of Thoroughbreds can be traced back to a great-great grandson of Darley Arabian named Eclipse (The Jockey Club, 2024). Over time, the English Thoroughbred has been introduced to many countries around the world and has been bred for racing or for breed improvement of native stock (Oklahoma State University, 2024). Additionally, still today, the Thoroughbred breed does not allow the use of reproductive-assisted technology such as artificial insemination and/or embryo transfer. All mares must be mated to a stallion through live cover (Horowitz, 2024).

**2.2. History of the Thoroughbred in the U.S.**

In 1730, the first Thoroughbred was introduced to the United States. A stallion by the name of Bulle Rock arrived in Virginia. He was a direct son of Darley Arabian and stemmed from Byerly Turk on the maternal side of his pedigree (Trevathan, 1905). Over the next 45 years, 186 more Thoroughbreds were imported from England to form the foundation of the American Thoroughbred (PBS, 2024).

Due to the fact that many breeding records of horses were incomplete, most horses remained unnamed until they showed outstanding ability. In 1791, James Weatherby consolidated his privately maintained pedigree records and released the first general stud book in England (Oklahoma State University, 2024). Weatherby created a list of pedigrees from 387 mares, all of which traced back to the previously mentioned Eclipse (Oklahoma State University, 2024). As the American Thoroughbred steadily increased in popularity, the first American version of the American Stud Book was published in 1873 by Col. Sanders D. Bruce. Bruce produced six volumes until The Jockey Club took over producing and maintaining the stud book in 1896 (Oklahoma State University, 2024).

In 1894, The Jockey Club was founded to oversee the Thoroughbred racing industry and to serve as the central organization that maintains the American Stud Book. Today, the main objective of The Jockey Club is to ensure integrity of the breed and to promote breeding, racing, and international trade (The Jockey Club, 2024). The Jockey Club is also responsible for disseminating information about sale reports and race records. Among other activities, The Club is involved in horse safety initiatives, the economic state of the sport, and the marketing of horse racing (The Jockey Club, 2024).

In 2022, 18,700 foals in North America were registered with The Jockey Club (The Jockey Club, 2024). Kentucky is the leading state in terms of Thoroughbred foal crop. In 2022, Kentucky was home to 44.8% of the total foal crop born. Florida was second with 7.5%, followed by California at 7.4% and New York at 7.1% (The Jockey Club, 2024).

## 2.3. Horse Racing in the U.S.

Horse racing in the U.S. can be traced back to the year 1665 on Long Island. Governor Samuel Ogle of Maryland organized the first Thoroughbred race in 1745. Today, Thoroughbred racing spans from coast to coast and the volume of racing in the U.S. is greater than all other countries (The Jockey Club, 2024). In 2023, 33,453 Thoroughbred races were run in 34 states and over $1.2 billion was distributed in purse money (The Jockey Club, 2024).

## 2.4. Thoroughbred Sales in the U.S.

According to The Jockey Club (2024) Thoroughbred sales totaled over $1.2 billion dollars across 14,429 horses being sold in 2022. These sale data only account for Thoroughbred horses that were sold at public auction.

### 2.4.1. Types of Sales

At auction, Thoroughbred horses are sold by class or category determined by the age of the animal. Weanlings are horses that are typically sold between 5 and 11 months of age (Hansen & Stowe, 2018). Yearlings are horses that are one year of age but under two years old and typically sell at approximately 1.5 years of age (Chezum & Wimmer, 1997). At a Weanling and Yearling sale, horses are evaluated by perspective buyers on confirmation, temperament, and quality of walk. Pedigree and the race record of their sire, dam, or other related animals is also considered. These evaluation methods are used because these two categories of horses are physically young and have not started any kind of race training (Hansen & Stowe, 2018). Thoroughbreds typically start training as two-year olds and are commonly known as two-year olds in-training. A prospective buyer can watch the horse under tack; meaning they carry a rider and evaluate the horse as it "breezes." A breeze is a run of a short distance, usually one furlong (1/8 of a mile) on a racetrack (Hansen & Stowe, 2018). In a Broodmare sale, Thoroughbred females that are no longer racing (or in some cases never raced) are sold with the intention to serve as breeding stock. The youngest a broodmare or broodmare prospect can be is two years of age. Broodmares are purchased based on a combination of breeding, past racing performance, and genetic ability (Neibergs, 2001).

### 2.4.2. U.S. Auction Companies

Thoroughbred horses are sold at auctions. These auctions are standard English or ascending-bid auctions (Chezum & Wimmer, 1997). Fasig-Tipton is the oldest Thoroughbred auction company in North America. The company was founded by William B. Fasig and Edward A. Tipton in 1898. The first Fasig-Tipton headquarters was in New York at Madison Square Garden (Fasig-Tipton, 2024). In 1903, Fasig died, leaving Tipton to bring on Enock James

Tranter as a partner. Tranter revolutionized the way catalog pages were laid out by reducing the number of dams listed on the page to only focus on the immediate pedigree, plus race records and production information (Fasig-Tipton, 2024). Currently, Fasig-Tipton hosts Thoroughbred sales in Kentucky, New York, Maryland, and California. In 2022, Fasig-Tipton unveiled their Digital Platform. This new sale platform allowed horses to be sold exclusively through an online bidding platform. Synergy Investments, a Dubai-based company, purchased Fasig-Tipton in 2008 (Fasig-Tipton, 2024) and remains the proprietor to this day.

Keeneland Sales was founded in October of 1936. Keeneland is home to four Thoroughbred sales annually including a January mixed sale, April mixed sale, September yearling sale, and December breeding stock sale. Keeneland accounts for over $500 million in sales annually with buyers and sellers from more than 50 countries (Keeneland, 2024).

Along with Fasig-Tipton and Keeneland, numerous regional and state organizations and associations also host Thoroughbred auctions. Thoroughbred sales are held in the states of Arizona, California, Oklahoma, Colorado, Louisiana, Indiana, Iowa, Minnesota, Florida, Ohio, New Mexico, and Washington (The Jockey Club, 2024).

**2.4.3. Valuation of a Thoroughbred**

There is a great amount of literature that focuses on determining the value of a Thoroughbred at auction. This section will examine factors that are focused on a specific age or class of horse, such as weanlings, yearlings, two-year olds, and broodmares. According to Vickner and Koch (2001), Thoroughbred buyers and sellers recognize the value of providing additional information on a horse's value during sales. Commonly, the information that buyers tend to rely on is pedigree, the race performance of genetically similar horses, the expertise of a

"bloodstock agent" (a person hired by buyers to evaluate sale horses and offer buying suggestions), and their own knowledge and/or experience (Plant & Stowe, 2013).

### 2.4.3.1. Weanlings

Weanling Thoroughbreds are sold at auction between five and eleven months of age. Due to a weanling's young age, confirmation traits such as the animal's build and walk are the only physical characteristics that can be evaluated by a potential buyer. Pedigree and race records of the sire, dam, and other related horses are also considered (Hansen & Stowe, 2018). According to The Jockey Club (2024), 1,187 weanlings were sold, grossing $83,807,981 in 2022, with a 9.1% increase in dollars of sales over 2021. The value of a weanling Thoroughbred, according to Hansen and Stowe (2018), comes down to a number of factors. These include the quality of the horse's pedigree, the sire's stud fee, the stage of sire's breeding career, and if the dam of the weanling being offered for sale has produced progeny who have earned black type. The term "black type" refers to a heavy font used within the sale catalog page, indicating an animal who has won a stakes race. In a stakes race, the owner pays a fee to enter a horse to run, and the track or venue contributes to the overall purse. stakes races are distinguished by the level of competition and the total amount of the purse (Daily Racing Form, 2024) Age, gender, state of birth, and the placement within the sale are also deemed to be factors in the overall valuation of a weanling (Hansen & Stowe, 2018). Many of the weanlings sold at auction are purchased by pinhookers. The term "pinhooking" is used for the process of buying weanlings with the intent to train and develop them, then resell them for a profit as a yearling or two-year-old in training (Hansen & Stowe, 2018).

*2.4.3.2. Yearlings*

Yearling Thoroughbred horses are typically sold at public auction at approximately 1.5 years of age, but can range in age from 12 months to 23 months of age. During this time, potential buyers evaluate yearling horses on confirmation and build, temperament, complete medical history, pedigree, and the race records of the sire, dam, and other related horses (Chezum & Wimmer, 1997). Because yearlings are still too young to start training due to their limited physical development and immaturity, buyers must rely on the racing performance of animals within their pedigrees and the reputation of the breeder and the seller (Vickner & Koch, 2001). Chezum and Wimmer (1997) reported that the sale prices of Thoroughbred yearlings are a function of the racing intensity of the breeder, the pedigrees of the sire and the dam, the age, gender, and birth location of the foal, and visually observable factors.

Chezum and Wimmer (1997) also concluded that the average purse, stud fee, juvenile sire (first crop), sire-mare cross, stamina, age, sex, and the location of the foal's origin significantly impacted the price paid for a yearling. A study by Buzby and Jessup (1994) discovered that yearling specific factors such as sire's stud fee, month foaled, and if the dam was a black-type winner influenced a yearling's sale price. The impact of foreign buyers, tax changes, and interest rates were the most influential macroeconomic factors regarding the value of a Thoroughbred yearling at auction. In conjunction with the stud fee of the sire, racing history and record of the sire and dam, origin (location) of the foal, and gender of the foal all contribute to the value of a yearling at auction (Chezum & Wimmer, 1997). In an Australian study, Jackson et al. (2011) found that the price paid for a yearling horse was positively associated with that horse's race performance once it started racing. As the Australian sales market tends to react similarly to the American market, those willing to pay a premium or spend more money on a

Thoroughbred yearling saw an increase in the number of races started, number of races placed, and amount of prize money earned (Jackson et al, 2011). In 2022, 7,389 yearling Thoroughbreds were sold, grossing $651,025,460, for an average price of $88,107 per horse (The Jockey Club, 2024).

In a study by Vickner and Koch (2001), advertising a Thoroughbred yearling in Thoroughbred trade publications for the two months prior to the auction and one month during the sale did not result in an increased value of a Thoroughbred yearling at auction (Vickner & Koch, 2001). This was the only study that referenced advertising or promotion as a factor in determining the value of a Thoroughbred. In the same study by Vickner and Koch (2001), Thoroughbred yearlings that sold in "select" (the preferred sessions of the auction) demanded a higher price, or sold for a premium, compared to other sessions of the auction.

### 2.4.3.3. Two-year-old or two-year-olds in training

Two-year-old or "two-year-old in training" sales are specifically for Thoroughbreds who have turned two years old on the universal horse birthday of January first of the given year. When a horse turns two years old, it has reached a point in its growth pattern and maturity making it suitable to begin training. This added maturity provides additional physical information about the horse's ability to run compared to the younger weanlings or yearlings (Stowe & Chezum, 2011). In 2022, 2,476 two-year-olds grossed $229,310,052, for an average of $92,613 per horse (The Jockey Club, 2024).

In many cases, prior to the sale of a two-year-old, potential buyers have the opportunity to watch the horse consigned in the sale run a short distance called a "breeze." This short distance or breeze is typically 1/8 to 1/4 of a mile. These "breeze shows" are videoed and the run is timed for potential buyers to reference later for comparison to other horses in the sale. These

breeze shows give potential buyers more information about the horse's running style, physical ability, and speed (Hansen and & Stowe, 2018; Stowe & Chezum, 2011).

Based on the results of the study by Stowe and Chezum (2011), the more information one can acquire about a Thoroughbred, especially from yearling to two-year old, proves to be more insightful in determining and predicting a horse's racing value. In another study by Robert and Stowe (2016), the value of a two-year-old in training is impacted by factors similar to Thoroughbred yearlings. Robert and Stowe (2016) found that premium prices were paid for horses from first crop sires, even though no information has been recorded on their offspring, demonstrating that buyers are willing to pay more for quality in the individual horse at two-year-old sales. Ultimately, the valuation of a two-year-old in training is determined by the horse's characteristics such as speed and running style, with pedigree and overall quality of the sale also contributing to the value (Robert & Stowe, 2016). The study discussed by Robert and Stowe (2016) on the topic of two-year-olds is referenced as being the only of its kind, as no other research regarding the sale of two-year-olds has been shared.

### 2.4.3.4. Broodmares

The broodmare market is a well-established segment of the Thoroughbred sale industry; however, it tends to be challenging when it comes to determining a horse's value (Neibergs, 2001). The Jockey Club (2024) reported that 2,195 broodmares were sold in 2022, which grossed $174,856,049 with an average of $79,661 per mare. Because the Thoroughbred industry does not allow the use of assisted reproduction technology such as artificial insemination and embryo transfer, most determinations of a broodmare's quality and value is determined on the racing success of her and her offspring. Limited literature exists on this topic. According to Neibergs (2001), breeding, racing, and genetic factors played key roles in determining the value of

broodmares. This may include broodmares that produced a graded stakes winner, won a graded-stakes race herself, or have a graded stakes winner in their pedigree (Neibergs, 2001). This study concluded that broodmares that won or produced a graded stakes winner exhibited the greatest value in sale prices when sold at auction. It was further concluded that mares selling for the highest value and were the most sought after by buyers were winners of at least one graded stake race (Neibergs, 2001). Ultimately, Neibergs (2001) found that the value of a broodmare is a subjective process.

## 2.5. Photos in Selling Products Online

To make a better connection and to provide more insight on the original research question regarding how media (photos and/or video) can impact the price paid for Thoroughbred horses, it is important to examine research evaluating the impact of photos on the sale of online or e-commerce products. For example, Di et al. (2014) concluded that images or multimedia engaged the attention of a potential buyer and increased their trust in the company or product. Further, image quality also proved to be an important factor in decisions to purchase or not (Di et al., 2014). Additionally, the number of photos available was a significant factor that positively impacted sales. Di et al (2014) found the success of sales or conversion rate (products listed compared to products sold) is doubled when at least two different views of the object being offered for sale are provided (Di et al., 2014). In another study by Mokobombang and Kusumawati (2023), the presence of a product photo, the description of the product, and ratings and reviews of the product proved to positively influence e-commerce sales.

A study by Li et al. (2014) found that consumers prefer photos of a product with a larger key image, warmer colors, higher contrast, higher depth of field, and those that contain human faces within the product photo to provide a social presence thus increasing trust and purchase

intentions. Li et al. (2014) concluded that warm colors of the image can impact customers mood about a purchase, resulting in an increased intent to purchase the product. According to Xia et al. (2020), online stores should focus on ways to differentiate themselves from their online competitors. Many times, images can be the cue that can increase the attention and perception of the products being offered (Xia et al., 2020). Product photos are significant and useful in e-commerce for two reasons; 1) photos provide basic visual information about the product and 2) photos capture the attention of the consumers (Xia et al., 2020). Photos of the products based on certain attributes do increase buyer attention, resulting in increased sales (Xia et al., 2020).

## 2.6. Photography of Livestock

Throughout history, humans have depicted animals in drawings, paintings, and art. A study by Pruvost (2011) found that the paintings of prehistoric horses on cave walls approximately 25,000 years ago by humans in the Paleolithic era have phenotypes (set of observable characteristics) depicted in the artwork which accurately match genotypes (genetic makeup) of the horses of that time. Though the real reason for these paintings and drawings remains unclear, what is clear is that people dedicated time to the animals around them (Pruvost, 2011). Before the invention of photography, popular racehorses, sires, or favored animals were painted by commissioned portrait artists to depict a horse's image and conformation (Wickens, 2023). Thomas J. Scott was considered one of the top equine portrait artists of his time and traveled the country painting many of the most popular Thoroughbreds (Smithsonian, 2024). Today, these portraits serve as historical records and for historical reference when making breeding and mating decisions (Wickens, 2023).

There is a limited amount of literature related to the topic of livestock photography, specifically in regards to the impact livestock photography plays in the sale of livestock. Cutrer

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(2021) reported that livestock photography can ultimately increase the value of the animal photographed. Livestock that are photographed are better showcased, marketed, and promoted to a larger audience, exposing them to a greater number of potential buyers (Cutrer, 2021). A study conducted by Franks and Grandin (2015) discovered that a large percentage of beef bulls photographed for popular semen catalogs had their lower feet and legs not displayed in the photo. This hindered potential customers from seeing the foot and leg structure of the animal, thus limiting the ability to evaluate the bull's overall structure. Their data concluded that only 19.4% of bulls featured in semen company catalogs had their feet and legs fully displayed for potential buyers to see. Franks and Grandin speculate that the practice of not fully showing the leg and foot structure may be done deliberately to hide any structural defects. If buyers of semen were provided photos of the bull that contained the entire leg and foot structure, bulls with visual flaws could be avoided (Franks & Grandin, 2015).

## 2.7. Summary

A better understanding of the original research question of how media impacts Thoroughbred sales can be formed from the information presented in this literature review. We know that little to no research evaluating the topic of media in horse sales has been conducted. There is an extensive amount of information for determining the value of a horse and (or) understanding of the factors that impact the selling price of Thoroughbred auctions. Information such as pedigree, age, sex, type of sale, and stud fee of a stallion have been identified as the most common factors in determining the value of a Thoroughbred. It has also been shown that consumer buying decisions and buyer preferences are positively impacted from the presence of high-quality photos in e-commerce. These insights from the review of available literature support

our original research question; can photos increase the amount paid for each class of

Thoroughbred horses sold at auction?

# 3. MATERIALS AND METHODS

## 3.1. Introduction

The Thoroughbred breed was first imported into the US in 1730 from England. As the breed increased in popularity as a work horse and a racehorse, Thoroughbred auction companies were founded sell as people sought to find strongest or fastest horses around (Oklahoma State University, 2024). Fasig-Tipton and Keeneland Sales are two U.S. Thorough auction companies forming in 1898 and 1936 respectively. In the U.S., Thoroughbred horses are sold at auction to the highest bidder. Thoroughbred horses are typically sold in different age categories. Weanlings are horses that sold at 5 to 11 months of age (Hansen & Stowe, 2018). Yearlings are offered at auction at approximately 1.5 years old, two-year-olds in training sell as those horses that have turned two years old on the Thoroughbred and have began some kind of training (Hansen and & Stowe, 2018; Stowe & Chezum, 2011). Broodmares are females that are no longer racing and are sold based on their breeding and genetic potential (Niebergs, 2001). A number of factors can influence the price paid for a Thoroughbred at auction including pedigree, individual race records and earnings, progeny race records and earnings, stud fees, confirmation, walk, and veterinary inspections and reports (Chezum & Wimmer, 1997).

Photos of products being offered for sale have been proven to impact the buying decisions by capturing the attention of consumers and by instilling trust in a product (Xia et al., 2020). By providing multiple images of a product, sellers increase their success of product selling (Di et al., 2014). Sellers of livestock who provide photos of animals prior to the sale also tend to increase the value in their animals because of the increased visibility and exposure to a large audience (Cutrer 2021). Because no literature exists on the impact media (pictures and/or

videos) has on prices paid for Thoroughbred horses, the objective of this is study is to see if the presence of media did in fact impact the prices buyers of Thoroughbreds paid at an auction.

### 3.1.1. Dataset

Data for this research was obtained from 2022 and 2023 Keeneland and Fasig-Tipton Thoroughbred sales. These data include the results of eight Keeneland sales (three from 2022 and five from 2023) and 13 sales from Fasig-Tipton, each in 2022 and 2023. The combined dataset includes 28,031 records. Of those, 5,595 were removed from the sale ("Out") due to unknown reasons and were, therefore, not included in the analysis. Additionally, another 4,215 horses were not sold because they did not receive the minimum bid desired or "Reserve Not Attained" (RNA; when a horse does not receive a desired reserve price set by the seller). This left 18,221 records of horses with sale prices. There were 8,411 bays, 4,554 browns, and 3,693 chestnuts in the sold data. Only one white and four black horses were sold so they were combined with the 1,557 grey/roan horses into an "Other" category for color. The 194 geldings, 38 horses (intact males aged five or older), and seven ridglings were combined with the 7,141 colts as "Males". The 3,489 mares were combined with the 7,352 fillies as "Females".

The sold data was subdivided into three datasets: Weanlings (2,173 records), Yearlings (10,888 records), and Racing Age and Older (5,160 records). Weanlings are horses that are typically sold between five and 11 months of age (Hansen & Stowe, 2018). Yearlings are horses that are one year of age but under two years old and typically sell at approximately 1.5 years of age (Chezum & Wimmer, 1997). Thoroughbreds typically start training as two-year olds. These are commonly known as two-year olds in-training, or a racing prospect. Thoroughbred females that are no longer racing, or in some cases never raced, are sold as breeding stock. The youngest a broodmare or broodmare prospect can be is two years of age. Intact male horses may also be

sold as a stallion or stallion prospect. Horses can be sold as both a breeding prospect and a racing prospect so for the purpose of this study, all horses that do not fall into the Weanling or Yearling category will be classified as Racing Age and Older. The RNA data was also subdivided into three datasets: Weanlings (674 records), Yearlings (2,440 records), and Racing Age and Older (1,101 records), so that the frequency of media presence could be compared between the sold and RNA data subsets.

### 3.1.2. Statistical Analysis

The frequency procedure with a chi-square test in SAS (v. 9.4; SAS Institute, Inc., Cary, NC) was utilized to determine if media presence was associated with the frequency of horses sold versus horses that did not meet their desired bid. This was calculated across all horses and within each of the three data subsets (Weanlings, Yearlings, and Racing Age and Older). The chi-square test is a test of the null hypothesis that two variables are independent of each other, with an alternative hypothesis that the two variables are not independent of each other. A $P$-value of greater than 0.05 indicates insufficient evidence to reject the null hypothesis of independence.

Simple means and standard errors were calculated using the means procedure in SAS using a class statement of media (yes or no) for all horses and for each subset of data as a quick glance at the effect of media on sale price.

For subsets of data (Weanling, Yearling, and Racing Age and Older), the mixed procedure of SAS was utilized, fitting price as the dependent variable. Media (yes or no), color (bay, brown, chestnut, other), sex (male, female), and year (2022, 2023) were fit as fixed effects. For Racing Age and Older, age was included as a covariate. All fixed effect interactions were tested and removed from the model one at a time until all $P$-values for interactions were less than 0.10. Sire was fit as a random effect for all three models.

The data was further subdivided based on the frequency of a sire within a subset of data. Sires were ranked by frequency of offspring in the sale by subset and each subset was divided into fifths based on the frequency of the sire (**Table 1**). The effect of sire class on sale price was analyzed utilizing the mixed procedure of SAS with price as the dependent variable. Sire class, media, color, sex, year, and the interactions of media, color, sex, and year with sire class were included as fixed effects. Other interactions were tested and removed from the model one at a time until *P*-values for interactions were less than 0.10, with the exception of two-way interactions with sire class that were kept in the model regardless of *P*-value. For Racing Age and Older, age was also included as a covariate.

**Table 1.** Sires ranked by the frequency of offspring set for sale across each subset of data (Weanlings, Yearlings, and Racing Age and Older).

| Data subset[1] | Sire Class[2] | offspring/sire, n | sires, n | offspring, n |
|---|---|---|---|---|
| Weanlings | 1 | ≥35 | 10 | 404 |
| | 2 | 22-34 | 16 | 437 |
| | 3 | 16-21 | 24 | 448 |
| | 4 | 9-15 | 43 | 481 |
| | 5 | 1-8 | 124 | 403 |
| Yearlings | 1 | ≥138 | 14 | 2217 |
| | 2 | 94-137 | 18 | 2145 |
| | 3 | 66-93 | 29 | 2243 |
| | 4 | 38-65 | 42 | 2140 |
| | 5 | 1-37 | 263 | 2143 |
| Racing Age and Older | 1 | ≥81 | 10 | 1044 |
| | 2 | 44-80 | 16 | 1008 |
| | 3 | 22-43 | 34 | 1014 |
| | 4 | 8-21 | 84 | 1021 |
| | 5 | 1-7 | 509 | 1072 |

[1]Weanlings: horses sold between five and eleven months of age; Yearlings: horses one year of age and under two years old. Typically sold at 1.5 years old; Racing Age and Older: All horses two-year old and older.

[2]Sire class: Sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire.

### 3.2. Results

### 3.2.1. Frequency of Media

When comparing the frequencies of horses with media and whether they sold or did not receive the desired reserve price (RNA), 1,485 horses that <u>did not have</u> media were RNAs, while 2,730 horses that <u>had</u> media were also RNAs. That said, 5,761 horses that did not have media sold, yet nearly 2.2 times more horses (12,460) that had media were sold. Across all animals, 67.7% of animals had media available in the online catalog and of those possessing media, 68.4% sold. When compared to animals that did not receive the desired reserve price (RNA),

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64.8% of those horses had media available. The chi-square value comparing percentage of horses sold with media versus those that did not attain the desired reserve price with media was 20.45, with a *P*-value less than 0.0001. This suggests there is an association between media and whether an animal sold or not.

Within Weanlings, horses typically sold between 5 and 11 months of age, 61.8% had media available, and 62.3% of those sold. Weanlings that did not receive the desired reserve price (RNA), 60.2% had media available. Analysis found established a chi-square value of 0.94, with a *P*-value of 0.33, suggesting insufficient evidence to reject the null hypothesis that the presence of media and the success of a horse being sold are independent of each other among weanlings.

Within Yearlings, horses between 12 months and 24 months of age, 71.2% of animals had media available, with 71.7% of those sold having media. Of the horses that did not attain the desired reserve price, 68.8%, had media available. The chi-square value was 8.17, with a *P*-value of 0.004 suggesting an association between presence of media and Yearlings being sold.

For the purpose of this study, Horses of Racing Age and older are all other horses two years old and older. Within the subset of Horses Racing Age and Older, 63% of the animals had media available, with 63.9% of those sold. Those horses that did not attain the desired reserve price, 58.6%, had media available. The chi-square value was 11.06 ($P < 0.001$), suggests an association between presence of media and sale of Horses Racing Age and Older.

**3.2.2. Simple Means**

When comparing the simple means of the average sale price for a horse with and without media available at sale time, across all horses, a horse with media sold for approximately $73,000 more than a horse without corresponding media (**Figure 1**). Within Weanlings, this

difference was only about $25,000. In Yearlings, the difference was approximately $74,000. In
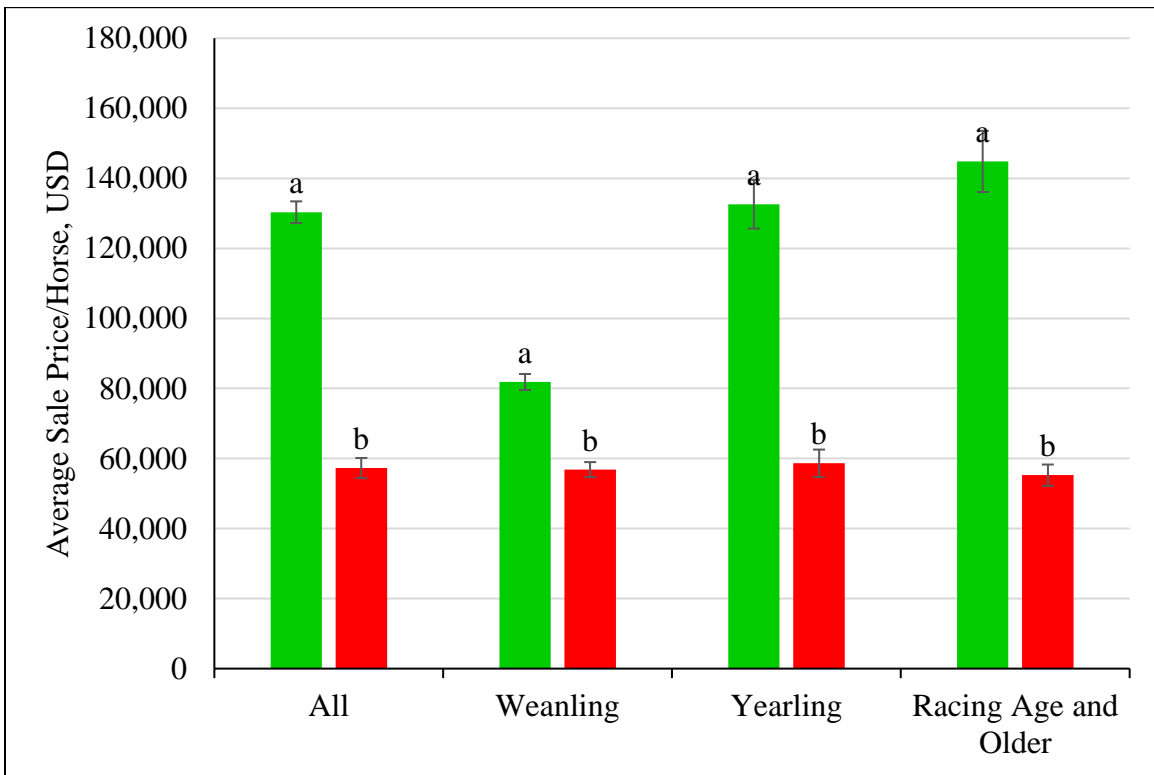
Racing Age and Older, the difference was nearly $89,500.



**Figure 1.** Simple means of the average sale price for a horse with and without media available at sale time across all horses and within each data subset. a,b – values with different letters differ by $P < 0.05$

### 3.2.3. Analysis of Sale Price by Subset (Weanling, Yearling, Racing Age and Older)

For horses of racing age and older, an increase of one year of age corresponded to a

decreased sale price of $7,505.70 ($P < 0.0001$). The $P$-values for the fixed effects in the final

model are provided in Table 2.

**Table 2.** Level of statistical significance (*P*-values) for the fixed effects of weanling, yearling and racing age and older horses.

| Effect | *P*-value | | |
|---|---|---|---|
| | Weanlings | Yearlings | Racing Age and Older |
| Media | 0.004 | <0.0001 | <0.0001 |
| Sex | 0.03 | 0.06 | 0.0005 |
| Color | 0.31 | 0.58 | 0.05 |
| Year | 0.005 | 0.001 | 0.0009 |
| Media * Year | 0.0007 | | 0.09 |
| Media * Sex | | 0.003 | |
| Sex * Color | | 0.01 | |

### 3.2.4. Media Effect

The main effect of media was significant for all three subsets of data ($P < 0.004$), with the largest difference occurring in horses of racing age or older (**Figure. 2**). Racing Age and Older horses that had media available at the time of sale sold for approximately $87,000 more than those without media ($P < 0.0001$). In Yearlings, the difference dropped to approximately $25,000 ($P < 0.0001$). In Weanlings, the difference declined to roughly $10,000 ($P = 0.004$).
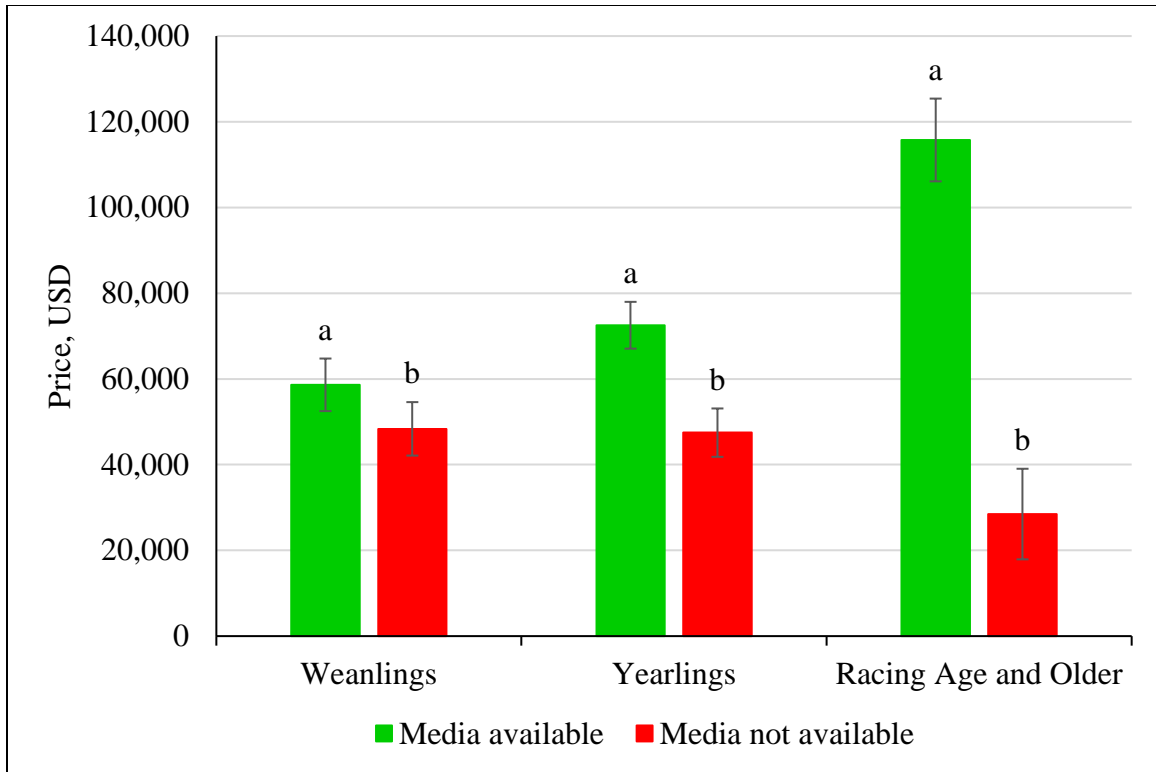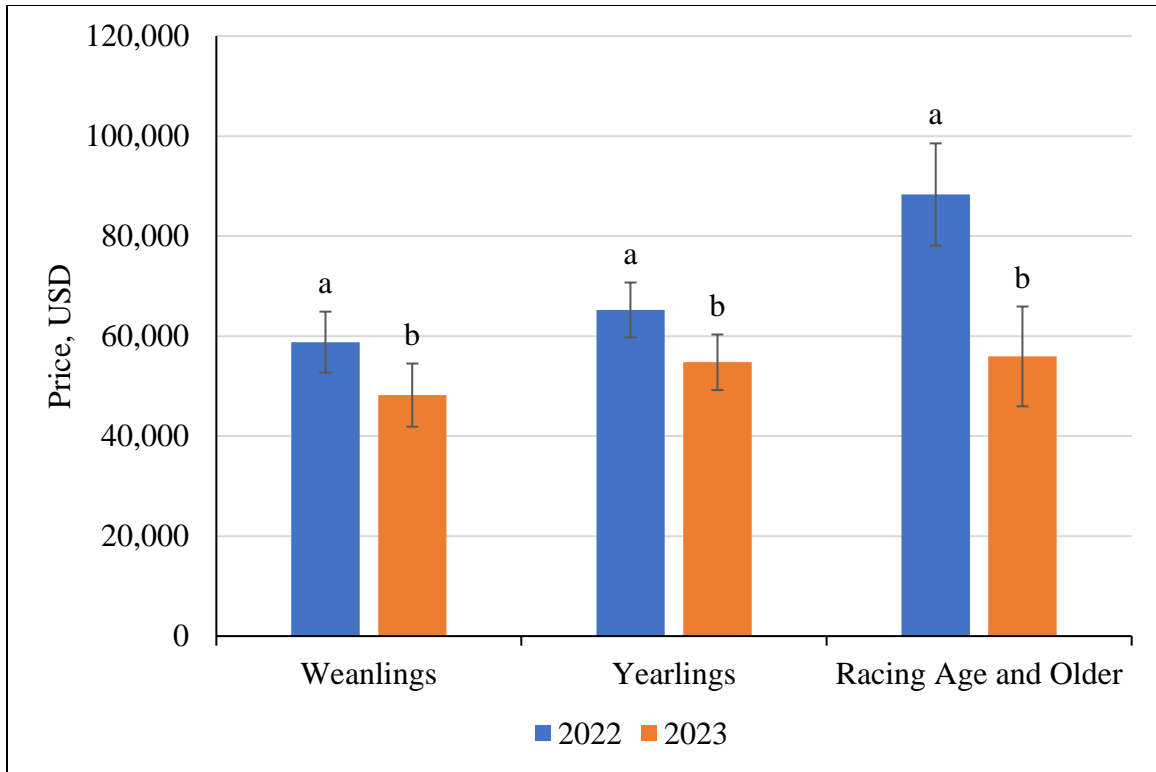
**Figure 2.** The effect of media presence on sale price for each of the data subsets (Weanlings, Yearlings, and Racing Age and Older). a,b – within a data subset, values with different letters differ by $P < 0.05$

### 3.2.5. Year Effect

The main effect of year was significant for all three subsets of data ($P < 0.005$), with the largest difference occurring in Horses of Racing Age or Older (**Figure. 3**). In Racing Age and Older, horses sold for approximately $32,000 more in 2023 than in 2022 ($P = 0.0009$). In both Weanlings and Yearlings, the difference was about $10,500 ($P = 0.005$ and 0.001, respectively).

**Figure 3.** The effect of year on sale price for each of the data subsets (Weanlings, Yearlings, and Racing Age and Older). a,b – within a data subset, values with different letters differ by $P < 0.05$

### 3.2.6. Media and Year Interaction

The effect of media on sale price (**Figure. 4**) was different across years for Weanlings ($P = 0.0007$) and tended to be different for Racing Age and Older ($P = 0.09$). In Weanlings, there was a difference of nearly $20,000 in 2022 between those with media and those without ($P < 0.0001$). However, in 2023, no differences in sale price were observed between those weanlings with and without media ($P = 0.79$). Sale prices in 2023 did not differ from the sale price of weanlings without media in 2022 ($P > 0.84$). In Racing Age and Older, horses with media sold for approximately $104,000 more than those without in 2022 ($P < 0.0001$) and for roughly $71,000 more in 2023 ($P < 0.0001$). While sale prices decreased from 2022 to 2023 in horses with media ($P < 0.0001$), there was no difference in sale prices of horses without media between 2022 and 2023 ($P = 0.31$).
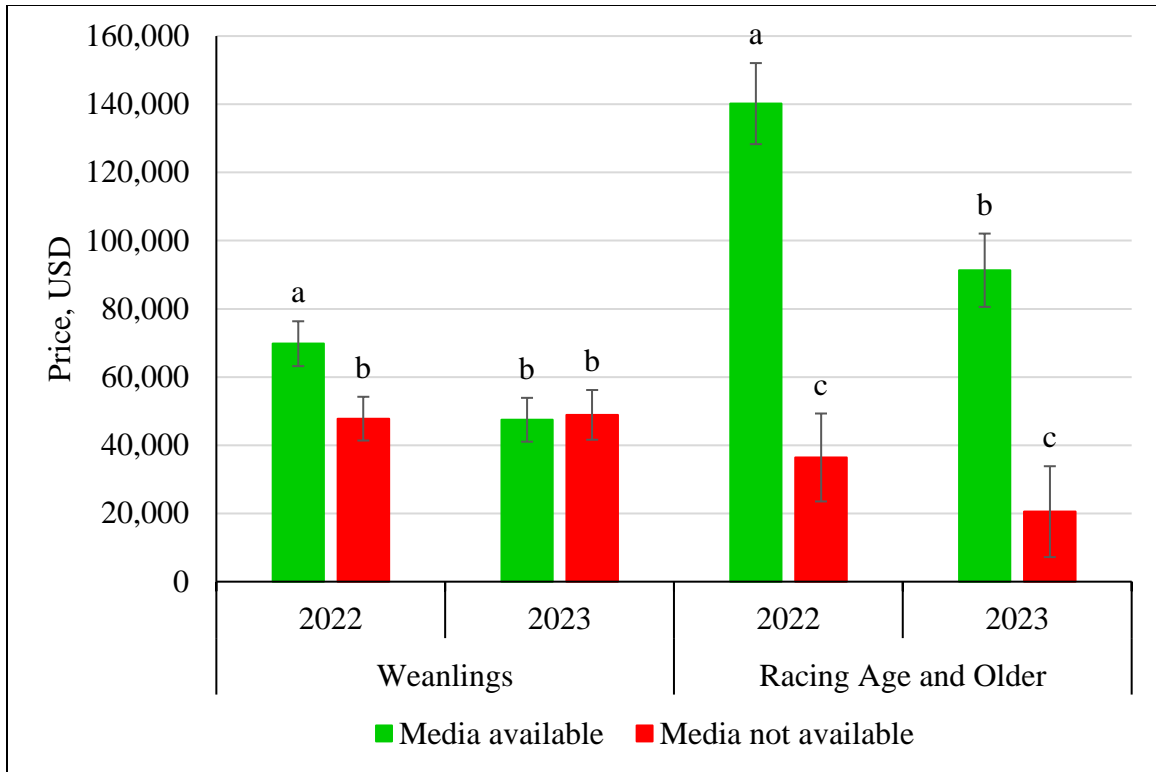
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**Figure 4.** Media by sex interaction for Weanlings and Racing Age and Older data subsets. a,b – within a data subset, values with different letters differ by $P < 0.05$

### 3.2.7. Sex Effect

Males sell for more than females as weanlings ($P = 0.03$; **Figure. 5**), but yearling males only sale for more than females when they possess available media at the time of sale ($P < 0.0001$; **Figure. 6**). In the absence of media, there is no difference between males and females ($P = 0.65$) and both sell for less than females with media ($P < 0.001$). In racing age and breeding animals (**Figure. 5**), females sell for more than males ($P = 0.0005$).
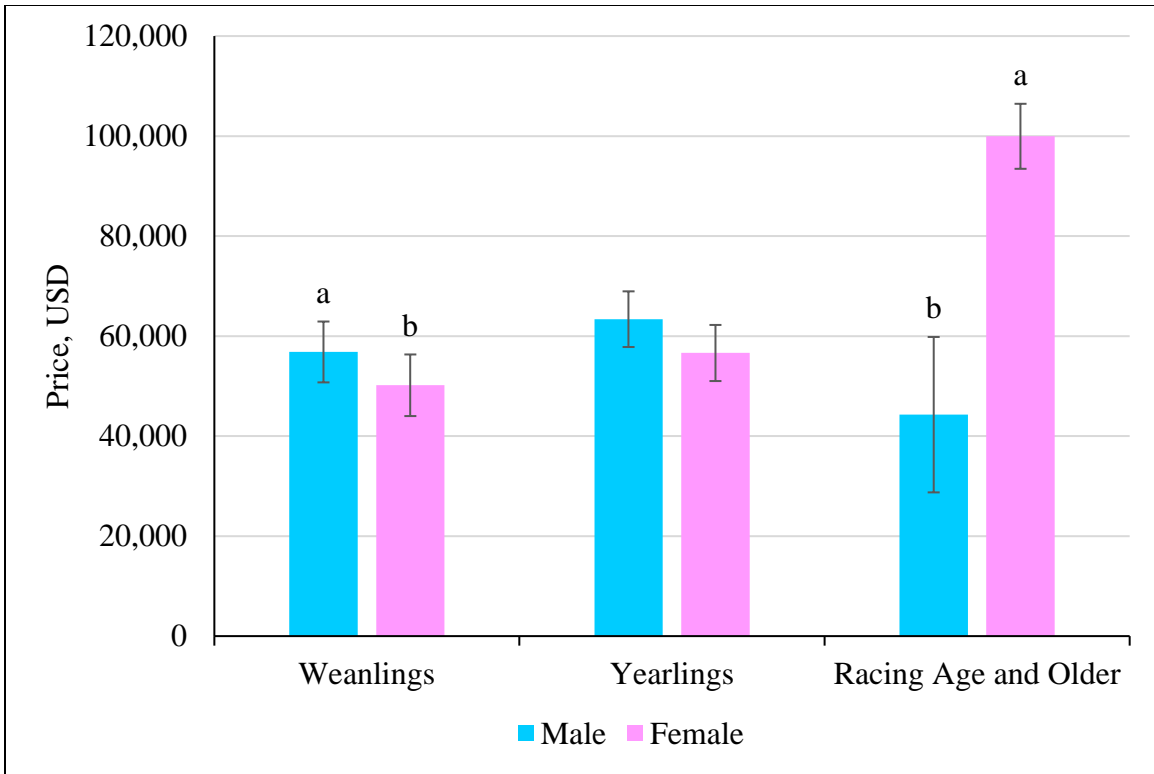
**Figure 5.** The effect of sex on sale price for each of the data subsets (Weanlings, Yearlings, and Racing Age and Older). a,b – within a data subset, values with different letters differ by $P < 0.05$
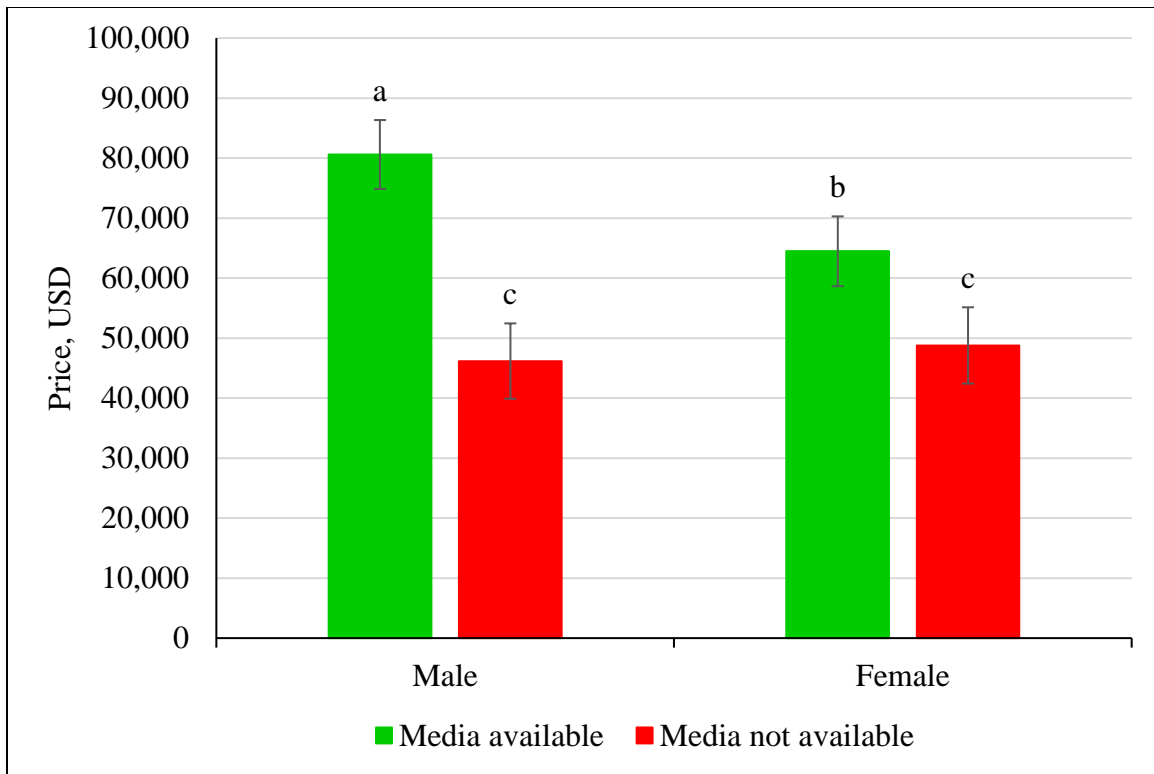
**Figure 6.** Sex by media interaction for Yearlings. a,b – values with different letters differ by $P < 0.05$

### 3.2.8. Color

While color did not affect the price of weanlings ($P = 0.31$), there was a sex by color interaction ($P = 0.01$) for yearlings (**Figure. 7**). For yearlings of the most frequent colors (bay, brown, chestnut), males sold for more than females ($P < 0.02$). However, for yearlings that were of less frequent color types (black, white, grey, roan), females tended to sell for more than males ($P = 0.07$). Color also played a role in the sale price of racing age and older animals ($P = 0.05$; **Figure. 8**), with bays selling for more than chestnut and other ($P < 0.05$). Browns sold for a price intermediate to bays and the other colors, but did not differ from either ($P > 0.12$).
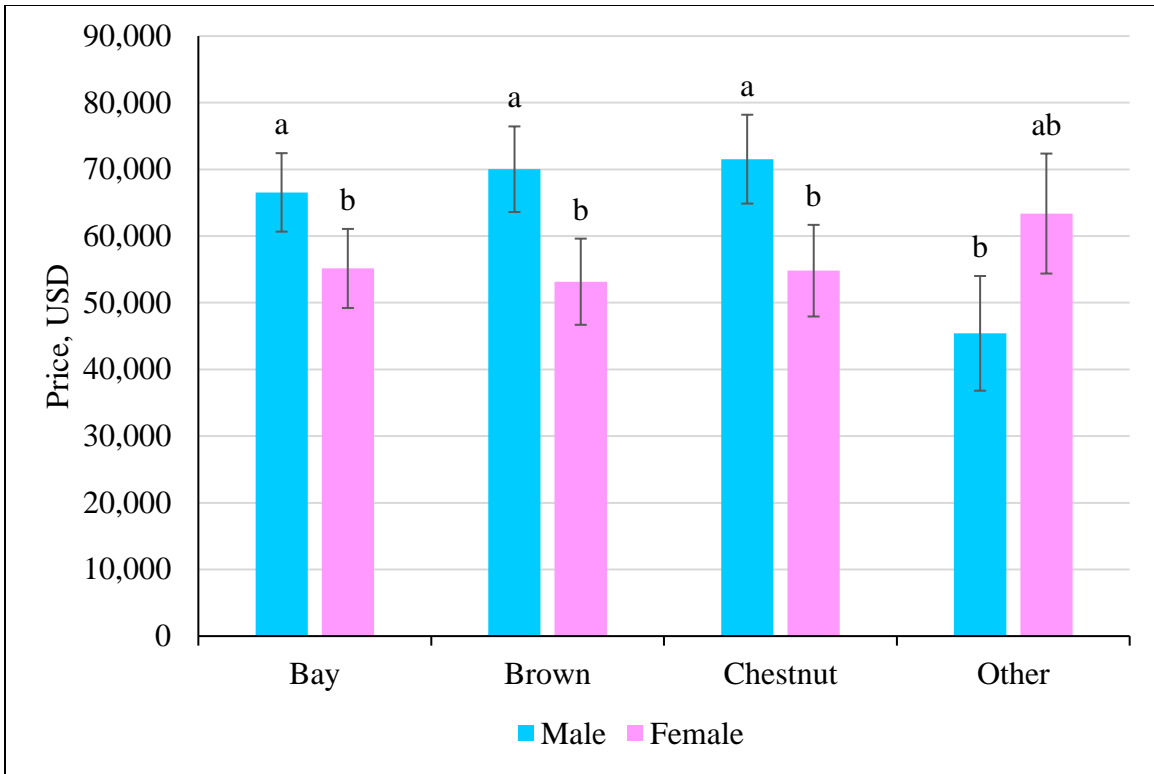
**Figure 7.** Color by sex interaction for Yearling horses. a,b – values with different letters differ by $P < 0.05$
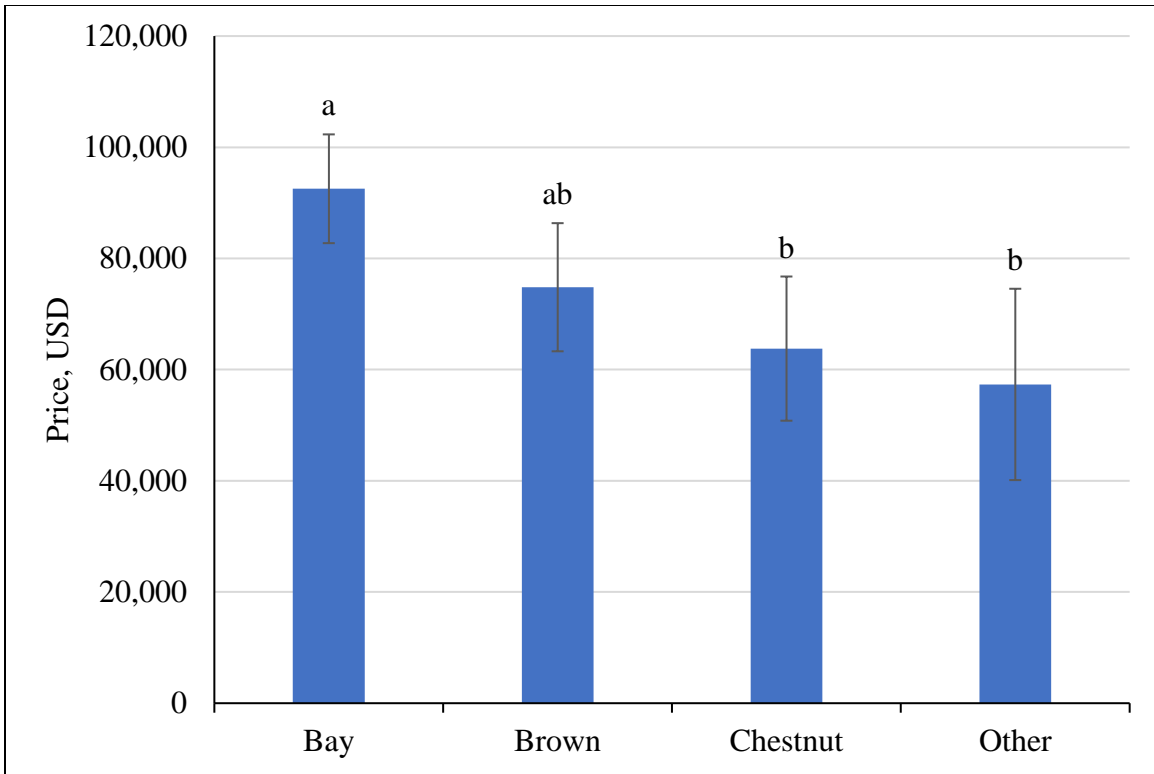
**Figure 8.** The effect of color on sale price in Racing Age and Older horses. a,b – values with different letters differ by $P < 0.05$

### 3.2.9. Sire Frequency and Effect on Price

The effect of sire class on sale price varied greatly across weanlings, yearlings, and horses of racing age and older.

**Table 3.** Level of significance (*P*-value) for fixed effects of Sire, Media, Sex, Color, and Year when sire class[1] is included in the model.

| Effect | *P*-value | | |
|---|---|---|---|
| | Weanlings | Yearlings | Racing Age and Older |
| Sire Class | <.0001 | <.0001 | 0.37 |
| Media | 0.0002 | <.0001 | <.0001 |
| Sex | 0.19 | 0.0005 | 0.001 |
| Color | 0.78 | 0.02 | 0.09 |
| Year | 0.21 | <.0001 | <.0001 |
| Sire Class * Media | 0.01 | <.0001 | 0.49 |
| Sire Class * Sex | 0.66 | <.0001 | 0.96 |
| Sire Class * Color | 0.03 | <.0001 | 0.41 |
| Sire Class * Year | 0.10 | 0.01 | 0.07 |
| Media * Year | 0.004 | 0.005 | |
| Sire Class * Media * Year | | 0.04 | |
| Media * Sex * Color | | 0.01 | |

[1]Sire class: sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire.

For Weanlings (**Figure. 9**), no differences were observed in sale price between horses with and without media for the top two sire classes (*P* > 0.54). However, weanlings in the lower three sire classes sold for more with media than without (*P* < 0.03). In Yearlings (**Figure. 10**), all sire classes sold for more with media than without (*P* < 0.004). Evaluation within those classes of horses with media and those classes of horses without media, yearlings from the top two sire classes sold for similar prices (*P* > 0.40). which were higher than sale prices from other sire classes (*P* < 0.09). Evaluation of Racing Age and Older (**Figure. 11**) revealed no effect of sire class (*P* = 0.37) or an interaction of sire class with media (*P* = 0.49). Horses without media in sire class one tended to sell for more than those in sire classes four or five (*P* = 0.06 and 0.08, respectively), while all other comparisons between sire classes within horses without media were

not significant ($P > 0.26$). Those with media sold for similar prices regardless of sire class ($P > 0.17$).
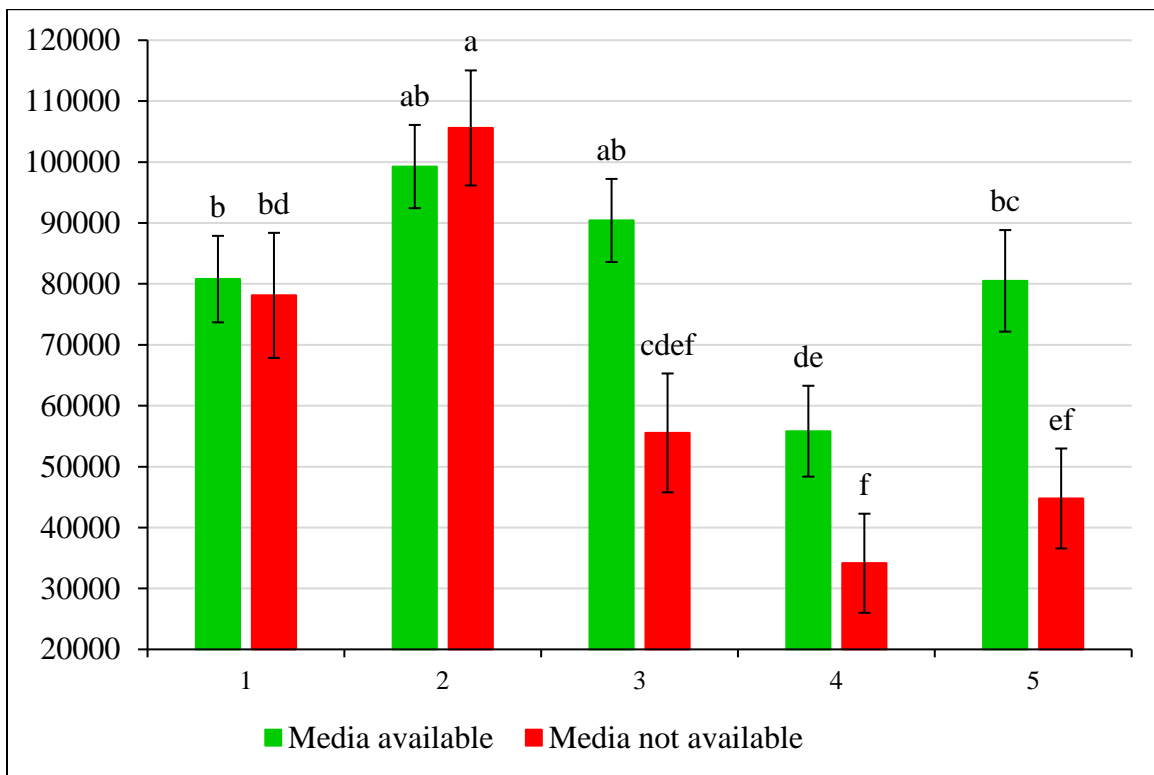


**Figure 9.** Sire class (sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire) by media interaction ($P = 0.01$) for Weanlings. a-f – values with different letters differ by $P < 0.05$
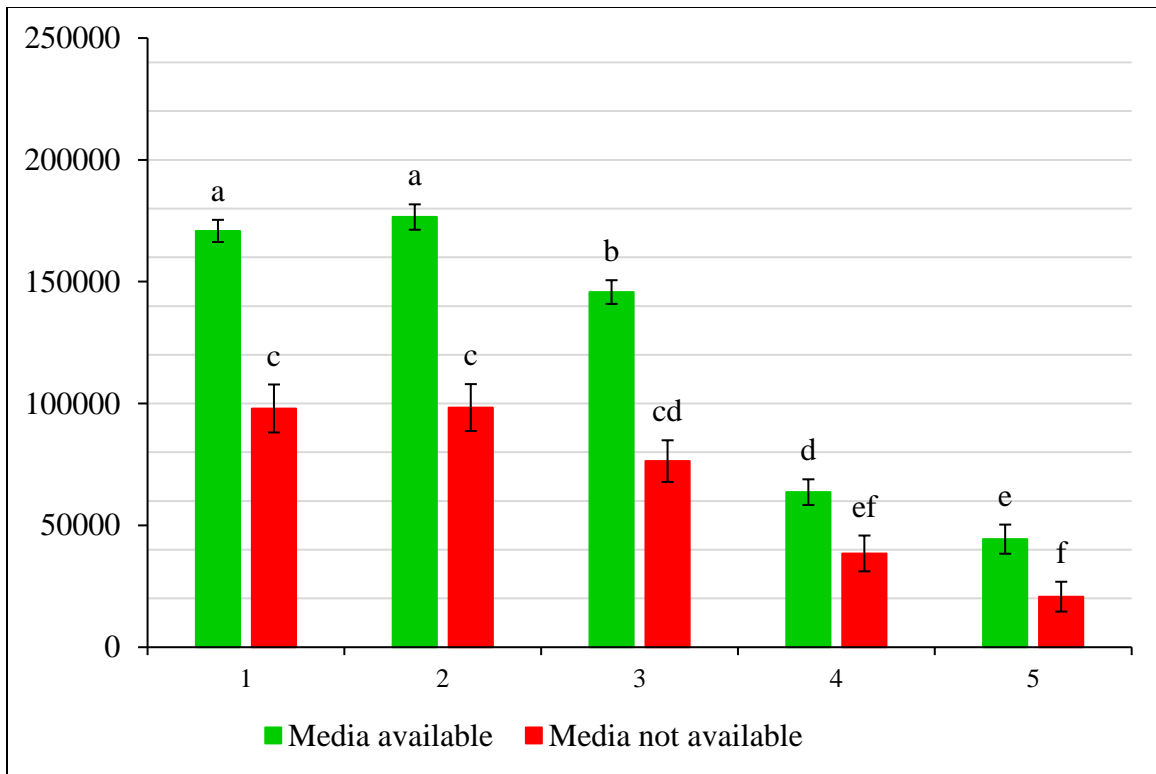
**Figure 10.** Sire class (sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire) by media interaction ($P < 0.0001$) for Yearlings. a-f – values with different letters differ by $P < 0.05$
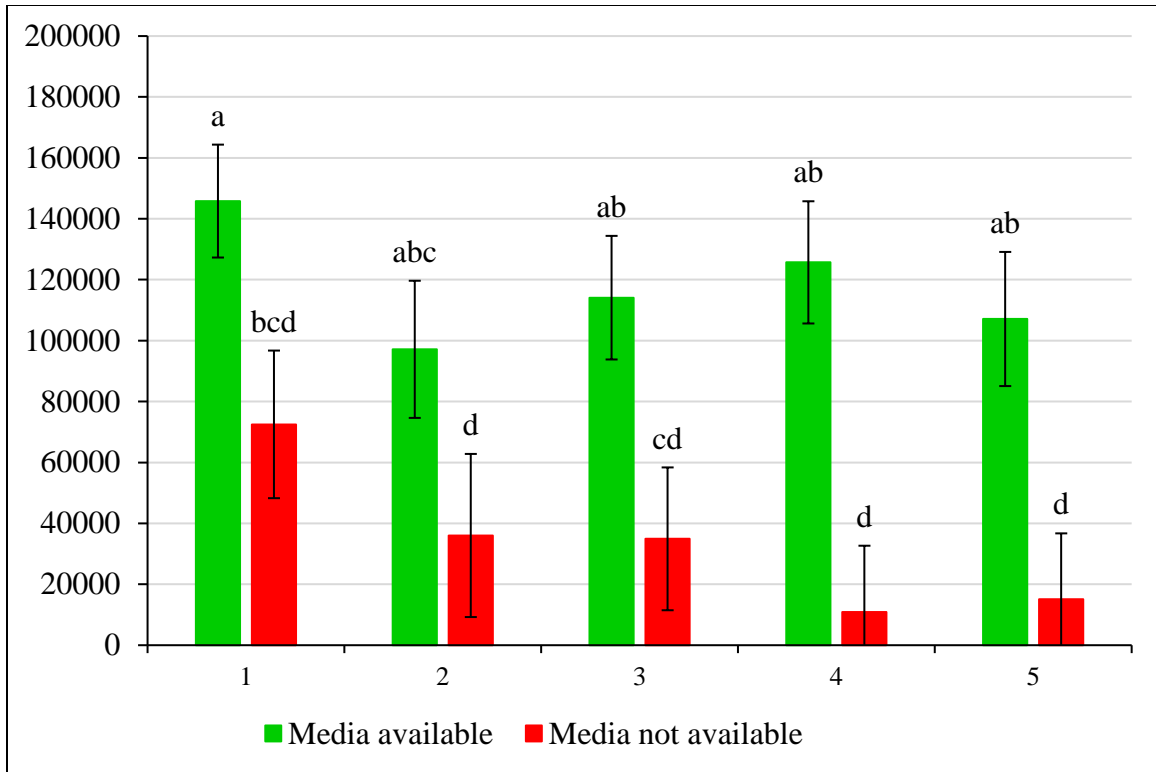
**Figure 11.** Sire class (sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire) by media interaction ($P = 0.49$) for Racing Age and Older. a-d – values with different letters differ by $P < 0.05$

For Weanlings (**Figure. 12**), there appears to be a quadratic effect (not presented) of sire class with those from sire class 2 selling for the most, although not different from sire class 3 in 2022 ($P = 0.34$) or sire class 1 in 2023 ($P = 0.27$). Those in sire class 4 sold for the least, although not different from sire class 5 in 2022 ($P = 0.06$) or sire classes 3 and 5 in 2023 ($P = 0.27$ and $0.22$, respectively). Only sire class 3 sold for more in 2022 than in 2023 ($P = 0.007$), with no difference in sale prices between years within other sire classes ($P > 0.25$). In Yearlings (**Figure. 13**), sire classes 1 to 4 sold for more in 2022 than 2023 ($P < 0.04$), while there no differences were observed in price paid between 2022 and 2023 for sire class 5 ($P = 0.70$). In 2022, sire class 1 and 2 sold for approximately the same amount ($P = 0.10$), with each successive sire class decreasing in price ($P < 0.02$). In 2023, the bottom 2 classes sold for similar prices

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(0.21), while the upper 3 classes were more linear. Sire class 1 sold for more than sire class 3 ($P$ = 0.03), while sire class 2 was intermediate to, but not different from, sire classes 1 and 3 ($P$ = 0.39 and 0.21, respectively). For horses Racing Age and Older (**Figure. 14**), sire class 1 sold for more than sire classes 2 and 5 ($P$ = 0.02 and 0.04, respectively) and tended to sell for more than sire class 3 ($P$ = 0.07) in 2022. All other comparisons between sire classes in 2022 did not differ ($P$ > 0.21). In 2023, horses of racing age and older did not differ in sale prices across sire classes ($P$ > 0.12).
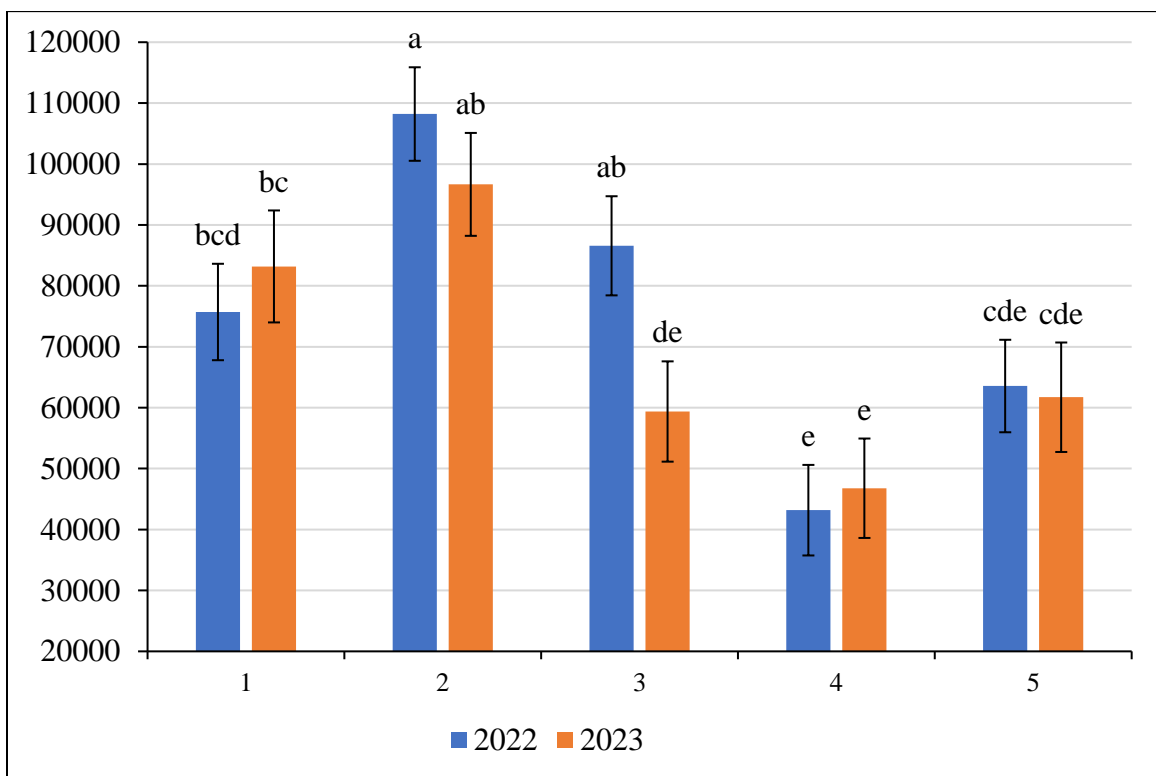


**Figure 12.** Sire class (sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire) by year interaction ($P$ = 0.10) for Weanlings. a-e – values with different letters differ by $P$ < 0.05
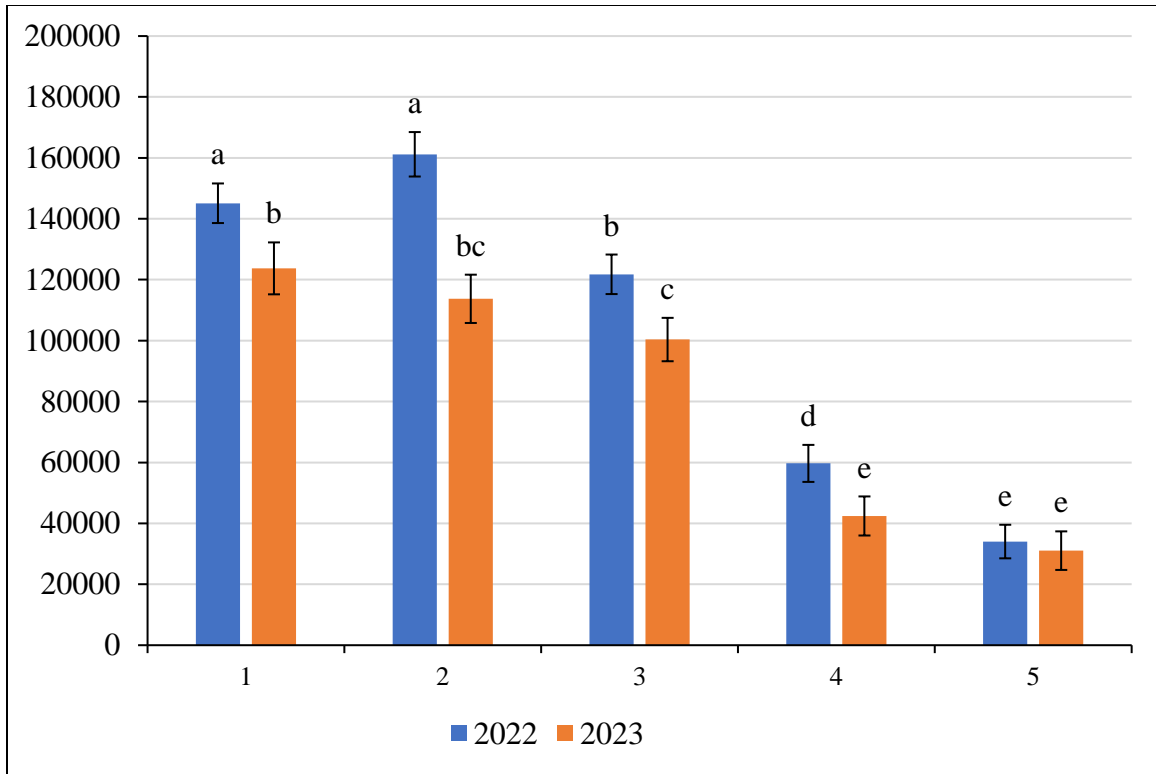
**Figure 13.** Sire class (sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire) by year interaction ($P = 0.01$) for Yearlings. a-e – values with different letters differ by $P < 0.05$
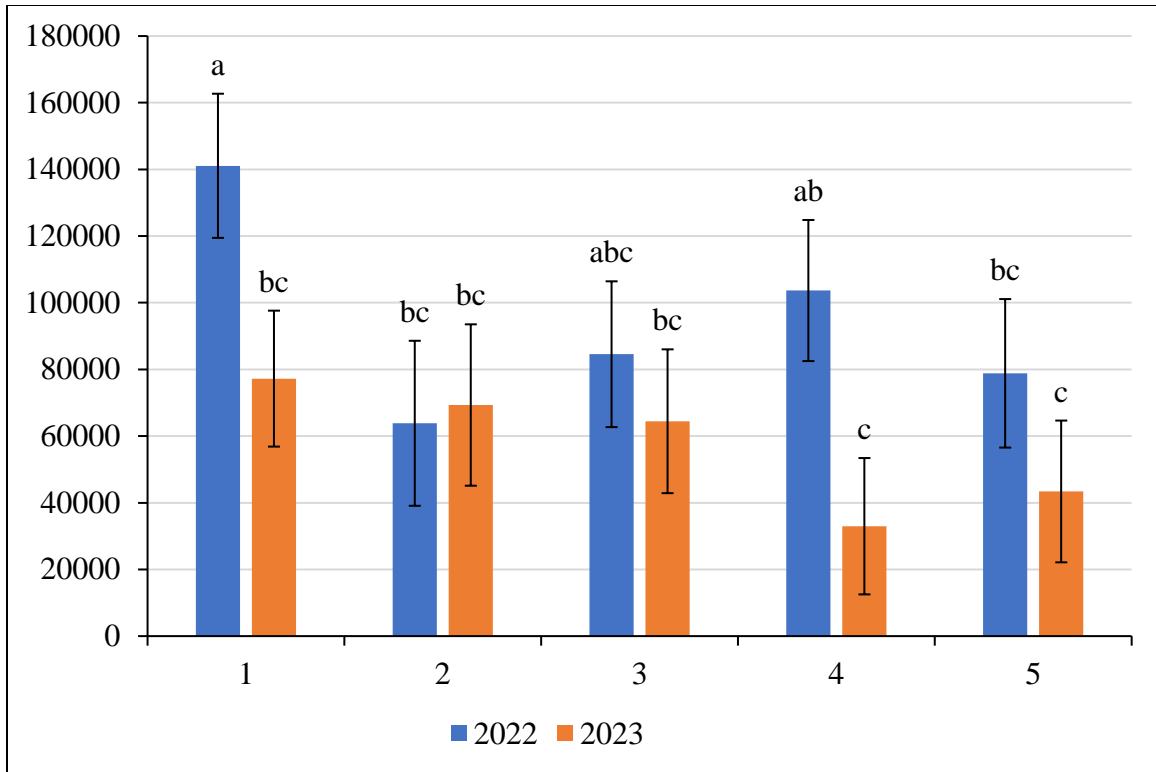
**Figure 14.** Sire class (sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire) by year interaction ($P = 0.007$) for Racing Age and Older. a-c – values with different letters differ by $P < 0.05$

For Yearlings, there was a three-way interaction between sire class, media, and year (**Figure. 15**). Horses with media sold for more than horses without media ($P < 0.04$), except for sire class 4 in 2023 ($P = 0.08$). The effect of year was inconsistent across sire class and media presence. Within media available, 2022 had higher sale prices than 2023 within sire classes 2 and 4 ($P = 0.01$ and $0.02$, respectively) and tended to have higher sale prices within sire class 3 ($P = 0.09$), with similar sale prices within sire classes 1 and 5 ($P = 0.52$ and $0.84$, respectively). Within media not available, 2022 had higher sale prices than 2023 in sire classes 1 and 2 ($P = 0.01$ and $P < 0.0001$, respectively), tended to have higher sale prices within sire class 3 ($P = 0.07$), and presented similar sale prices within sire classes 4 and 5 ($P = 0.32$ and $0.73$, respectively).
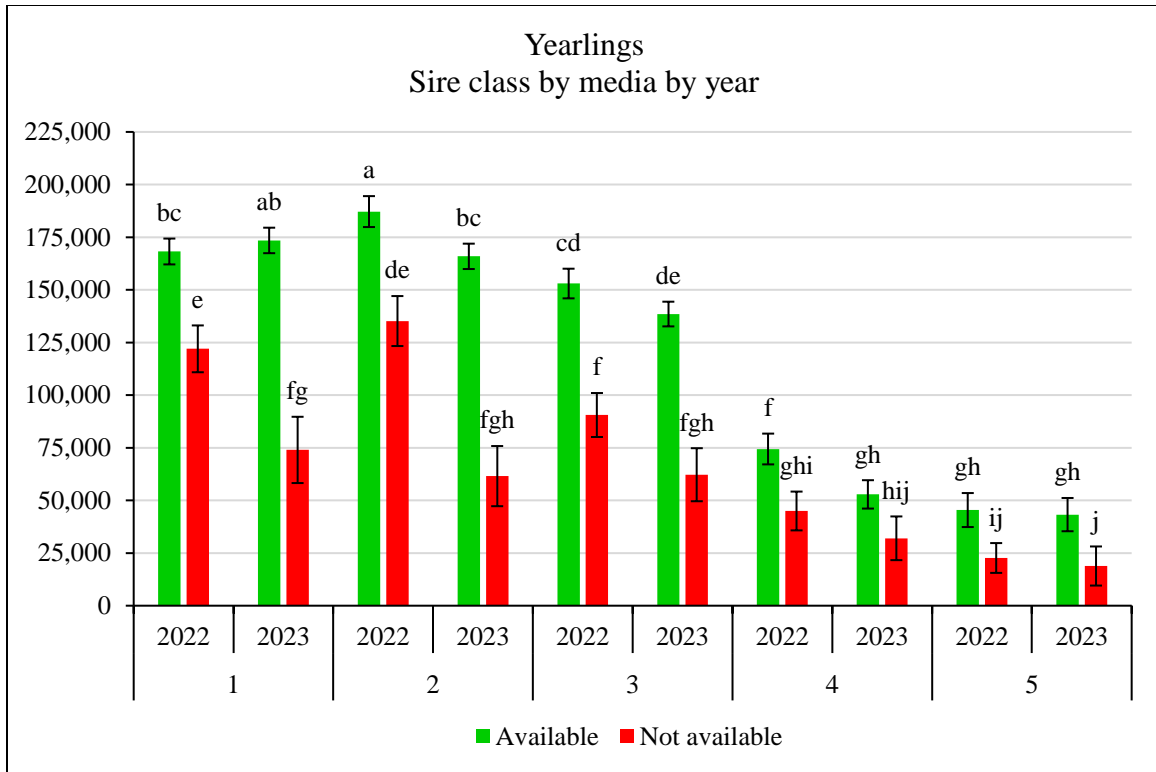
**Figure 15.** Sire class (sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire) by media by year interaction ($P = 0.04$) for Yearlings. a-j – values with different letters differ by $P < 0.05$

Within the Yearlings data subset (**Figure. 16**), males sold for more than females within sire classes 1 and 2 ($P < 0.0001$). However, males and females did not differ in sale price within the last 3 sire classes ($P > 0.60$). Males sold for the same amount in sire classes 1 and 2 ($P = 0.4915$) but then decreased from sire class 2 to sire class 3 ($P < 0.0001$), from sire class 3 to 4 ($P < 0.0001$), and from sire class 4 to 5 ($P = 0.007$). Females sold for the same price in sire classes 1 to 3 ($P > 0.43$) and for the same price in sire classes 4 and 5 ($P = 0.09$), which was lower than the price paid for sire classes 1 to 3 ($P < 0.0001$).
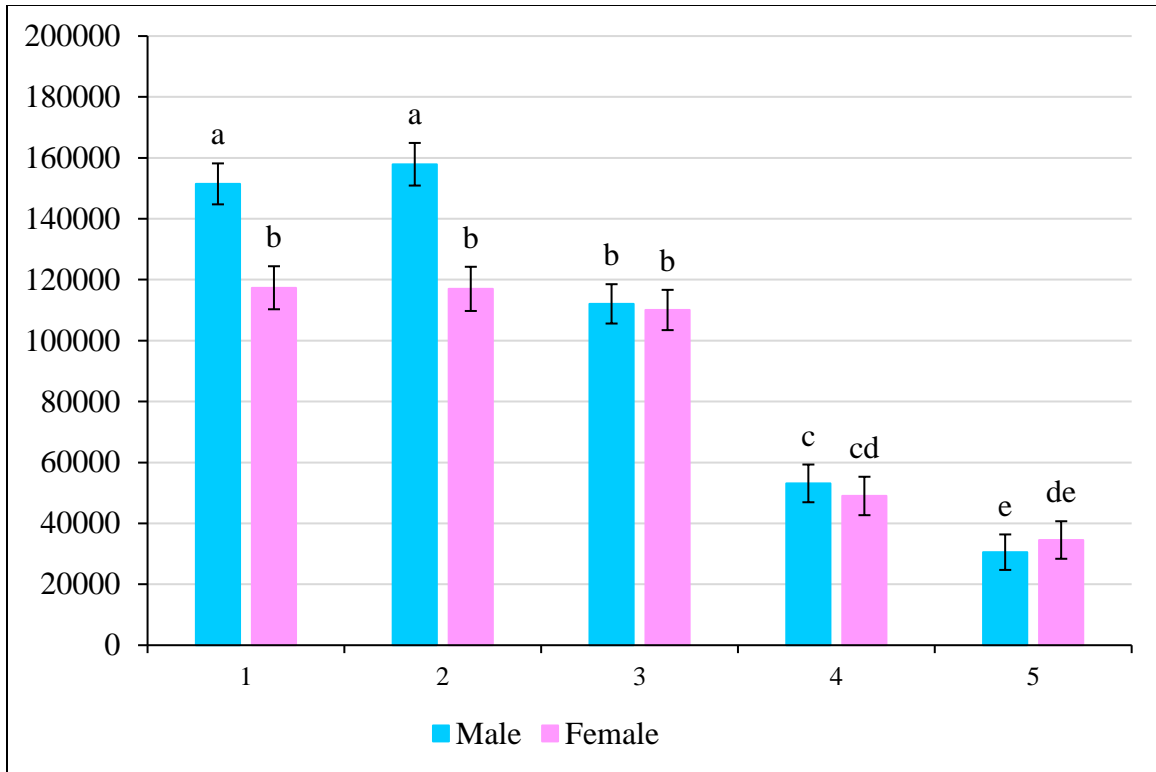
**Figure 16.** Sire class (sires were ranked by frequency of offspring in the sale by subset and each subset was divided into approximate fifths based on the frequency of the sire) by sex interaction ($P < 0.0001$) for Yearlings. a-e – values with different letters differ by $P < 0.05$

### 3.2.10. Frequency of Media Within Different Price Point Categories

Within Weanlings, the frequency of horses with media decreased as the price decreased (**Figure. 17**). Only two weanlings had a sale price over $1 million and both had media. Only 16 weanlings had a sale price between $500,000 and $1 million, with only one (6.3%) of those not having media. There were 439 weanlings with a sale price between $100,000 and $500,000, with 312 (71.1%) having media. Of the 390 weanlings with a sale price between $50,000 and $100,000, 265 (68.0%) had media available. There were 836 weanlings with a sale price between $10,000 and $50,000, with 529 (63.4%) having media available. In the lowest price category (< $10,000), 231 (47.1%) of the 490 weanlings had media available. The chi-square value was 75.9, with a *P*-value less than 0.0001 suggesting that there is an association between media and price point among weanlings.

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Within Yearlings, the frequency of horses with media also decreased as the price decreased (**Figure. 17**). Only 73 of the 10,888 yearlings had a sale price over $1 million, with 66 (90.4%) of those having media. In the price point category of $500,000 to $1 million, 276 of 306 yearlings (90.2%) had media. There were 2,781 yearlings with a sale price between $100,000 and $500,000, with 2,401 (86.3%) having media available. Of the 1,863 yearlings with a sale price between $50,000 and $100,000, 1,450 (77.8%) had media available. There were 3,778 yearlings with a sale price between $10,000 and $50,000, with 2,536 (67.1%) having media available. In the lowest price category ($< $10,000$), 1,079 (51.7%) of the 2,087 yearlings had media available. The chi-square value was 842.8, with a *P*-value less than 0.0001 suggesting an association between media and price point among yearlings.

Within Racing Age and Older, the percent of horses with media also decreased as the price decreased (**Figure. 17**). Only 73 of the 5,160 horses had a sale price over $1 million and 67 (91.8%) of those had media. In the price point range of $500,000 to $1 million, 94 of the 110 horses (85.5%) had media. There were 966 racing age and older horses that sold for between $100,000 and $500,000, with 773 (80.0%) having media available. Of the 736 horses that sold for between $50,000 and $100,000, 520 (70.7%) had media available. There were 1,178 (62.7%) horses with media of the 1,879 that sold for between $10,000 to $50,000. In the lowest price category ($< $10,000$), 666 (47.7%) of the 1,396 had media available. The chi-square value was 330.0, with a *P*-value less than 0.0001 suggesting an association between media and price point among horses that are racing age and older.
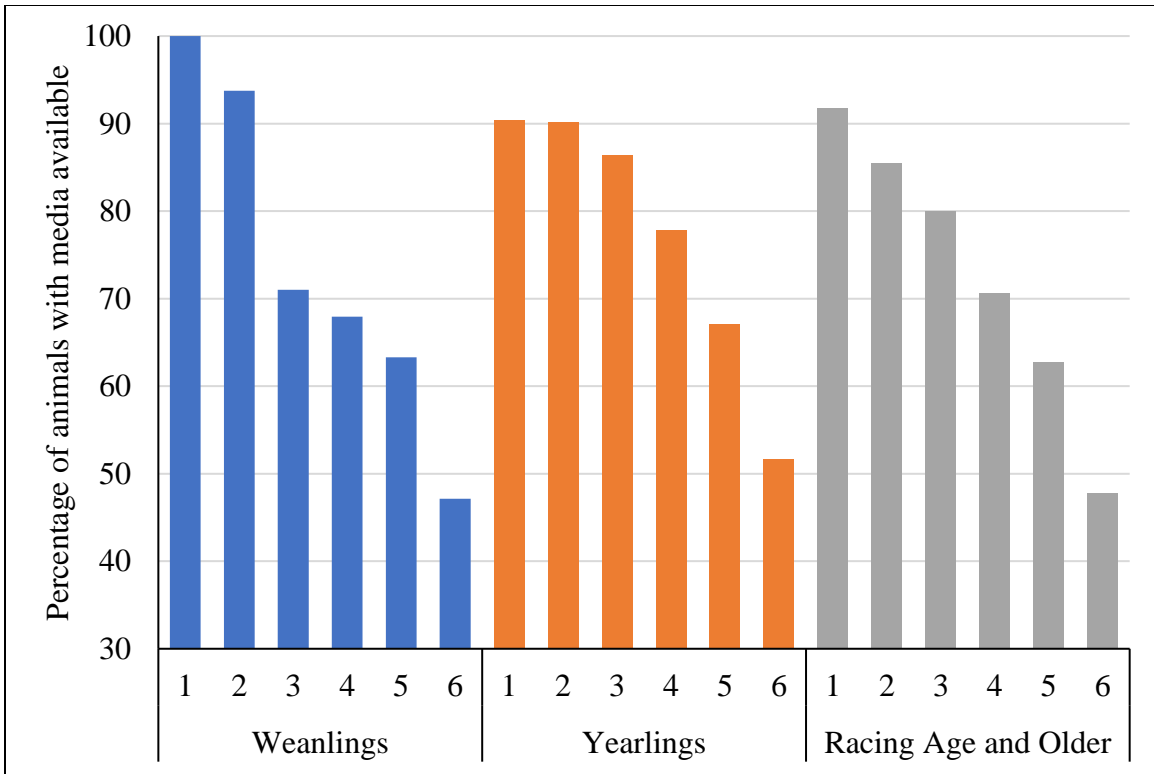
**Figure 17.** Frequency of horses within a price point with media available at the point of sale for Weanlings, Yearlings, and Racing Age and Older horses. Price point categories correspond to the following values: 1 = >$1 million; 2 = $500k to $1 million; 3 = $100k - $500k; 4 = $50k - $100k; 5 = $10k - $50k; 6 = <$10k

# 4. DISCUSSION

## 4.1. Discussion

The objective of this study was to determine the impact of media availability at the point of sale impacted the price paid for Thoroughbred horses at auction. Regardless of horse classification category (Weanling, Yearling, or Racing Age and Older), the availability of media, either a still photo or video, was associated with an increased price paid for a Thoroughbred at auction. Thoroughbred horses with media sold for approximately $73,000 more than those horses without media. When separated by category, the Racing Age and Older category were impacted the most by the presence of media. A possible reason for the increased price paid for Racing Age and Older horses may be the fact that this category is comprised of a large percentage of female horses. Females at this stage of life are transitioning from racing competition to broodmare status. Females of this category are more likely to retain residual value because of their genetic ability as breeding stock. As buyers invest in breeding stock for their genetic potential, premiums are paid for females more apt to pass competitive athletic ability to their offspring. Potential buyers of horses within this category are specifically seeking images and video of broodmares which will be used in their decision to purchase or not. The phenotypic appearance of weanlings and yearlings is more prone to change with age and maturity; therefore, the media provided of mature horses is a better assessment of current phenotype at the time of auction. From our findings in the present study, we may hypothesize that those buyers purchasing within the Racing Age and Older category may place more value on the media presented for the horse than they do on the in-person visual appraisal. Future research could survey buyers to gain greater understanding regarding how the use of media influences their buying decisions.

The influence of media was also found to be significantly associated with Weanlings and Yearlings. Yearlings sold for approximately $25,000 more than their contemporaries that did not possess accompanying media. Further, weanlings with media sold for approximately $10,000 more than weanlings without. Of the three categories evaluated, Weanling horses had the lowest presence of media with just over 61%. As previously mentioned, weanlings are the youngest and the most immature during this phase of life and often undergo the most rapid phenotypic changes as they develop to the next classification category. In other words, media images of weanlings quickly become outdated and may not be worth the investment because the animal outgrows its image.  Weanlings are also the most challenging to photograph. In a review by Authors (year), it was suggested that factors such as pedigree and race performance of the prospective weanling's sire or dam are the driving marketing factors that influence the price paid for weanlings. The impact of media on price paid for weanlings is further confounded because consignors will often set a reserve price on weanlings and if a horse does not achieve that desired bid price, the horse is not sold and the consignor retains ownership. The frequency of RNA for weanlings is due to the fact that there are future opportunities to sell the horse during the next calendar year when they become a yearling.  Furthermore, RNA weanlings could be developed for a Two-year Old in Training sale.

Vickner & Koch (2001) noted that buyers and sellers recognize that providing additional information about the sale horses will impact the price paid for Thoroughbreds at auction. Additionally, Mokobombang & Kusumawati (2023) reported that providing a description of a product with an accompanying product photo had a positive impact on the intent to purchase E-commerce products. Thus, it could be suggested that the presence of media coupled with relevant racing/genetic information of Thoroughbreds presented for sale at auction could impart a similar

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effect on the buyers' intent to purchase Thoroughbred horses. The outcome of this study supports the hypothesis that the media is a contributing factor in price paid for horses at auction. Approximately 11,000 yearlings were included in this study and over 71% of yearlings sold with media. This was the highest percentage of media present of the three categories in this study. Therefore, it could be assumed that consignors believe that having media available for potential buyers to view would be beneficial for their sales.

Consignors have the right to set a reserve price. A reserve price is a minimum bid price a horse must achieve in order to sell to a new owner. If a horse does not achieve that bid price in the auction, the horse does not sell and the consignor retains ownership. As previously stated, the industry term for this is "Reserve Not Achieved" (RNA). Based on the frequencies of media and being sold, there was an association between the presence of media and a horse selling; specifically, in the categories of Yearlings and Racing Age and Older. From these findings, we may be tempted to conclude that when media is present, a consignor is more likely to sell their horse or achieve their desired sale price. However, in Weanlings, the same does not hold true as the current study does not support the relationship between media and whether or not a weanling is sold. The lack of association between media and sale of weanlings is further degraded due to the fact that weanlings have the lowest percentage of media present and are provided a greater number of opportunities for sale as they mature. Therefore, consignors are more likely to set a higher reserve price and retain ownership.

In the present study, males brought a higher price at auction than females. This supports our assumption that buyers are seeking those males who could develop into great racehorses on the track and develop into top stallion prospects. We found that the media $\times$ sex interaction was most apparent in Yearlings. Yearling males with media sold for more than females with media.

However, there was no difference in price paid between males without media and females without media present. Additionally, females with media sold for more than both males and females without media thus strengthening the evidence that the presence of media does impact the price paid for Thoroughbreds yearlings at auction. The effect of sex in the Racing Age and Older category was opposite compared to yearlings whereby females sold for more than males. This supports our assumption that females in this category offer more residual value because of their genetic contributions in the future as a broodmare. Males in this category sell for less compared to the females because they tend to be horses that were less successful on the track, were not high-quality enough to stand as a stallion, or have been gelded (castrated).

There was a reduction in the price paid for a Thoroughbred horse across all three categories from 2022 to 2023. The average price paid per horse in the Racing Age and Older category dropped $32,000 from 2022 to 2023. Weanlings and Yearlings dropped nearly $10,500 over the same timeframe. Factors impacting the reduction in price paid at auction may include a change in the global economy, inflation, increasing production costs and expenses, as well as a reduction the perceived quality overall in the foal crop available at that point in history. There was a media and year interaction on weanlings in 2022 which could be associated with a difference of approximately $20,000 in price paid for a weanling with media versus a weanling without; however, no difference was observed in 2023. There was a media and year interaction for horses of racing age and older where horses with media sold for $104,000 more than those without media in 2022, while in 2023 horses with media only sold for $71,000 more than those without media. The real reason for this reduction in price is the result of a number of complex economic and environmental factors. A more in-depth evaluation of the global economy during

this timeframe, as well as the exchange rate for international buyers, could result in a better understanding of price fluctuation from year to year.

The color of each horse included in this study was provided in the sales data bank and therefore was included in this model. A sex $\times$ color interaction in Yearlings was observed, whereby males representing the more frequent colors sold for more than the females of the same colors. Also, it was observed that yearling females of the less frequent colors showed a tendency to sell for more than the males of the less frequent colors. It is difficult to explain the reason why certain color of horses sold for higher prices other than the personal preferences of the buyers.

The sire of each horse in this dataset was provided and was subdivided for analysis based on the frequency of a sire within a subset of data. Sires were ranked by frequency of offspring in the sale within each subset, then each subset was further divided again into approximate fifths based on sire frequency. Weanlings with media in the lower three sire classes, old for more versus those weanlings without media. This supports our hypothesis that offspring from popular or highly-used sires are being purchased on the value of their pedigree, but for those horses sired by less popular sires, the presence of media may be the extra piece of information that drives the intent to purchase and (or) price paid of those lower frequency horses. Yearlings with media sold for more versus those without media regardless of the sire class. This further strengthens the idea that the presence of media impacts sale price. As for the Racing Age and Older category, sire class did not make a difference. A potential takeaway from this result is buyers of racing age or older horses are shifting their selection decisions away from sire popularity and moving towards the individual traits of the horse, such as individual race records of the sire or race records of their offspring. In Weanlings, it was observed that sire class 2 (the second most popular sires based on number of offspring) tended to sell for more than sire classes 1, 3, 4 and 5. A possible

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explanation of this may be that sire class 2 could contain younger or newer sires that are gaining popularity. Also, this sire class might contain those sires that are on the rise in popularity and the market is not yet saturated with a surplus of offspring from this sire class. A deeper study into sire classes could evaluate additional factors that may be contributing to an increased sale price associated with sire popularity such as the age of the sire, the number of foal crops previously sired, the age of the sire's oldest offspring, and associated stud fee. As for media and sire class, those horses with media sold for more than those without media, further supporting the idea media impacts the prices paid for Thoroughbred horses at auction.

The frequencies of media versus price point proved to be promising and valuable information for consignors and auction companies. Price points were divided into six subsets within the three categories of horses in this study (Weanling, Yearling, and Racing Age and Older). The subsets were greater than $1 million, $500K to $1 million, $100K to $500K, $50K to $100K, $10K to $50K and less than $10K. After analysis, a linear trend was observed. As the percentage of horses with media decreased, the price paid for a Thoroughbred horse at auction also decreased. The take away from this result clearly supports the original research hypothesis that the presence of media has a positive impact on prices paid for a Thoroughbred, regardless of the category of horse. It is possible to conclude that because horses with media are being viewed by potential buyers, the presence of media is influencing the decisions of buyers and demanding a higher price. A differing view of this topic could be presented. Consignors that believe their horses are of higher-quality will choose to provide media on their sale entry versus those who may feel their horses are of lower quality and elect not to provide media. Future research could utilize survey data obtained from Thoroughbred consignors as a means to examine reasons why sellers of horses either provide or do not provide media for a particular horse. Evaluation of this

sort of marketing information may lend more clarity regarding whether or not high-quality

horses will by nature possess the accompanying media while lower quality horses may be

deemed not worthy of the effort.

## 4.2. Implications

It has been proven that photos and videos are important tools to influence a consumer's

willingness to purchase and how much they are willing to pay (Mokobombang and Kusumawati,

2023). This study is the first to support this marketing strategy relative to the impact photos

and/or videos play in the prices paid for Thoroughbred horses sold at auction. Thoroughbred

horses possessing media allows a potential buyer to virtually inspect a horse prior to the auction,

allows consignors to use these data to justify the additional expense of photos/videos prior to an

auction, and allows auction companies to better serve their clientele with another useful piece of

information their customers can use to make a more informed buying decisions. Furthermore,

this study could be replicated in a number of different species of livestock that sell animals in an

auction-type setting such as the purebred beef seedstock industry; especially auctions of purebred

beef bulls.

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# APPENDIX

Consigned by Taylor Made Sales Agency, Agent
for DJ Stable LLC Graduate

## Wonder Wheel

| Wonder Wheel . . .<br>Dark bay/br. filly;<br>foaled 2020 | Into Mischief . . . . . . . . | Harlan's Holiday . . . . . | Harlan<br>Christmas in Aiken |
| | | Leslie's Lady . . . . . . . | Tricky Creek<br>Crystal Lady |
| | Wonder Gal . . . . . . .<br>(2012) | Tiz Wonderful . . . . . . . | Tiznow<br>Evil |
| | | Passe . . . . . . . . . . . . | Dixie Union<br>Gal On the Go |
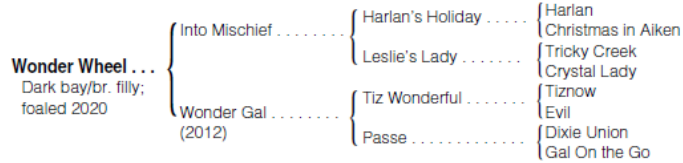
By **INTO MISCHIEF** (2005), [**G1**] $597,080. Leading sire 4 times. Sire of 12 crops, 135 black type wnrs, 7 champions, $156,369,634, including Authentic [**G1**] ($7,201,200), Gamine [**G1**]-ntr ($1,771,500), Wonder Wheel [**G1**] ($1,591,857) and Life Is Good [**G1**] ($4,541,700). Sire of dams of black type winners White Abarrio, Stitched, Club Car, Cilla, etc.

**1st dam**
**WONDER GAL**, by Tiz Wonderful. 4 wins, 2 to 5, $904,800, Ladies H. [**L**] (AQU, $60,000), Empire Distaff H.-R (BEL, $150,000), Lynbrook S.-R (BEL, $75,000), 2nd Mother Goose S. [**G1**] (BEL, $60,000), Frizette S. [**G1**] (BEL, $100,000), 3rd Acorn S. [**G1**] (BEL, $75,000), Breeders' Cup Juvenile Fillies [**G1**] (SA, $200,000), Adirondack S. [**G2**] (SAR, $20,-000), Comely S. [**G3**] (AQU, $30,000), Go for Wand H. [**G3**] (AQU, $25,-000), Ladies H. [**L**] (AQU, $10,000). Dam of 2 foals of racing age--
    **WONDER WHEEL** (f. by Into Mischief). Black type winner, see below.
    Road Bible (g. by Pioneerof the Nile). 4 wins, 3 to 5, 2023, $81,680.

**2nd dam**
PASSE, by Dixie Union. Unraced. Dam of 2 foals to race, both winners, incl.--
    **WONDER GAL** (f. by Tiz Wonderful). Black type winner, see above.

**3rd dam**
**GAL ON THE GO**, by Irgun. 4 wins at 2 and 3, $238,949, Valdale S. [**L**] (TP, $31,300), 2nd Singapore Plate S. [**G3**], HBPA H. [**L**], Winning Colors S. [**L**], Fairway Fun S., 3rd Chou Croute H. [**L**], etc. Dam of 5 winners, incl.--
    **SOCIAL QUEEN**. 6 wins, 3 to 5, $335,700 in N.A./U.S., Eatontown H. [**G3**] (MTH, $90,000), Gallorette H. [**G3**] (PIM, $60,000), Politely S., Eatontown S., 3rd Beaugay S. [**G3**], etc. Total: $344,164. Dam of--
        **FORCE THE PASS**. 5 wins, $1,359,114, Belmont Derby Invitational S. [**G1**] (BEL, $670,000), Penn Mile S. [**G3**] (PEN, $272,000), Cliff Hanger S. [**L**], 2nd Poker S. [**G3**] (BEL, $60,000), Forbidden Apple S. [**L**], James W. Murphy S. [**L**], 3rd Secretariat S. [**G1**], Commonwealth Derby [**G2**], Monmouth S. [**G2**], Commonwealth Turf Cup S. [**G2**], etc.
    I'm Always Hopeful. Placed at 3, $6,340. Dam of 4 winners, including--
        Nakamura. 4 wins at 3 and 4, $258,222 in N.A./U.S., 2nd Sycamore S. [**G3**], 3rd Elkhorn S. [**G2**], Japan Turf Cup S. [**L**], etc. Total: $265,230.

**4th dam**
Gypsy, by Marfa. 2 wins at 2, $49,815, 2nd Magnolia Breeders' Cup S. Half-sister to **PERFECT DRIFT** ($4,714,213, Stephen Foster H. [**G1**], etc.), **Raintree Lake**. Dam of 8 winners, including **GAL ON THE GO** (above).

Race Record: (In N.A./U.S.) at 2, champion, 4 wins (Breeders' Cup Juvenile Fillies [**G1**], KEE, $1,040,000, Darley Alcibiades S. [**G1**], KEE, $275,125, Debutante S. [**L**], CD, $106,140), once 2nd (Spinaway S. [**G1**], SAR, $60,-000) in 5 starts; at 3, once 2nd (Suncoast S. [**L**], TAM, $20,000). Totals: 4 wins, twice 2nd in 8 starts, earned $1,590,725. (In Canada) at 3, unplaced in 1 start. Earned $1,500. Total: $1,591,857.
**Broodmare prospect.**

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**Figure A1**. Sale catalog page
Note: Example sale catalog page. (Fasig-Tipton, 2024)

Figure A2. How to read a sale catalog page
Note: Directions on how to read a sale catalog page. (Van Leer, 2019)

## 2024 January Sale

Photos | Documents | Videos | Updates

All Sessions | RESET | PDF | CSV | SEARCH | CATALOG DOWNLOADS | CATALOG UPDATES

| Hip | Sex | Sold As | Horse | Sire | Dam | Covering Sire | PregConsignor | Barn | Buyer | Price | Out |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0001 | M | Broodmare | Machu Picchu | Violence | Unfold the Rose | Game Winner PR | Bedouin Bloodstock, Agent III | 1 | Straightaway Farm | 55,000 | |
| 0002 | F | Yearling | | Silver State | Magical Dancer | | Bridie Harrison, Agent for Peter E. Blum Thoroughbreds | 10 | Alberto Ramirez | 6,000 | |
| 0003 | F | Yearling | | Lexitonian | Magical Dream | | Buckland Sales (Zach Madden), Agent XIII | 2 | Scott Pierce | 20,000 | |
| 0004 | F | Yearling | | Blame | Magically Honored | | Checkmate Thoroughbreds LLC (Adrian Gonzalez), Agent | 8 | SBTL Stables | 30,000 | |
| 0005 | M | Broodmare | Magic of Reality (FR) | Galileo (IRE) | Breathe (FR) | NM | Keith Lancaster, Agent | 10 | JC Bloodstock | 60,000 | |
| 0006 | F | Yearling | | Hard Spun | Majorette | | Hunter Valley Farm, Agent | 1 | Kinsman Farm | 70,000 | |
| 0007 | C | Yearling | | Mitole | Mama Said No | | Hill 'n' Dale at Xalapa, Agent | 7 | | | OUT |
| 0008 | F | Racing or Broodmare Prospect | Manhattan Jungle (IRE) | Bungle Inthejungle (GB) | Skylight (IRE) | | Bluewater Sales LLC, Agent X | 8 | R.N.A. (170,000) | | RNA |
| 0009 | F | Broodmare Prospect | Map | Practical Joke | Snap Cat | | Susan Y. Foreman, Agent | 8 | J. C. Farm | 5,000 | PS |
| 0010 | F | Yearling | | Maxfield | Maqboola | | Hunter Valley Farm, Agent | 1 | Dear Creek Stables | 120,000 | |
| 0011 | C | Yearling | | Improbable | Ma Reve | | Buckland Sales (Zach Madden), Agent XVIII | 2.5 | Pierre and Leslie Amestoy &amp; Roger Beasley | 37,000 | |
| 0012 | F | Yearling | | Maximus Mischief | Margarita Island | | Legacy Bloodstock, Agent VIII | 9 | R.N.A. (6,000) | | RNA |
| 0013 | F | Yearling | | Violence | Marine Layer | | Checkmate Thoroughbreds LLC (Adrian Gonzalez), Agent | 8 | R.N.A. (37,000) | | RNA |
| 0014 | M | Broodmare | Marriage | Will Take Charge | Lady's Touch | Flameaway PR | Johnson Cross, Agent II | 4 | Straightaway Farm | 25,000 | |
| 0015 | M | Racing or Broodmare Prospect | Marvelous Maude | Slumber (GB) | Wait Your Turn | | ELiTE, Agent | 5 | | | OUT |
| 0016 | F | Yearling | | Classic Empire | Mary Bernice | | Taylor Made Sales Agency, Agent XVI | 3 | | | OUT |
| 0017 | M | Broodmare | McGuire | Curlin | Wyomia | Take Charge Indy PR | Taylor Made Sales Agency, Agent XXXV | 3 | Straightaway Farm | 40,000 | |

**Figure A3**. Online sale catalog page
Note: Example of a portion of an online sale catalog. (Keeneland Sales, 2024)

| HIP | FAV | SOLD AS | NAME / COVERING SIRE | SIRE - DAM , COLOR SEX | CONSIGNOR | STATE | BARN | BONUS | PP | BUYER / PRICE |
|---|---|---|---|---|---|---|---|---|---|---|
| 537 | ♡ | RB | JUST READ IT | CONSTITUTION-MYBROKENHOME, DKB F | TAYLOR MADE SALES AGENCY AGENT XLII | KY | 1&2 | VIDEO Photos | PP | WACHTEL STABLE $200,000 |
| 536 | ♡ | RB | ELOQUENT SPEAKER | FLATTER-SPOKEN NOT BROKEN, B M | TAYLOR MADE SALES AGENCY AGENT XLIII | NY | 1&2 | VIDEO Photos | PP | BLUEWATER SALES LLC, AGENT $200,000 |
| 359 | ♡ | B | LEMHILL BASR AMERICAN PHAROAH | QUALITY ROAD-DIPLOMAT LADY, B M | HILL 'N' DALE SALES AGENCY AGENT | KY | 3 | | | CYPRESS CREEK LLC $200,000 |
| 273 | ♡ | Y | | TWIRLING CANDY-FLOURISH, B F | BLAKE-ALBINA THOROUGHBRED SERVICES LLC AGENT I | KY | 11 | VIDEO Photos | | MKW INVESTMENTS LLC $190,000 |
| 180 | ♡ | Y | | SPEIGHTSTOWN-BOW, CH F | TAYLOR MADE SALES AGENCY AGENT XXXVI | KY | 1&2 | VIDEO Photos | | BLUEWATER, AGENT FOR MAIN LINE RACING $185,000 |
| 337 | ♡ | Y | | CITY OF LIGHT-JUSTWALKONBY, B C | TAYLOR MADE SALES AGENCY AGENT XXXVI | KY | 1&2 | VIDEO Photos | | FOUR STAR SALES, AGENT $180,000 |
| 434 | ♡ | B | PATTI'S REGAL SONG | UNBRIDLED'S SONG-REGAL PENNANT, GRR M | VINERY SALES AGENT XXIX | KY | 14&15 | | | SEAN S PERL BLOODSTOCK & BACCARI BLOODSTOCK $175,000 |

**Figure A4**. Online sale catalog page
Note: Example of a portion of an online sale catalog. (Fasig-Tipton, 2024)

| Hip | Horse | Photo | Sex | Sire | Dam | CoveringSire | Consignor | Buyer | RNA / PS | Out | Price ▾ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0092 | Metfardeh | Photo | Filly | Into Mischief | Delightful Joy | | Gainesway, Agent XXIII | Shadwell Racing, LLC | | | 2,300,000 |
| 0154 | | Photo | Colt | Uncle Mo | Helena Bay (GB) | | Runnymede Farm LLC, Agent | Donato Lanni, Agent for Zedan Racing | | | 2,000,000 |
| 0162 | | Photo | Colt | Into Mischief | I'll Take Charge | | Gainesway, Agent XL | Jersey City Destroyers Stables | | | 1,700,000 |
| 0145 | Mischievous Intent | Photo | Colt | Into Mischief | Guarana | | Hill 'n' Dale at Xalapa, Agent | Winchell Thoroughbreds LLC | | | 1,400,000 |
| 0094 | Sansone | | Colt | Uncle Mo | Diva Delite | | Hunter Valley Farm, Agent | Sonson, Woodford, West Point, LEB, A... | | | 1,350,000 |
| 0130 | | Photo | Colt | Uncle Mo | Forever for Now | | Penn Sales, Agent for Bar C Racing Stables | MV Magnier | | | 1,350,000 |
| 0018 | | Photo | Colt | Into Mischief | American Gal | | Gainesway, Agent XL | Grandview Equine | | | 1,100,000 |
| 0147 | Ghostrick | Photo | Colt | Into Mischief | Halo Humor | | Eaton Sales, Agent | Gavin O'Connor, Agent for John Stewart | | | 1,000,000 |
| 0148 | Starbound | Photo | Colt | Uncle Mo | Hang a Star | | Eaton Sales, Agent | Talla Racing/ Kim Lloyd, Agent | | | 900,000 |
| 0168 | Innovator | Photo | Colt | Authentic | Inspired | | Bridle Harrison, Agent for Peter E. Blum Thoroughbreds | BC Stables LLC | | | 900,000 |
| 0189 | First Class Lady | Photo | Filly | Uncle Mo | Lady Pauline | | Denali Stud, Agent for Stonestreet Bred & Raised | Douglas Scharbauer | | | 900,000 |
| 0110 | Freaky | Photo | Colt | Into Mischief | Enchanted Ghost | | Taylor Made Sales Agency, Agent for Aaron & Marie Jones LLC | Eclipse T'Brd/Walmac Farm/Bridlewoo... | | | 850,000 |
| 0135 | Contribution | Photo | Colt | Constitution | Gifting | | Hill 'n' Dale at Xalapa, Agent | Gavin O'Connor, Agent for John Stewart | | | 850,000 |
| 0083 | Il Cavallino | Photo | Colt | Into Mischief | Daisy | | Clearsky Farms, Agent I | Gavin O'Connor, Agent for John Stewart | | | 800,000 |
| 0020 | Ghanaayem | Photo | Filly | Uncle Mo | Angela Renee | | Taylor Made Sales Agency, Agent CLXII | Shadwell Racing, LLC | | | 750,000 |

**Figure A5**. Online sale catalog results page
Note: Example of sale results. (Keeneland Sales, 2024)

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