

Use and Perceptions of Equestrian Safety Equipment

By

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ABSTRACT

Modernization of equestrian sport has focused on advancements of safety equipment. The purpose of this study was to investigate factors influencing the use of safety equipment in equestrian sports. It was hypothesized that use, perceptions of efficacy, and influencing factors would differ according to discipline but not other demographic factors. More than 700 responses were obtained from an online survey. Reported helmet use was lower in western disciplines than English disciplines ($P < 0.0001$) or driving ($P < 0.0001$). Only 58.2% of all participants reported “always” wearing a helmet, yet 74.2% considered helmets “very effective” in preventing injury. Usage of other safety equipment was lower. These results suggest that while helmet use is considered an effective way to prevent injury, discipline still influences safety equipment use. Understanding equestrian demographics and disciplines that are likely to use safety equipment, as well as how they are influenced will allow for greater education and safety.

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CHAPTER ONE: Literature Review

Introduction

Partnerships between humans and horses have been around for hundreds of years. From racing and jumping, to working animals, humans have found ways to use a horse's natural abilities to go far beyond what a single person could ever do alone. These partnerships are nothing new, although many aspects of the partnerships have evolved with time. Now, horses and riders compete in more than 100 different equestrian sports, or disciplines as they are commonly referred. These international sports include, but are certainly not limited to dressage, reining, racing, and show jumping. Within these athletic endeavors, the horse and rider may run at speeds approaching 90 km/h or jump obstacles well over 1 m.

Horseback riding as a leisure activity has also grown exponentially. In a single year in the United States, an estimated 30 million people ride horses (American Horse Council, 2018). Across the United States, there are many businesses that cater to and offer a horseback riding experience to customers who may not have ever been around horses. These businesses include trail riding, dude ranches, and summer camps. These businesses are vastly important to the equine industry. In 2018, more than 10% of all households in the US participated in trail riding, and the 8.4% of households participated in lessons. Additionally, the equine industry supported more than 160,000 jobs in 2018 (American Horse Council, 2018).

With competitions around the world and an ever-growing leisure sport, equestrian sports must constantly modernize their practices regarding the welfare of both equine and

human athletes. The industry has naturally followed the rest of the world in finding ways to operate online and in social media. This big step into the world of social media has led to an increase in awareness in both the dangers and injuries of the sport. There is no doubt that equestrian sports have high incidence of injury. Partnering with animals 5-10 times the size of people leads to high incidence of injury. In fact, equestrians have some of the highest occurrence of injuries in sports (U.S. Department of Health and Human Services, 1990). Equestrian sports have been reported as the 3rd highest sport requiring hospital admission following an emergency hospital visit (Williams, 1995).

The goal of this literature review is to discuss not only the types of personal protective equipment available to equestrian athletes, but also the effects this equipment has on safety and injury prevention. In this paper, typical equestrian related injuries will be addressed, including demographic and discipline effects. Additionally, this paper will discuss current helmet, safety vest, and safety stirrups types, and certifications for this equipment, which together may aid in reducing injuries.

Prevalence of Injuries in the Equine Industry

The fact that equestrians are prone to injury is no secret. In many parts of the equestrian community, falling off an equine partner is considered almost a badge of honor. Still, one must recognize that injuries can and do occur when people partner with animals, especially large animals like horses. While other livestock can cause injury, horses result in 55% of large animal related injury, more than bulls (32%) and cows (11%) combined (Norwood, 2000). While injuries do occur while handling horses on the ground, 77% of injuries result from falling from the horse (Williams, 1995). In fact, in a

retrospective study, it was found that one in five equestrians will be seriously injured during their riding career (Mayberry, 2007). Of that previously discussed 77% of falling injuries, the study found that 48% of fall victims require significant treatment. Soft tissue damage, sprains, neurological issues, or other injuries may require significant care, such as intensive care and specialists' referrals (Williams, 1995). In a similar study in New Zealand, it was found that 75% of all equestrian injuries resulted from falls from a horse. Additionally, it was noted that those under the age of 19 were at the highest risk of injury (Smartt, P. 2009).

Of equestrian related emergency room visits, head and face injuries account for 38% of injuries, while 26% are thoracic injuries. Spinal column injuries account for 22%, while pelvis and extremities account for 21% each (Clarke, C. 2008). In older literature, head injuries alone were found to be responsible for 78% of all deaths, but were only around 9% of reported injuries (Figure 1) (Williams, F. 1995). Similarly, in rodeo sports, which often seek medical assistance outside of hospitals, the head and face were most commonly injured, with additional prevalence of knee injuries (Downey, 2007).

Head injuries often lead to concussions. It is estimated that 1.1 to 1.9 million youth suffer from sports-related concussions every year in the United States (McCarty et al., 2019). While concussions themselves are not life threatening, symptoms may be debilitating, and complications to concussions can be fatal. Some symptoms include headaches, dizziness, and light sensitivity, pupil dilation, vomiting and insomnia (Churchill et al., 2018). Multiple concussions may lead to Secondary Impact Syndrome, which may cause edema or herniation in the brain and even lead to death (Bey, 2009).

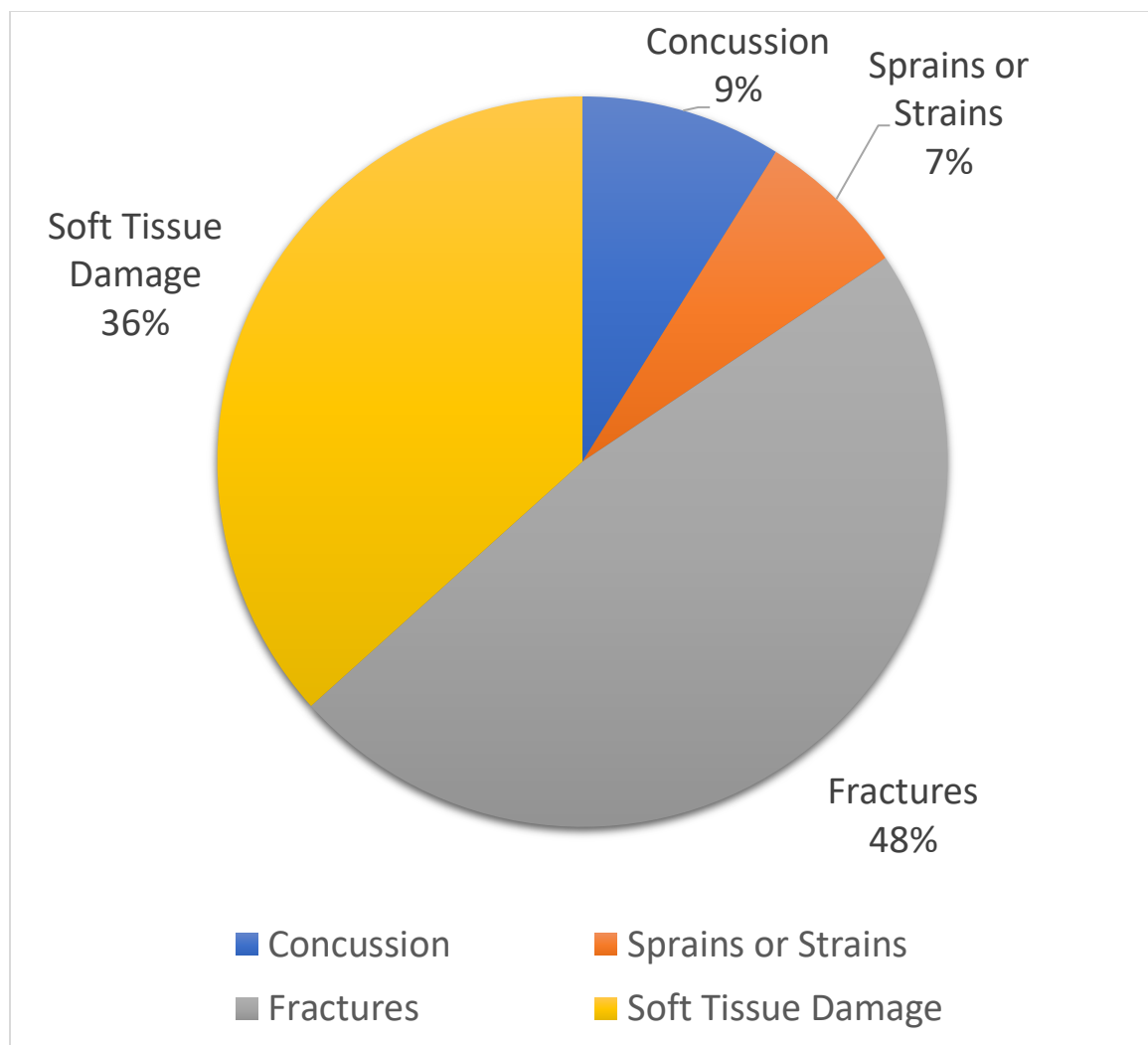


Figure 1. Common Equestrian Injuries (adapted from Williams, 1995).

Additional concerns regarding multiple head injuries come from research of brain injuries in football players. Mortality from neurodegenerative diseases such as Alzheimer disease, Parkinson disease, and amyotrophic lateral sclerosis was three times higher in these football players than the general US population (Lehman, 2012). Beyond these physical diseases, it is suggested that brain injuries may predispose people to mental illness. Research of student athletes suggests that those with a greater history of concussion are more likely to show some form of psychological distress, suggesting that athletes with extensive concussion histories should be more closely monitored for psychological distress (Weber, 2018).

Chest and thoracic injuries often coincide with further internal injuries. While the most common injuries to the chest region were found to be rib and clavicle fractures, pneumothoraces and hemothoraces were also commonly noted. Further internal injuries often occur in chest and thoracic injuries as well as injuries to the spinal cord (Ball, 2007).

Injuries to the extremities are also highly common in all types of equestrian sport. Crushing of legs, feet and other joints (especially the ankle) are common injuries when the foot and leg are caught in the stirrup when falling from the horse. Falling of both the horse and rider also often result in such crushing injuries to the lower extremities (Ceroni, 2007). Similarly, arms, hands, and fingers are at high risk of injury, especially in rodeo sports (Downey, 2007).

These various injuries can be debilitating and result in changes in lifestyle and activity. Some such injuries can result in long-term handicaps and disabilities. Its

suggested that the large majority of injuries in sports result in some amount of lost time, as such injuries often require the athlete to refrain from participation for some time (Dekker, 2004). Beyond simply physical long-term effects, severe injuries often result in further psychological effects. Higher levels of injury have been found to coincide with depression, anger, and other mood disturbances (Smith, 1990). In an effort to prevent such injuries and post-injury issues, many forms of personal protective equipment have been developed for the equestrian sport.

Helmet Function and Use

In equestrian sports, the most severe head injuries are related to a lack of protective headgear (Grossman, 1978). Preventing traumatic brain injuries is one of the primary goals of protective headwear, or helmets. Helmets can and do prevent these injuries through simple mechanisms (Rueda, 2011). Most modern helmets include an impact resistant outer shell with a protective inner liner to absorb impact (Broersma, 1998). The inner liner is often expanded polypropylene, a type of foam, to absorb energy from the impact of the helmet to the ground following a fall (Connor, 2019).

Not all equestrian head gear is created equal. Most helmets have a visor and strap under the chin. The visor typically is not highly efficient in preventing injuries, though may offer some protection to the face in the event of a fall. The chin strap is vital to maintaining the correct helmet position. In contrast, skull caps often lack the visor, yet retain the chin strap and are often worn by jockeys in the racehorse industry (Connor, 2019). Different yet is the cap popular in the Hunter Under Saddle event, often referred to as a hunt cap. This cap lacks the chin strap and many varieties lack the shock absorbing

inner lining (Young, 1964). Many certifications for the modern helmet require both the chin strap and visor.

There are several certifications that a helmet can receive, including ASTM, BSI, and Snell (Connor, 2019). ASTM stands for American Society for Testing and Materials, the BSI stands for British Standards Institute, and the Snell certification is a certification given by the Snell Memorial Foundation, a private helmet testing organization (Connor, 2019). Each of these certifications requires the helmets to protect greater than or equal to 250 G (where $G=9.81 \text{ m/s}^2$) (Connor, 2019). In Snell, ASTM, and BSI certifications, the four goals in testing helmets are impact management, positional stability, strength, and extent of protection (PAS015:2016). The goal of these tests is to determine if the helmet protects against impacts, how well it stays in place when necessary, if the individual parts are strong enough to hold together during impact, and how much of the head is actually protected by the helmet.

Many organizations now require helmets in some form or another, with most regulations coming in the last decade. The United States Equestrian Federation (USEF), Federation Equestre Internationale (FEI), and many other governing bodies require helmets either in all competition, or when completing in specific discipline competition (United States Equestrian Federation, 2021; Federation Equestre Internationale, 2021).

Beyond these federations' requirements, it is becoming more common for horse associations to require youth to wear helmets in an attempt to protect young riders from serious brain injuries. For example, the Tennessee 4-H program now requires all riders to wear certified helmets in 4-H sponsored events (Tennessee 4H Horse Extension, 2019),

stating “All riders (including adults) at 4-H events and activities are required to wear properly fitted ASTM/SEI certified helmets with chin straps properly fastened while mounted or while in a vehicle being pulled by equine.” (Tennessee 4H Horse Extension, 2019).

It must be noted that helmets cannot entirely eliminate the potential for injury. In fact, ill-fitting helmets can increase the potential for injury. Upwards of 7% of all catastrophic head injuries in football players were attributed to ill-fitting helmets (Greenhill, 2016). While these results are based on football players, the concept of helmets and impact injuries are similar to those in equestrian sports.

Safety Vest Function and Use

Following head injuries, another area of concern is the chest and upper body. Falling of the horse on top of the rider often can be fatal for the rider due to both injuries to the head and chest. While many studies find that the head and face are the most at risk, another concerning factor is the shoulder and chest areas. Some literature has reported shoulder and chest injuries making up 20.7% and around 12% respectively (Whitlock, 1999). While these injuries are often less deadly than previously discussed head injuries, they may still result in fatalities due to severe injuries to the chest, torso, and spinal cord (Nylund, 2019).

In an effort to prevent against such upper body/torso injuries, body protectors, commonly referred to as “safety vests”, have been designed to protect the upper body in case of a fall. Equestrian body protectors have taken two distinct approaches to preventing injuries. The first is the standard body protector. These body protectors can

be ASTM/SEI certified, similarly to previously discussed helmet certifications. These vests seek to absorb the force of the fall in a way similar to the foam inner lining of helmets (ASTM F1937). Slight differences between individual certifications include the amount of torso required to be covered, as well as the level of testing required (including weight dropped and height dropped from differences) as well as methods of testing. For example, only ASTM testing requires weight dropped onto the vest to with clay under the vest. An indent of more than one inch into the clay results in the vest failing the drop test and will not be certified (ASTM F1937).

In contrast, the second kind of safety vest is an air vest. Air vests are inflating airbag vests that inflate in the event of a fall, similarly to a car's airbag system. These vests, originally developed for motorcyclists, rely on CO₂ cartridges (Nylund, 2019). When the pin connected to the saddle is pulled (a result of the rider separating from the saddle), the CO₂ is released, providing torso protection against impact with the ground. Air vests have not been proven to prevent injury more than a standard body protector, and are potentially less effective (Nylund, 2019). There are currently few standards and certifications for air vests, however they are legal in United States Equestrian Federation regulated competitions when worn over top of previously discussed certified body protectors (United States Equestrian Federation, 2021).

A retrospective study comparing incident reports of riders who wore protective vests and those who did not wear such vests suggests that these approved safety vests can reduce risk of injury by up to 56% (Andres, 2018). While these protective vests are not often required in all riding or competition, United States Equestrian Federation and

Federation Equestrian International both require vests of some type to be worn during cross country competition and riding. Additionally, in the marathon portion of combined driving, the FEI requires the entirety of the driving team to wear helmets and body protectors (Federation Equestre Internationale, 2021).

Safety Stirrup Function and Use

Another concerning injury to equestrians is often to the extremities. In the instance of falling, riders may find their feet and ankles trapped within the traditional stirrup. The traditional stirrup is often made of a single material in a D shape with an opening and flat edge for the ball of the foot to rest. The risk of these stirrups is the foot traveling too far into the stirrup and potentially trapping the foot or ankle within the stirrup and, as a result, dragging a fallen rider if the horse continues to move. Dragging of the rider often results in injuries to the foot and ankle as well as potential injuries to head, neck, and torso (Ceroni, 2007).

In an effort to avoid such injuries, safety stirrups have been designed with a lateral opening which releases when adequate pressure is applied. Instead of the rider's foot becoming trapped in the stirrup, these safety stirrups release the rider in case of a fall so the rider is not injured or dragged. Additionally, in the case of a horse falling on the rider, these safety stirrups may prevent crushing of the foot and ankle that may occur with a traditional stirrup iron (Ceroni, 2007).

Several types of safety stirrups have been developed. The first is an English style stirrup called a peacock stirrup. This stirrup type has a lateral opening on the outside of the stirrup. A rubber band is stretched over the opening so that, while the rider may not

“lose” their stirrup during typical riding, it will still give if the rider falls from the horse. Another type is a magnetic closure on the outside opening. This type of stirrup is held closed by a magnetic fastening but will still release the rider’s foot when enough outward force is applied. Both of these styles are easily reset after a fall that triggers the release mechanism. Additionally, western styles of safety stirrups have been developed that are spring loaded and release in the event of a fall.

Safety stirrups are not currently required in any discipline or governing body known to the author. There are currently no certifications or requirements for such stirrups. Similarly, there is little research to determine the efficacy of these stirrups in preventing injury to riders.

Use and Influences of Safety Equipment

Use of these types of equipment in specifically equestrian sports have not been heavily studied, however in other sports and outdoor expeditions, similar safety equipment and protective gear is often available and recommended. These other pursuits can also be highly dangerous and can result in injuries similar to those received in horseback riding. An older study suggests that riders often perceive helmets as uncomfortable, expensive and inappropriate for some riding styles (Condie, 1993). Some influences on the use of equestrian safety equipment have been thought to be knowledge of the sport and inherent danger, perceived effectiveness of safety equipment, rules or regulations requiring safety equipment, outside peer pressures and influences, or previous injuries.

In a study regarding bicycle safety equipment, those who tended to cycle less tended to use less safety equipment and were suggested to have less knowledge regarding such safety equipment (Teschke, 2012). In a study regarding bicycle helmets, it was suggested that individual motivation is a large factor in use. The same study found that lowering costs related to owning a bicycle helmet did not lead to widespread helmet use (Jacques, 1994). In additional literature regarding safety equipment use in motorsports, those who had previously sustained injuries were less likely to use safety equipment than those who had not previously been injured (Magnus, 2004). Similarly, in a study discussing safety equipment use in all-terrain vehicles found that the lack of perceived severity resulting from crashes were a major barrier to helmet use, and additionally suggest that comfort and convenience are large factors in use of helmets (Adams, 2013).

Several studies have been done to attempt to promote the use of equestrian helmets. Some suggestions have included lower cost, greater versatility, greater education, and encouraging associations to mandate a helmet policy (Condie, 1993). Newer studies suggest similar ideas, such as encouraging education of the risks posed to riders, as novice and youth equestrians often don't recognize the unpredictable nature of horses (Worley, 2010). Further research in this area suggests that novice riders see a greater incidence of injury than those of advanced and professional riders. This same study found that around 100 hours of riding experience are required to see a decline in injury (Mayberry, 2007). Some studies have found that 2/3 of injured riders believe that their accidents, and therefore injuries, may have been preventable. Additionally, 47% of responses in the same study reported changing their riding practices after their injury (Ball, 2007).

Conclusions

Equestrian sports of all kinds put athletes at high risk of serious injury.

Modernization of equestrian sport demands that the industry continues to find ways to better protect both the equine and human athlete. In response, industry driven personal protective equipment research has grown in necessity and support. Personal protective equipment, such as equestrian specific helmets and body protectors, have been proven to prevent severe injury and death in the equestrian sport. While many individual disciplines choose to require such safety equipment, the equestrian sport lacks an industry wide governing body to require any safety equipment. Rigorous testing of safety equipment requires the sport's safety gear to be evolving and using the latest technology to create a safer sport. New personal protective equipment, like air vests, continue to be developed. With continuous design of new equipment, there is always a need for more research into the safety, effectiveness, and use of personal protective equipment.

CHAPTER TWO: USE AND PERCEPTIONS OF EQUESTRIAN SAFETY EQUIPMENT

Introduction

Modernization of sport has led to a need for greater safety of athletes. The equestrian sport in particular has pushed for a safer sport for both horse and rider. Part of this push for safer practices has resulted in new technology in rider personal protective equipment. While some segments of the industry have accepted and implemented these new technologies and equipment, it is often noted that other parts are more opposed to new regulations and safety equipment. Determining opinions relating to current and future safety equipment use and regulations will help set the path for future modernization and safety of equestrian sport.

The purpose of this study was to investigate the use and perceptions of equestrian safety equipment. It was hypothesized that discipline would influence the typical use of safety equipment, especially showing differences between English and western disciplines.

Materials and methods

For this study, an online survey was developed using Qualtrics survey software. All methods were approved by the Institutional Review Board of Middle Tennessee State University (Appendix 1). The survey was distributed through social media (Facebook), equine organizations, and emails to industry contacts. The survey was open from January 17, 2020 to February 3, 2020. The survey was completely anonymous, and no questions

identified or saved any identity specific information. The survey in its entirety is provided in Appendix 2. Briefly, respondents first were directed to an information and disclosure section that described the purpose and risk related to this study. A short section (Questions 35-38) identified the respondents consent and understanding of the research procedures. It also confirmed that respondents were over 18 years of age and that they were voluntarily participating. If the response to either of these questions was “No”, or “NO I do not consent”, the responses were excluded from the data.

After consent, the first section of the survey identified respondent’s demographics. This included age, education, geographic location, primary discipline, and other industry relevant demographics, such as professional involvement and typical riding habits. Once these demographics were established, respondents were asked about use of specific safety equipment through a combination of multiple choice and Likert Scale questions. Additionally, this section included a section asking about the perceived effectiveness of helmets, safety vests, and safety stirrups. This survey also included a section of questions to determine instructor, discipline, and other influences on safety equipment use. A further section included Likert scales to identify opinions regarding current requirements and further uses of safety equipment regarding riding, driving, competition, and youth equestrians.

Responses to Likert scale questions were converted into numeric values for analysis. These values were then analyzed using PROC MIXED and PROC CORR in SAS for Academics to determine influence of and correlations between demographics, including age (Question 1), area of discipline (Question 24), industry involvement

(Question 3), geographic location (Question 4), and how often participants rode or attended events (Questions 5 and 6) on use, perception, or opinions of specific safety equipment. Significance was defined as $P < 0.05$ and trends were identified when $0.05 < P < 0.10$.

Results

Demographics

A total of 770 responses were analyzed in this study. The largest age group of responses was 26-35, at 25.2% of responses. Area of discipline showed a reasonably even split between English and western disciplines, at 48.6% and 46.2% respectively, with the remaining 5.2% identifying driving as their main discipline. Within the 48.6% of English disciplines, the hunter discipline was the most common. Within the 46.2% of western disciplines, the most common was the category denoted “All Around Showing (pleasure/horsemanship/trail)” (Figure 2).

Amateurs made up 77.2% of responses, with the remaining 22.8% identifying themselves as professionals. The majority of responses were from the Southeast United States, at 46.56%; however, a small number (4.5%) were from outside the United States (Figure 3). The majority of responses reported riding 3-5 times per week (41.5%), and showing less than 6 times per year (41.0%). When asked about highest level of education completed, the about 2/3 of responses reported either a Bachelor’s Degree (36.2%) or some form of Graduate Degree (31.6%), suggesting a greater level of education in respondents than may be expected in the general populace (Figure 4).

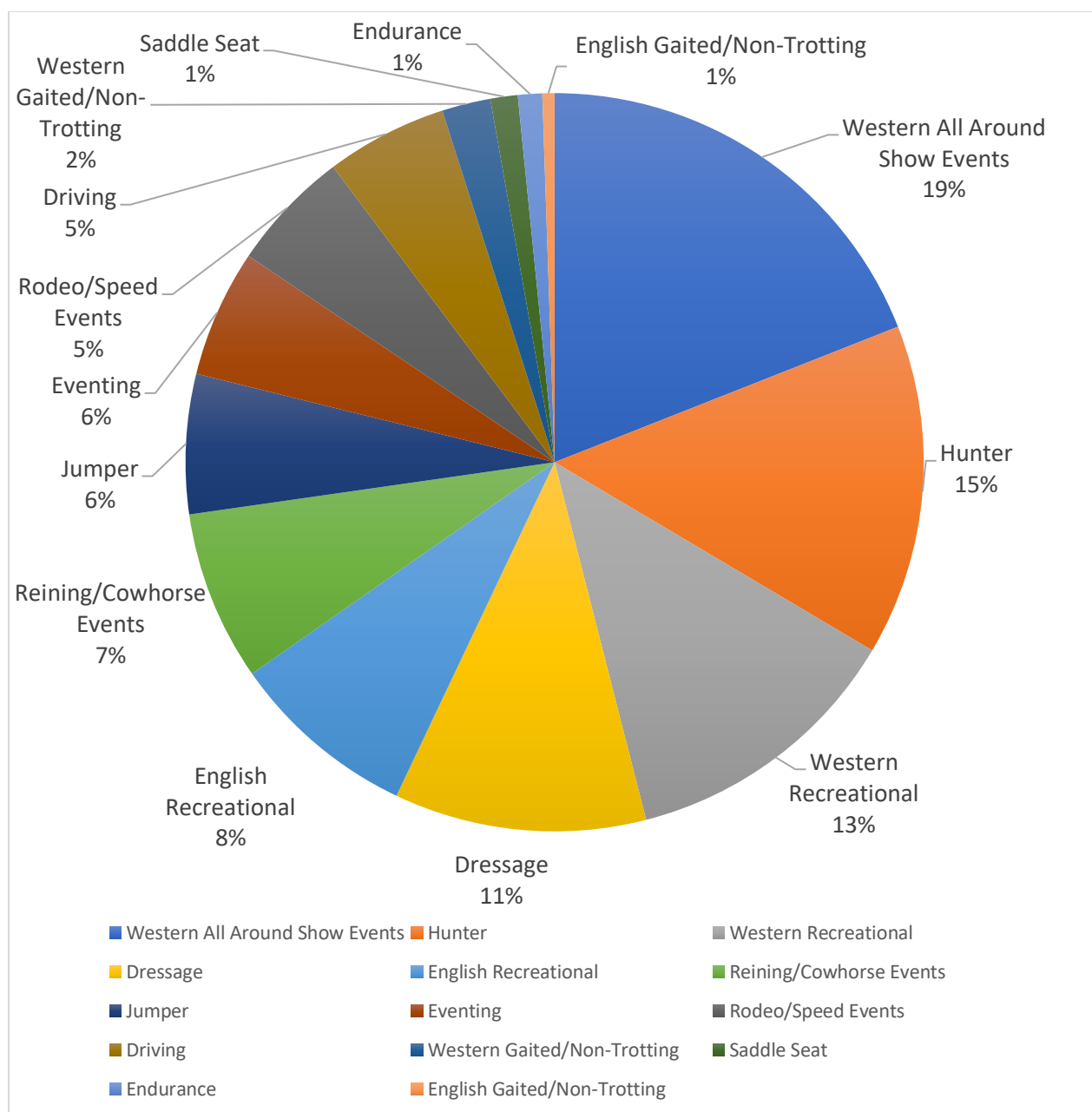


Figure 2. Primary discipline of respondents (n=770) in a survey investigating use and perceptions of equine safety equipment.

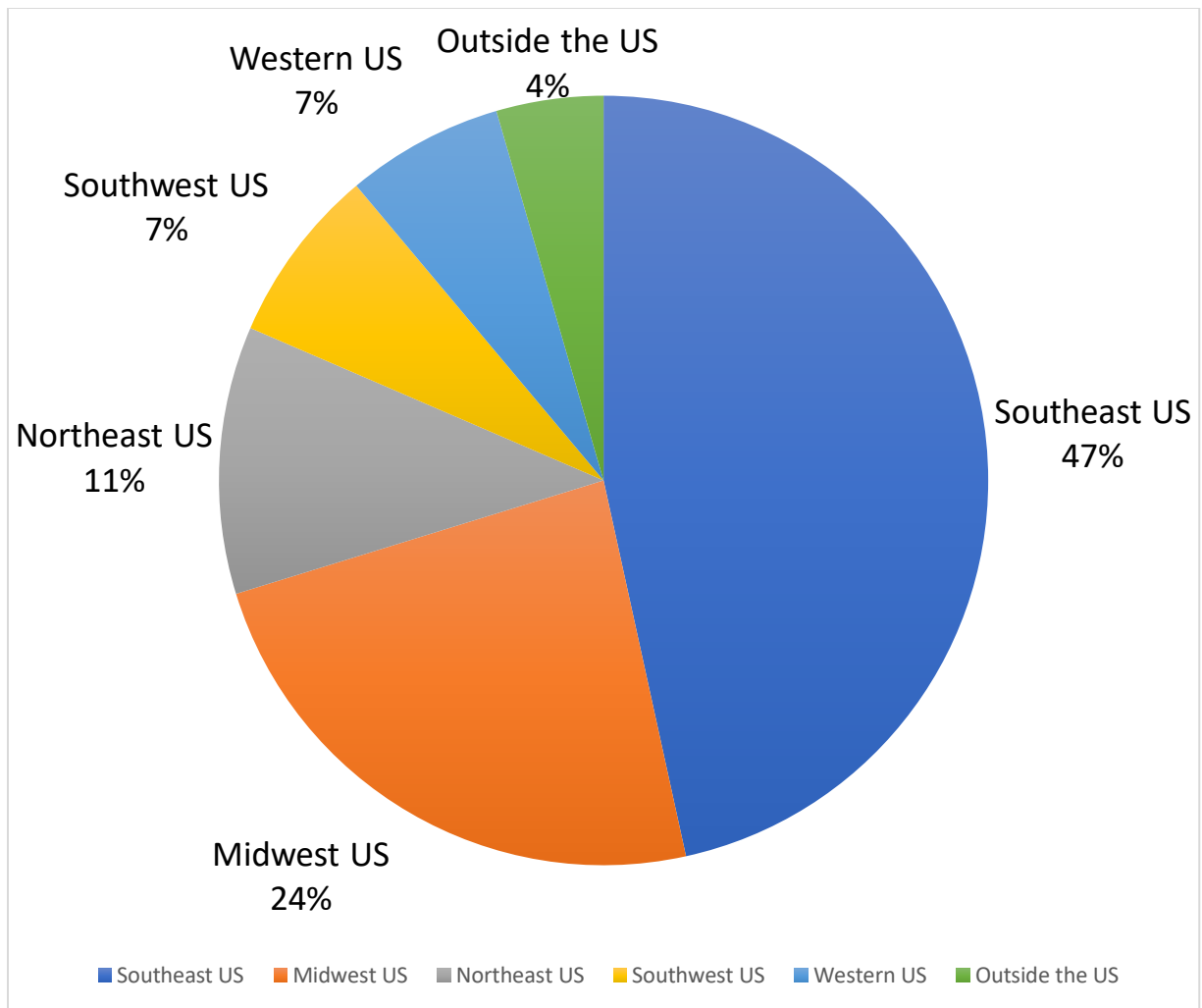


Figure 3. Geographic Location of respondents (n=770) in a survey investigating use and perceptions of equine safety equipment.

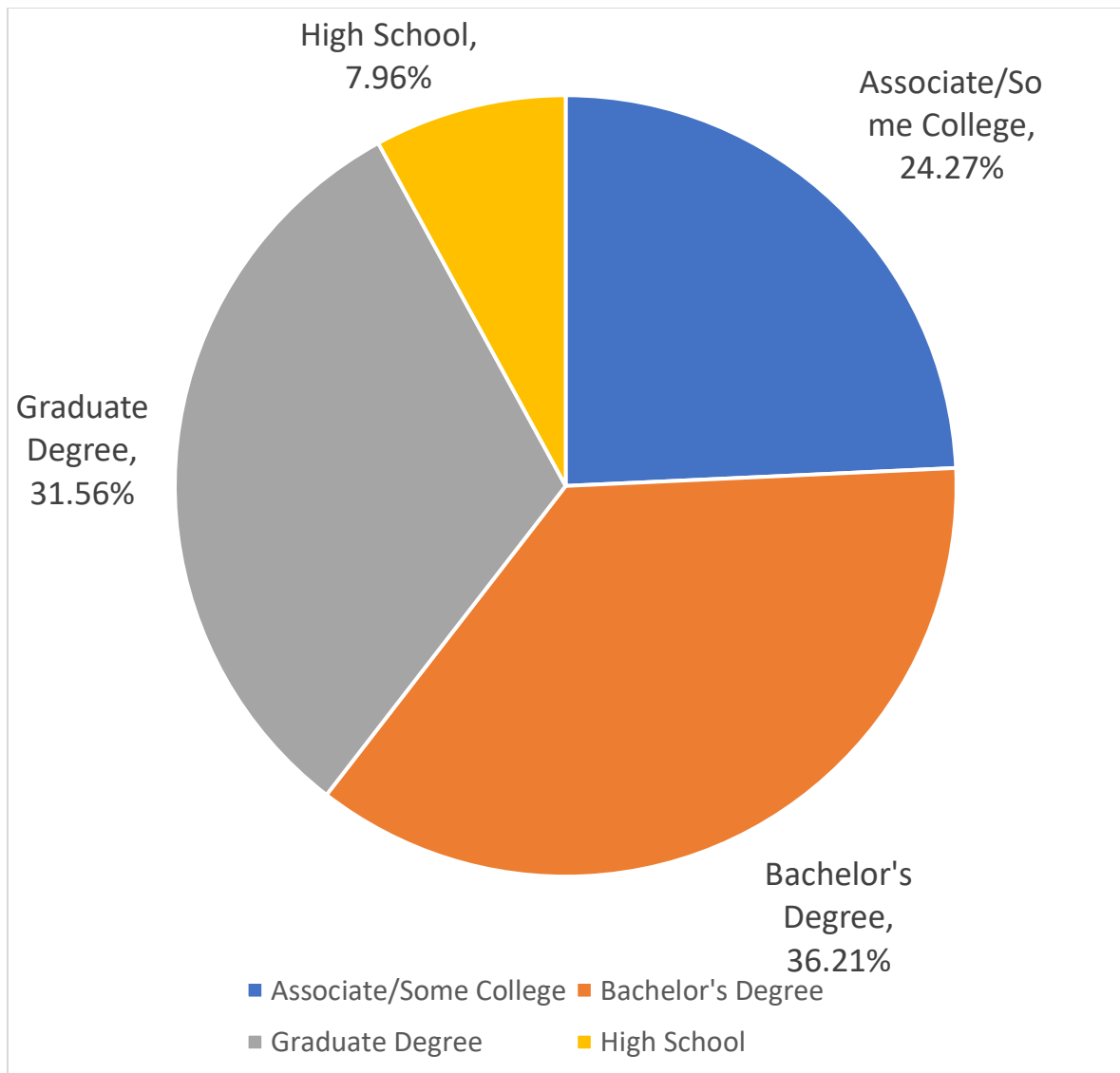


Figure 4. Highest level of education completed by respondents (n=770) in a survey investigating use and perceptions of equine safety equipment.

Safety Equipment Use and Perception

When questioned on helmet usage, 84.0% of responses reported wearing a helmet at least once in the past year. Only 16.8% reported wearing a safety vest, and 19.5% reported using safety stirrups in the past year. This lower use of safety vests and stirrups may be due to current discipline rules. While helmets are required in many disciplines, few require equestrians to use safety vests, and fewer require safety stirrups.

When asked about use in the past year, helmet and safety vest use was lower in identified western disciplines than English disciplines ($P < 0.0001$) or driving ($P < 0.0001$). Helmet use and was not different between English disciplines and driving ($P > 0.05$). Safety vest use was not different between English disciplines and driving ($P > 0.05$). Safety stirrup use was not different between driving and English disciplines ($P > 0.05$) or western disciplines ($P > 0.05$). Safety stirrup use was different between English and western disciplines ($P < 0.0007$). Riding in a discipline that requires helmets during competition did show a difference in helmet use ($P < 0.0001$). Additional demographics, such as age, geographic location, and education did not seem to influence helmet use ($P > 0.05$).

While 74.3% of responses believe helmets to be “very effective”, and an additional 18.1% believing helmets to be “moderately effective”, only 58.3% of responses believe that vests were “very effective” or “moderately effective” in preventing injury. This means that a large portion of the surveyed riders were either were unsure of safety vests effectiveness or believed them to be ineffective. Similarly, 40% of responses believed that safety stirrups were “very” or “moderately effective”. The remaining

responses were again unsure or believed safety stirrups to be ineffective. Less than 1% of responses believed helmets were “not effective” in preventing injury (Figure 5).

When asked about perceived effectiveness of safety equipment, no differences were found regarding helmets or safety stirrups. Discipline did affect the perception of safety vests. While there were no differences between English or western disciplines and driving, we found English disciplines and western disciplines to be different ($P < 0.0001$).

More than half of the responses (58.2%) marked “always” when asked how often they wear helmets, with an additional 12.7% marked “most of the time”. In contrast, only 4.7% of responses marked either “always” or “most of the time” when asked how often they wore safety vests. The majority of responses (73.0%) marked that they “never” wore safety vests, 68.8% reported “never” using safety stirrups. Previous research in usage rates of bicycle helmets in response to campaigns suggests that a plateau in helmet use around 50-60% use is not unusual. While it is unclear why this plateau occurs, it is suggested that it is due to lack of information regarding the influences on use (Finnoff, 2001). With little previous research regarding safety vests and stirrups, it is difficult to determine if these rates of use are increasing.

Influences on Safety Equipment Use

When considering the factors that influence the use of safety equipment, several factors have been suggested. This survey asked equestrians about the influences on safety equipment, including appearance, comfort, peer influence, personal experiences, price, and perceived safety of their horses. When asked about influences of appearance, 29.9% marked “strongly disagree”, and a further 16.9% marking “somewhat disagree” when

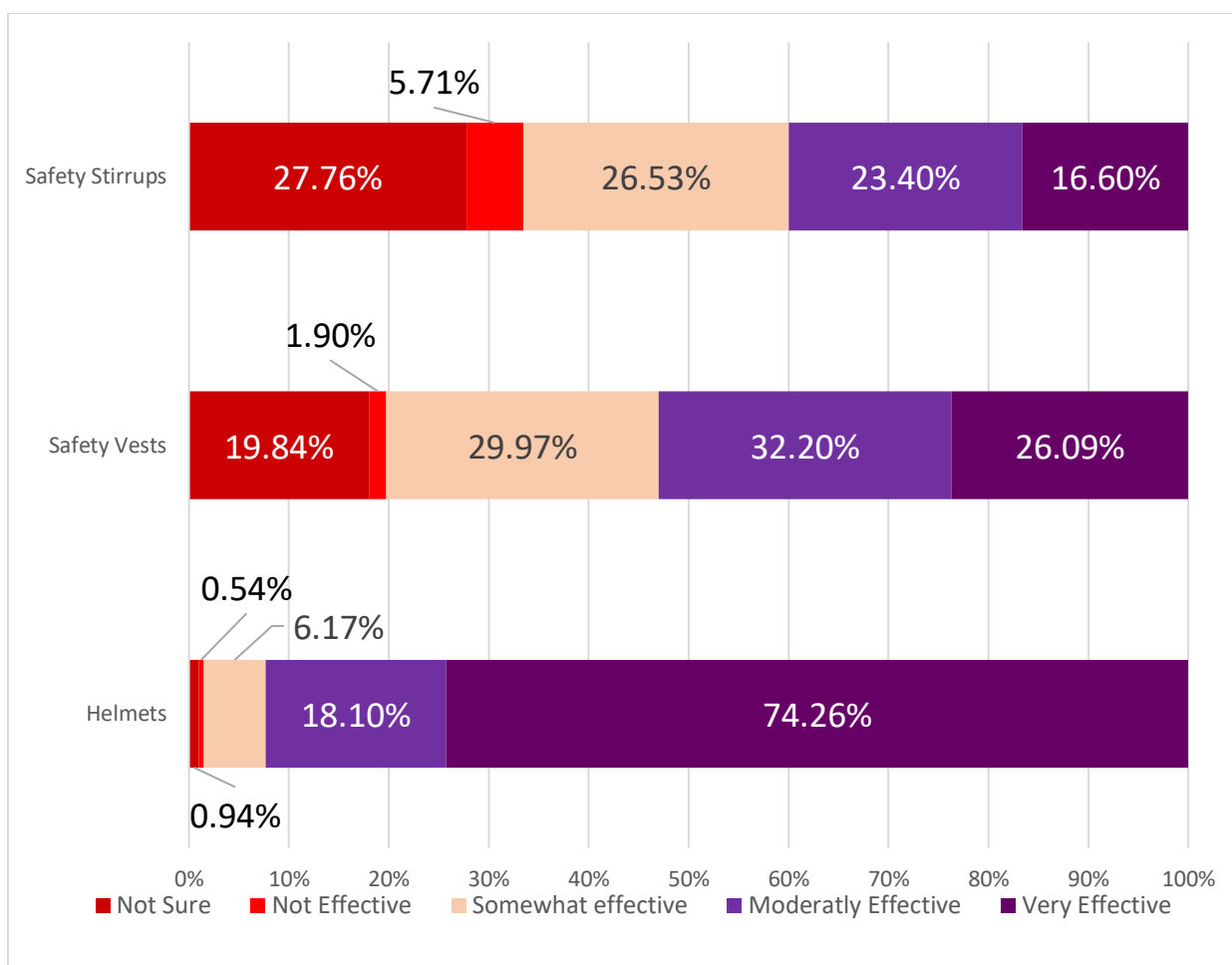


Figure 5. Perceived efficacy of safety equipment of respondents (n=770) in a survey investigating use and perceptions of equine safety equipment

asked if the appearance of helmets influenced their use. Most responses had “no opinion” on the appearance of safety vests and safety stirrups, with 51.9% and 54.3% respectively. This suggests that the wide variety of helmet brands, styles, and colors prevent appearance from limiting use. In contrast, the majority had no opinion on the appearance of safety vests and stirrups. This may be due in part to the limited brands and styles of these types of equipment, as well as, again, the lack of requirements in disciplines, resulting in riders simply not having used either equipment.

Comfort of helmets seems to be more influencing, with 72.9% of responses “strongly agree” or “somewhat agree” that their use of helmets is influenced by comfort. Again, the comfort of the vest or stirrup does not seem to be an influencing factor in use, with 54.2% having no opinion on the comfort of vests, and a 65% having no opinion on the comfort of stirrups. Nearly $\frac{3}{4}$ of responses agree to some degree that their helmet use is affected by comfort. Having a variety of brands and styles of helmets to fit many sizes and shapes may then be in part why helmets are more used than other safety equipment. There is a much more limited variety of vests (and even less certified vests) and stirrups than helmets, therefore being more difficult to fit correctly and potentially causing discomfort and perhaps even putting riders at greater risk of injury.

Peer influence on safety equipment use is more varied. While 31.8% “strongly disagree” that peers affected helmet use, 29.6% “somewhat agree” that peers affected helmet use (Figure 6). 53.7% of responses had “no opinion” on peer influence on vest use, while 18.8% marked “strongly disagree”. Similarly, when considering peer effect on safety stirrup use, 56.5% had “no opinion”, with 18.4% marked “strongly disagree”.

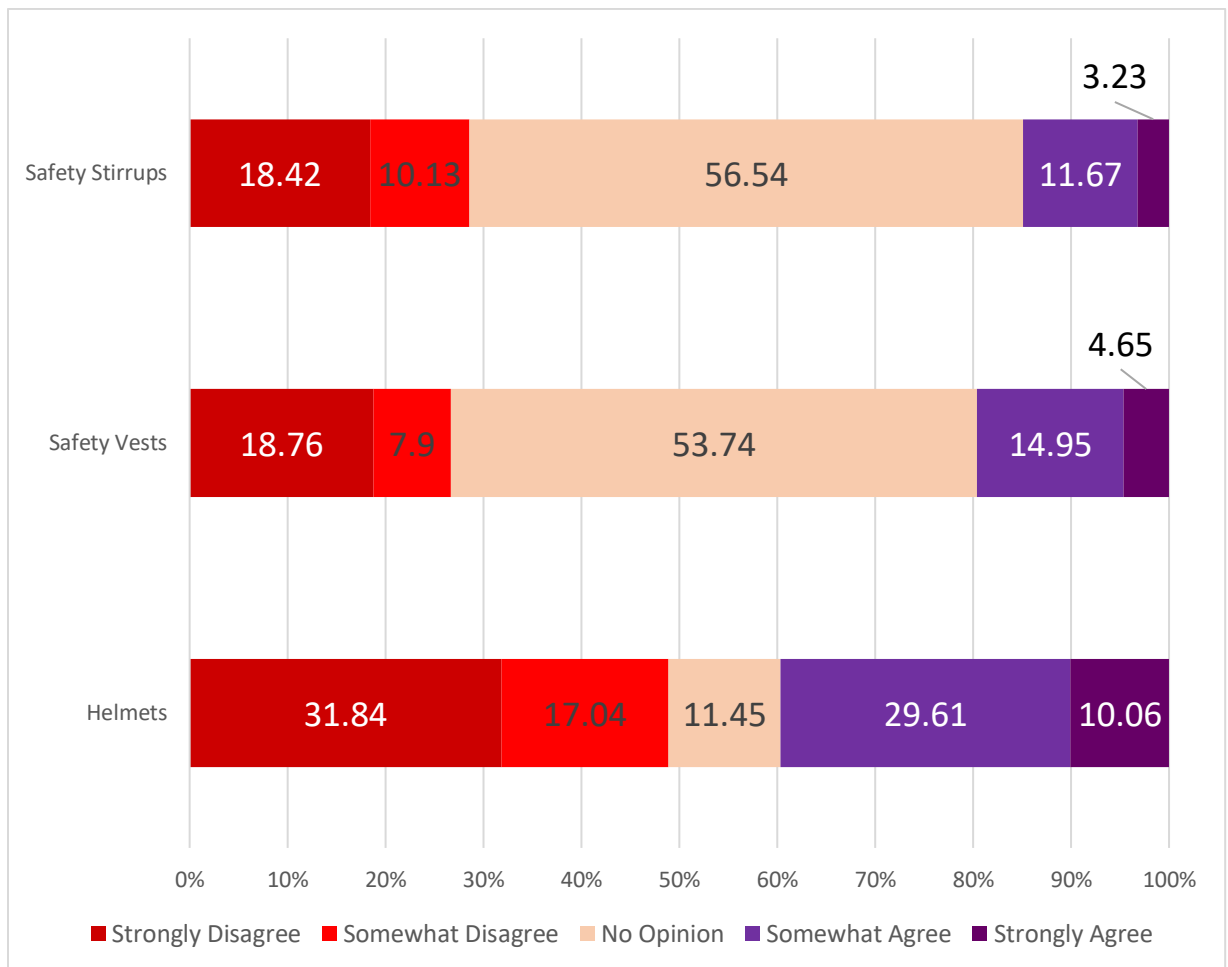


Figure 6. Perceived peer influence on safety equipment use of respondents (n=770) in a survey investigating use and perceptions of equine safety equipment.

Unsurprisingly, peers seem to influence the use of helmets. Those who marked strongly disagree when asked if peers influence their safety equipment use may never use these kinds of protective gear, or simply do not perceive these kinds of safety equipment to be effective enough to be swayed by their peers. This reflects research regarding bicycle helmets, which suggests that use by peers and parents influence the use of bike helmets (Jacques, 1994).

Personal experiences or injuries do seem to influence helmet use, with 50.35% reporting “strongly agree”, and a further 28.7% reporting “somewhat agree” when asked if personal experiences or injuries affected their helmet use. Vests and stirrups again showed little commitment by respondents with 58.5% having no opinion regarding personal experiences and vest use, and 60.1% having no opinion on stirrup use and personal experience. As one in five equestrians are severely injured in their equestrian career (Mayberry, 2007), it should be no surprise that prior injuries or experiences influence helmet use. Surprisingly, safety stirrups and vests showed little opinion on use in relation to injury. Again, this may be due to the lack of research and “proof” that these safety measures can prevent serious injury.

Of respondents, 41.5% “strongly agree” or “somewhat agree” that price influenced their use of safety equipment. Much of the equestrian sport is known to be expensive, and high-quality safety equipment is no exception. This cost does appear to have some influence on the purchase (and subsequent use) of safety equipment.

Nearly 40% of respondents (39.3%) report that they “strongly agree” that the horses they ride or drive are well trained and safe. A further 41% report that they

“somewhat agree” to this statement. It is possible then that this belief that the horses they interact with are safe causes many equestrians to be less cautious around these horses, and therefore feel safe enough without safety equipment.

Opinions on Safety Equipment Requirements

Interestingly, 53.6% of responses “strongly agree” that helmets should be required in riding or driving competition (Figure 7). There was a correlation between requiring helmets and discipline ($P < 0.0001$), whereas English disciplines were more likely to believe helmets should be required. This may be in part due to the fact that many English disciplines already do require helmets in competition.

Responses regarding requiring the use of safety vests are split with 28.2% of responses “strongly agree or somewhat agree”, 36.3% of responses had no opinion, and 35.6% “strongly disagree or somewhat disagree”. When asked about requiring safety stirrups in competition, 41.9% of responses had no opinion. This variation in opinions regarding safety vests may be due to the varying requirements of individual disciplines. Events that typically require certified safety vests include cross country, and the marathon portion of combined driving. In addition to these events, some rodeo associations require protective vests in bull and bronc riding. Still, these few disciplines were not strongly enough represented in the data to have likely caused this split. When questioned about youth, 75.3% of respondents “strongly agree” that youth riders or drivers should be required to wear helmets in competition. Regarding youth vest requirements, 17.3% of responses “strongly agree” that youth should be required to wear vests. An additional 30%

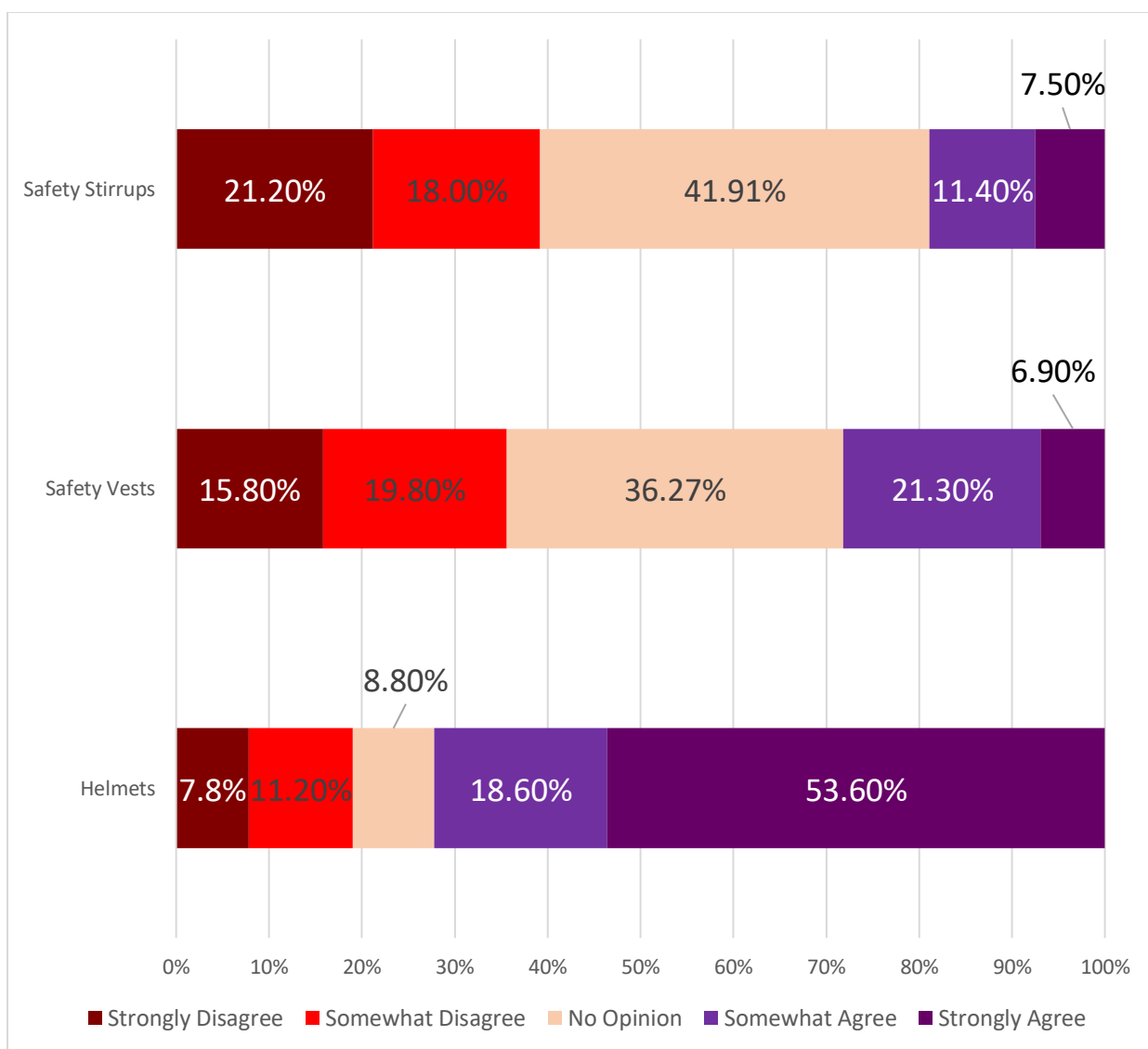


Figure 7 - Opinions of safety equipment requirements in riding/driving competition of respondents (n=770) in a survey investigating use and perceptions of equine safety equipment

“somewhat agree”. When asked about requiring youth to wear safety stirrups, 26.7% of responses “strongly agreed”, and an additional 28.1% “somewhat agreed”. These differences between general safety equipment requirements and youth safety equipment requirements may be due to a perception that youth riders are at more risk of injury, possibly due to bones and bodies still forming, or a lack of experience/decision making skills in relation to safe riding practices, and therefore require greater protection.

Conclusion

The results of this study confirm our hypothesis and show discipline bias toward safety equipment. Additionally, this study showed the variation of opinions within discipline areas regarding safety equipment use and requirements. Helmets were found to be the most commonly used safety equipment, while safety vests and safety stirrups are not as popular. Approximately half the surveyed population believes that all riders and drivers should be required to wear or use helmets in competition, around three quarters believed that youth riders and drivers should wear helmets.

Future research in this area should include investigating the role of gender in use and perceptions. Further determining the individual’s involvement in the industry may also assist in determining the industry’s feelings on safety equipment (ie judges vs coaches vs trainers). Additionally, it seems that further research or marketing for newer safety equipment is necessary for further acceptance and widespread use.

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APENDICES

APPENDIX A

IRB
INSTITUTIONAL REVIEW BOARD
 Office of Research Compliance,
 010A Sam Ingram Building,
 2269 Middle Tennessee Blvd
 Murfreesboro, TN 37129
 FWA: 00005331/IRB Regn.. 0003571



IRBN007 – EXEMPTION DETERMINATION NOTICE

Friday, January 15, 2021

Protocol Title **Influencing Factors in Safety Equipment in Equestrian Sport**
Protocol ID **21-1096 2q**

Principal Investigator **Holly Spooner** (Faculty)
Co-Investigators Kailey Vandekamp
Investigator Email(s) holly.spooner@mtsu.edu
Department/Affiliation Agriculture
Funding NONE

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the **EXEMPT** review mechanism under 45 CFR 46.101(b)(2) within the research category **(2) Educational Tests, surveys, interviews or observations of public behavior (Qualtrics Survey)**. A summary of the IRB action and other particulars of this protocol are shown below:

<i>IRB Action</i>	EXEMPT from further IRB review***		
<i>Date of Expiration</i>	6/30/2022	<i>Date of Approval:</i> 1/15/21	<i>Recent Amendment:</i> NONE
<i>Sample Size</i>	TWO HUNDRED AND FIFTY (250)		
<i>Participant Pool</i>	Healthy adults (18 or older) - Individual involved in the equestrian community		
<i>Exceptions</i>	Online consent followed by internet-based survey using Qualtrics is permitted (Qualtrics links on file).		
<i>Type of Interaction</i>	<input checked="" type="checkbox"/> Virtual/Remote/Online Interview/survey <input type="checkbox"/> In person or physical– Mandatory COVID-19 Management (refer next page)		
<i>Mandatory Restrictions</i>	1. All restrictions for exemption apply. 2. The participants must be 18 years or older. 3. Mandatory ACTIVE informed consent. Identifiable information including, names, addresses, voice/video data, must not be obtained. 4. NOT approved for in-person data collection.		
<i>Approved IRB Templates</i>	<i>IRB Templates:</i> Online Informed Consent and Recruitment Email <i>Non-MTSU Templates:</i> Social Media Recruitment		
<i>Research Inducement</i>	NONE		
<i>Comments</i>	NONE		

***Although this exemption determination allows above defined protocol from further IRB review, such as continuing review, MTSU IRB will continue to give regulatory oversight to ensure compliance.

Appendix B

Usage and Perception of Equestrian Safety Products

Q34 Usage and Perception of Equestrian Safety Products **Information and Disclosure Section**

The following information is provided to inform you about the research project in which you have been invited to participate. Please read this disclosure and feel free to ask any questions. The investigators must answer all of your questions and please save this page as a PDF for future reference. Your participation in this research study is voluntary. You are also free to withdraw from this study at any time without loss of any benefits. For additional information on your rights as a participant in this study, please contact the Middle Tennessee State University (MTSU) Office of Compliance (Tel 615-494-8918 or send your emails to irb_information@mtsu.edu. (URL: <http://www.mtsu.edu/irb>). Please read the following and respond to the consent questions at the bottom if you wish to enroll in this study.

1. Purpose: This research project is designed to help us evaluate the use and perceived effectiveness of equestrian safety equipment and the factors that influence rider opinion of safety equipment.
2. Description: There are several parts to this project. They are: Completion of an online survey designed to gather information regarding use and perceptions of equestrian safety equipment. This consent script only covers surveys conducted online. You will NOT be audio recorded or videotaped in this study.
3. IRB Approval Details Protocol Title: Influencing Factors on Safety Equipment in Equestrian Sport Primary Investigator: Holly Spooner PI Department & College: Agriculture; College of Basic & Applied Science
4. Protocol ID: 21-1096 2q Approval Date: 1/15/2021 Expiration Date:
6/30/2022
5. Duration: The whole activity should take 5-7 minutes. The participants must at least take 1 minute.
6. Here are your rights as a participant: Your participation in this research is voluntary. You may skip any item that you don't want to answer, and you may stop the experiment at any time (but see the note below) If you leave an item blank by either not clicking or entering a response, you may be warned that you missed one, just in case it was an accident. But you can continue the study

without entering a response if you didn't want to answer any questions. Some items may require a response to accurately present the survey.

7. Risks & Discomforts: There are no expected discomforts or risks as a result of your participation in this survey.
8. Benefits to you that you may not receive outside this research: There are no direct benefits to you from this study.
9. Benefits to the field of science or the community: The results of this survey may be shared with industry professionals, breed organizations, major governing bodies of the equestrian sport, and others involved in safety gear production. Results may be used to design equestrian sport protocols and regulations surrounding the use of safety equipment. Results may also be used to design more accommodating safety equipment.
10. Identifiable Information: You will NOT be asked to provide identifiable personal information.
11. Compensation: There is no compensation for participating in this study.
12. Confidentiality: All efforts, within reason, will be made to keep the personal information private but total privacy cannot be promised. Your information may be shared with MTSU or the government, such as the Middle Tennessee State University Institutional Review Board, Federal Government Office for Human Research Protections, if you or someone else is in danger or if we are required to do so by law.
13. Contact Information: If you should have any questions about this research study or possibly injury, please feel free to contact Dr. Holly Spooner by telephone 615-494-8849 or by email holly.spooner@mtsu.edu. You can also contact the MTSU Office of compliance via telephone (615 494 8918) or by email (compliance@mtsu.edu). This contact information will be presented again at the end of the experiment.

You are not required to do anything further if you decide not to enroll in this study. Just quit your browser. Please complete the response section below if you wish to learn more or you wish to part take in this study.

Q35 I have read this informed consent document pertaining to the above identified research

- Yes
- No

Q36 The research procedures to be conducted are clear to me

- Yes
- No

Q37 I confirm that I am 18 years or older

- Yes
- No

Q38 I am aware of the potential risks of the study

By clicking below, I affirm that I freely and voluntarily choose to participate in this study. I understand I can withdraw from this study at any time without facing any consequences.

- NO I do not consent
- Yes I consent

(SKIP TO: END OF SURVEY IF Q38=NO I do not consent)

Q1 What is your age range?

- 18-25
- 26-35
- 36-45
- 46-55
- 56-65
- 66+

Q24 What is the area of your primary discipline?

- English
- Western
- Driving

(SKIP TO Q3 if Q24=Driving)

(DISPLAY Q28 if Q24=English)

(DISPLAY Q29 if Q24=Western)

Q28 What is your primary discipline?

- Hunter
- Jumper
- Eventing
- Endurance
- Saddle Seat
- Gaited/Non-Trotting
- Dressage
- English Recreational Riding/Other

Q29 What is your primary discipline?

- Western All Around Show Events (pleasure/horsemanship/trail)
- Reining/Cowhorse Events
- Rodeo/Speed Events
- Gaited/Non-Trotting
- Western Recreational/Other

Q3 What is your involvement in the industry?

- Professional (Judge, coach, instructor, trainer, etc)
- Amateur (Exhibitor, pleasure rider, etc)

Q4 What is your geographic location in the United States?

- Northeast US
- Southeast US
- Midwest US
- Western US
- Southwest US
- Outside the United States

Q5 How often do you ride?

- I do not regularly ride or drive (less than 1x per week)
- 1-2x per week
- 3-5x per week
- 6-7x per week

Q6 How often do you attend horse shows or other discipline specific events?

- Never
- Less than 6 times per year
- 6-12 times per year
- 13-24 times per year
- More than 24 times per year

Q7 What is the highest level of education you have completed?

- High school diploma
- Associate Degree/Some college course work
- Bachelor's Degree
- Graduate Degree (Masters/PhD/DVM)

Q8 What kind of safety equipment do you use or have used within the last year? (Select all that apply)

- Helmet
- Safety vest
- Safety stirrups
- None
- Other (please specify) _____

Q9 How often do you use the following safety equipment?

	Always (1)	Most of the time (2)	Sometimes (3)	Rarely (4)	Never (5)
Helmet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Safety vest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Safety stirrups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q31 Please indicate your response to the following questions regarding efficacy of equestrian safety equipment.

	Very Effective (1)	Moderately Effective (2)	Somewhat Effective (3)	Not Effective (4)	Not Sure (5)
How effective do you believe helmets are in preventing injury?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How effective do you believe safety vests are in preventing injury?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How effective do you believe safety stirrups are in preventing injury?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13 How often do you take lessons?

- 4 or more x per month
 - 2x per month
 - Less than 1x per month
 - I don't receive instruction
- (SKIP TO Q17 if Q13=I don't receive instruction)

Q14 Does your instructor require you to wear protective gear?

- Yes
- No

Q15 Does your instructor influence your choice to wear protective gear outside of lessons?

- Yes
- No

Q16 Is your instructor certified in any association?

- Yes
- No
- I don't know

Q17 Does your discipline require safety equipment?

- Yes
- No

Q18 Do your discipline requirements influence your decisions pertaining to wearing safety gear?

- Yes
- No

Q32 Please indicate your response to the following statements regarding safety equipment use

	Strongly Agree (1)	Somewhat Agree (2)	No Opinion (3)	Somewhat Disagree (4)	Strongly Disagree (5)
My use of helmets is influenced by their appearance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My use of safety vests is influenced by their appearance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My use of safety stirrups is influenced by their appearance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My use of helmets is influenced by the comfort of helmets.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My use of safety vests is influenced by the comfort of safety vests.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My use of safety stirrups is influenced by the comfort of safety stirrups.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My use of helmets is influenced by peers or others in my discipline.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My use of safety vests is influenced by peers or others in my discipline.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My use of safety stirrups is influenced by peers or others in my discipline.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My personal experiences/injuries influence my decision to wear helmets.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

My personal experiences/injuries influence my decision to wear safety vests.

My personal experiences/injuries influence my decision to wear safety stirrups.

The price of safety gear influences my decision to wear it.

Q33 Please indicate your response to the following statements regarding safety equipment use

	Strongly Agree (1)	Somewhat Agree (2)	No Opinion (3)	Somewhat Disagree (4)	Strongly Disagree (5)
My use of safety equipment is dependent on the discipline I am riding.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The horse(s) I most often ride or drive is (are) well trained and safe.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My use of safety equipment is dependent on the perceived safety of the horse I am riding or driving.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think helmets should be required in riding or driving competition.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think safety vests should be required in riding or driving competition.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think safety stirrups should be required in riding or driving competition.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think helmets should be required while unmounted/not driving but working with horses.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I think safety vests should be required while unmounted/not driving but working with horses.

I think helmets should be required for youth riders.

I think safety vests should be required for youth riders.

I think safety stirrups should be required for youth riders.