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Style over safety: factors influencing riders' selection of equestrian body protector

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Abstract

Horse riding is a high-risk sport with significant potential for torso injuries. Whilst compulsory for some competition disciplines, body protector use remains inconsistent. This study investigated equestrian riders' use, preferences, and perceived barriers related to body protectors, including standard foam and air jackets. An online questionnaire was completed by 1,009 equestrian riders, the majority of whom were female, consistent with previous surveybased equestrian research. Data included frequency of body protector use, purchasing influences, perceived comfort and fit, and rider characteristics. Associations between rider status (amateur vs professional) and body protector use were examined using chisquare analysis and odds ratios. Openended responses were analysed using reflexive thematic analysis.

Only 20% of riders reported wearing a body protector every time they rode, with the majority indicating situational use. A significant association was observed between rider status and body protector usage frequency ($\chi^2(4) = 10.48$, $p = 0.033$). Riders who always wore a body protector had significantly lower odds of inconsistent use compared with those who wore one occasionally or not at all (OR = 0.06, 95% CI: 0.03–0.12, $p < 0.001$). Amateur riders were more likely than professional riders to report consistent body protector use (OR = 2.45, 95% CI: 1.25–4.80, $p = 0.004$). Thematic analysis identified discomfort, bulkiness, poor fit, particularly for female body shapes and perceived restriction of movement as primary barriers to regular use.

Findings highlight a trade-off between safety and performance: perceived interference with posture and comfort strongly influences adoption. Cross-sector insights from military and police body armour suggest that user-centred design, ergonomic optimisation, and gender-specific considerations are critical to improve compliance. These results provide practical guidance for manufacturers, governing bodies, and educators to enhance body protector uptake and safety outcomes in equestrian sport.

Keywords: Injuries, Equestrian, Protective Equipment, Airbag Vest, Airbag Jackets

Introduction

Horse riding is widely recognised as a high-risk sport, regardless of whether it is practised recreationally or competitively. The inherent unpredictability of the horse, combined with speed and rider elevation, contributes to a heightened risk of injury, including fatality [1-4], with injury rates as high as 1 per 350-1000 hours while mounted [5]. Horse riding causes some of the highest total body injury and mortality rates compared to all other modern sporting activities; and is more hazardous than either motorcycle riding or rugby [6]. Most injuries are as a result of falling off with over 50% riders reporting a fall within the last 12 months and nearly a quarter had fallen off at least twice [7]. The most common area of riding injuries reported to an Accident and Emergency (A&E) department were spinal (41%), lower limb (16%), pelvic (14%), upper limb (12%), head (7%), chest (7%), and abdominal (2%) (Liaw et al., 2019). While equestrian safety equipment has evolved significantly, particularly head protection, a similar level of attention has not been extended to body protectors (BP) and airbag jackets (also known as airbag vests, air jackets, air vests) (AJ), designed to reduce the risk of serious torso injuries from falls or kicks.

Current literature predominantly focuses on head trauma and helmet efficacy [8-10], with limited evidence of the real-world effectiveness of BP and AJ in preventing upper-body or spinal injuries [11,12]. Despite the introduction of standards like BETA Level 3 and EN13158, and the compulsory use of body protectors in some disciplines such as cross-country and racing, uptake among riders remains inconsistent, particularly outside of competition.

Research has shown that although BP reduce the risk of rib and chest injuries [12], there is little conclusive data on their role in preventing spinal damage [11]. Usage rates remain low, with studies reporting that approximately 7–10% of injured riders were wearing a BP at the time of their accident, with air-jacket use either rare or not consistently recorded in earlier injury surveillance data [13-14]. Even when used, riders have cited discomfort, restricted movement, heat retention, and financial cost as barriers to consistent body protector wear [15]. These concerns are particularly relevant when comparing traditional BP to newer innovations such as AJ, which function differently and may offer different levels of protection and comfort. In addition, in some disciplines such as FEI eventing, riders who elect to wear an air jacket are required to wear an approved body protector underneath it, which may also have an influence.

Despite some promising findings such as reduced injury severity in cross-country riders who wore a BP [15], there remains a critical research gap in understanding how rider experience, perceived comfort, aesthetics, and type of activity influence body protector use and preference. Therefore, this study aimed to investigate horse riders' use, preference, and perceived issues related to body protectors and air jackets, with the goal of identifying key factors that influence product selection and compliance. Several objectives were required to meet this aim, these included: To determine the frequency and context in which body protectors and/or air jackets (BP&/AJ) are used by equestrian; To explore rider preferences for different types of protectors; To identify barriers to use among riders who choose not to wear body protection and understand their reasons for non-compliance and finally to generate practical recommendations for riders, manufacturers, and governing bodies based on user experiences and preferences. Findings provide valuable, user-focused insights informing both product development and safety guidelines in the equestrian industry, and potentially encouraging greater adoption of body protection, improving safety outcomes in equestrian sport.

Method

Following institutional ethical approval (ETHICS2021-331-LR) and informed consent, a twenty-four question online survey (Surveymonkey™) was completed by riders aged over 18 years. Volunteer participants were recruited from personal contacts via email, and several specialist equestrian social media sites (such as the Horse & Hound forum) where a link to the questionnaire was posted. A snowball sampling technique was employed where those receiving an email regarding the questionnaire were asked to send on the email to other horse riders that they knew. Due to the anonymity of the questionnaire, completion of the form was considered as consent to take part in the study (which was explained in the participant information sheet preceding the survey).

Survey design

Survey design followed bestpractice guidance for questionnaire construction to optimise clarity and response quality [16] and comprised 24 questions, including a mixture of closed – response (e.g. Yes / No and ordinal Likert scale responses) and open-response questions, and took no longer than 15 minutes to complete. The survey was divided into three sections. Section one focused on rider demographics. Questions 1-8, included participant's age, gender, equestrian background and discipline. Section two focussed on body protectors and or air bag jacket (BP&/AJ) usage, including what type/brand of body protector worn and frequency of wear. Finally, Section three investigated any barriers to BP&/AJ use.

Data analysis

Survey data were analysed using descriptive and inferential statistics. Participant demographics, riding characteristics, BP&/AJ ownership, usage patterns, discipline involvement, and fall experiences were summarised using frequencies and percentages. Associations between rider characteristics (e.g. amateur versus professional status, discipline, age group, and sex) and BP&/AJ usage frequency were examined using chisquare tests. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to quantify differences in usage patterns between amateur and professional riders. Likert-scale responses relating to purchase decision factors were analysed using means and standard deviations, with independent samples *t*-tests conducted to compare amateur and professional riders. The perceived impact of BP&/AJ on riding position and related barriers to use were examined using chisquare analysis and logistic regression. Data were analysed using SPSS for Windows version 24. Statistical significance was set at $p < 0.05$. Freetext responses related to comfort and design were analysed using thematic analysis following the approach by Clarke and Braun (2017) [17] to identify lower and higherorder themes. Content analysis was also analysed and presented using word clouds (Canva™).

Results

Participant Demographics

A total of 1,009 equestrian riders completed the survey. The sample was predominantly female (97.8%, n=988), with a small proportion identifying as male (1.8%, n=18) or neither (0.3%, n=3). Most participants were amateur riders (89.8%, n=907), with professional riders representing 10.1% (n=102).

Age distribution was skewed toward younger riders, with the largest proportion aged 21–30 years (36.8%, n=372), followed by 18–20 years (26.2%, n=265). Riding behaviour was highly active: 56.0% (n=566) rode daily, and 38.3% (n=387) rode weekly. Competition involvement varied, with 30.0% (n=303) competing monthly and 27.8% (n=280) not competing at all. Eighty-one percent (n=818) of riders reported to owning a standard style

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body protector, with 6% (n=60) an airbag jacket and 13% (n=131) owning both. Most participants within this study have owned their BP&/AJ for 1-5 years (56%), 46% (n=464) over 5 years.

Frequency of body protector and/or airbag jacket use

The most popular situations for wearing a BP&/AJ were contextspecific rather than habitual. Reported use of a BP&/AJ varied by riding context (Figure 1). Use was most frequently reported when jumping, with just over a quarter of respondents indicating use in this situation (26.8%, *n* = 271). This was followed by use when riding a difficult horse (23.8%, *n* = 240) and during competition (21.3%, *n* = 215). Regular use every time participants rode was reported by 19.8% (*n* = 200), while a similar proportion indicated use when riding young horses (19.8%, *n* = 200). Less frequent use was reported sometimes when riding (12.9%, *n* = 130) and during training (12.9%, *n* = 130). Use of a BP&/AJ was uncommon when hacking (5.0%, *n* = 50) or in lessons (2.5%, *n* = 25), and only a small proportion of respondents reported never wearing one (2.0%, *n* = 20). As participants were able to select multiple contexts, percentages sum to greater than 100%. Only 19.8% of riders reported wearing a BP&/AJ every time they ride, while 80.2% wore a BP&/AJ only sometimes or never, this resulted in an odds ratio of 0.06 (95% CI: 0.03–0.12, p < 0.001), indicating that the odds of wearing a BP&/AJ every time were significantly lower than the odds of wearing one only sometimes or not at all.

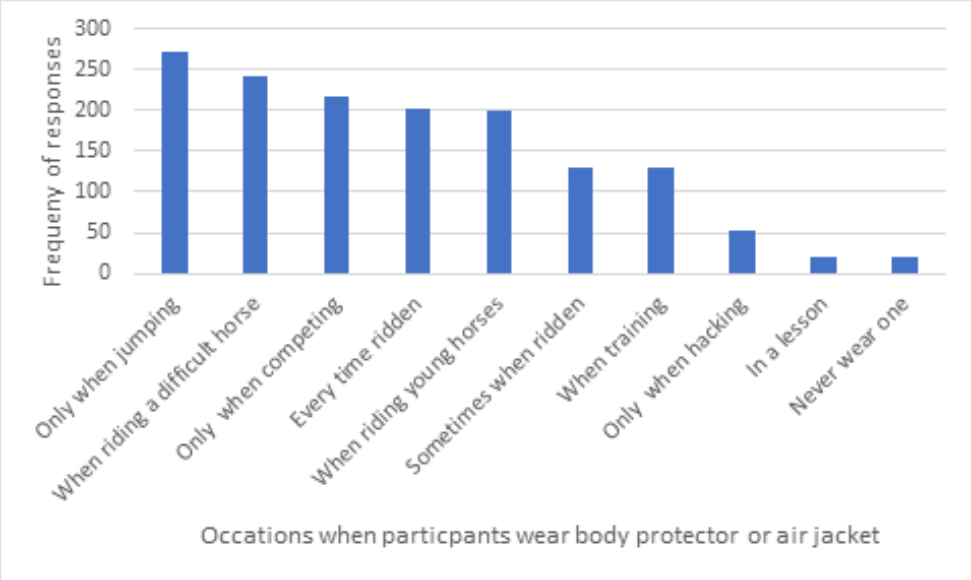

Figure 1: Ridden activities when riders decide to wear body protectors and/or airbag jackets

A majority of respondents (63%) indicated that they did not prefer to ride in a BP&/AJ, whereas the remaining 37% either reported a preference for riding in a BP&/AJ or indicated no preference, suggesting that they did not mind riding in one (Figure 2). When preferences were examined using odds analysis, respondents were almost three times more likely to report a preference not to ride in a BP&/AJ than to prefer riding in one (odds ratio [OR] = 2.90, 95% confidence interval 1.63–5.15, Fisher's exact test pvalue = p = 0.00038). As the confidence interval did not cross unity, this association suggests a clear predominance of preference away from BP&/AJ use within the sample.

Riders Status

Figure 3, shows BP&/AJ usage frequency among amateur (*n* = 907) and professional (*n* = 102) riders. A chisquare test of independence showed a significant association between rider status and BP&/AJ usage frequency ($\chi^2(4) = 10.48$, $p = 0.033$), indicating that patterns of BP&/AJ use differed between amateur (*n* = 907) and professional riders (*n* = 102).

Among amateur riders, the most common pattern of use was wearing a BP&/AJ in specific situations (47.4%, *n* = 430), followed by wearing a BP&/AJ every time (21.0%, *n* = 190). Smaller proportions reported wearing a BP&/AJ never or rarely (14.3%, *n* = 130), sometimes (7.2%, *n* = 65), or only when competing (10.1%, *n* = 92). A similar distribution was observed among professional riders, with the highest proportion reporting BP&/AJ use in specific situations (34.3%, *n* = 35). However, fewer professional riders reported wearing a BP&/AJ every time (9.8%, *n* = 10), while 17.6% (*n* = 18) reported never or rarely wearing a BP, 5.9% (*n* = 6) sometimes wearing a BP&/AJ, and 14.7% (*n* = 15) wearing a BP&/AJ only when competing.

Amateur riders had lower odds of reporting sometimes/often wearing a BP&/AJ compared with professional riders (OR = 0.74), although this difference was not statistically significant (95% CI 0.35–1.59).

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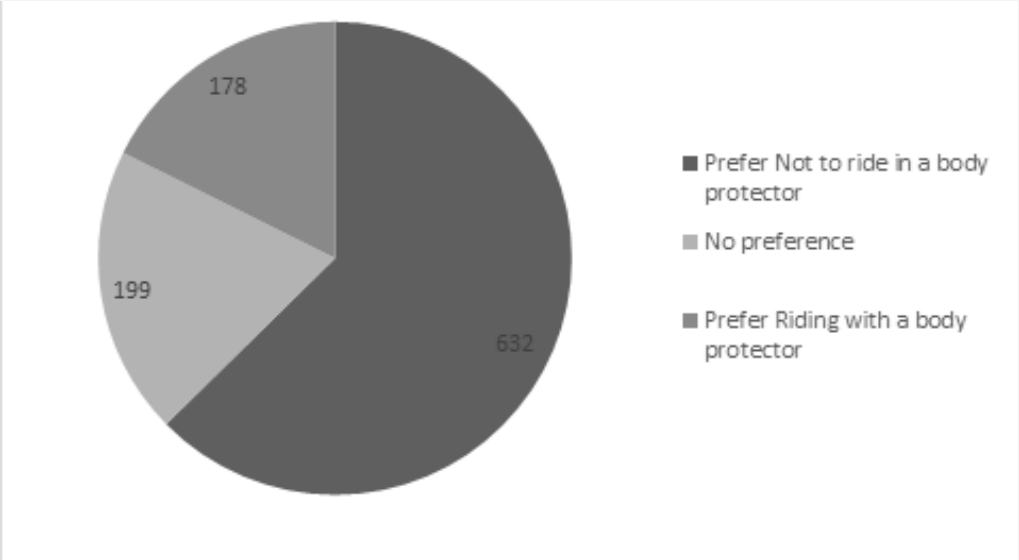

Figure 2: Report preference of riding with or without a body protector or air jacket

Amateurs were more than twice as likely as professionals to wear BP&/AJ every ride (OR = 2.45, 95% CI 1.25–4.80, p = 0.0035) (Table 1). Differences in non-use (OR = 0.78, 95% CI 0.45–1.34, p = 0.37) and situational use (OR = 1.52, 95% CI 1.00–2.32, p = 0.051) were smaller and not statistically significant (Table 1). These results suggest that amateurs demonstrate higher consistent use, while patterns of non-use and situational adoption are broadly similar between rider groups.

Table 1: Odds Ratios for Body Protector and/or air jacket usage patterns in amateur compared with professional riders

Usage Pattern	Odds Ratio (Amateur vs Professional)	95% CI	Z Value	P Value
Consistent (every ride)	2.45	1.25-4.80	2.92	P=0.0035
Non-use (never/rarely)	0.78	0.45-1.34	-0.9	P=0.37
Situational Use (young/inexperienced horse, when jumping)	1.52	1-2.32	1.95	P=0.051
Usage Pattern	Odds Ratio (Amateur vs Professional)	95% CI	Z Value	P Value
Consistent (every ride)	0.653333333	1.25-4.81	0.353333333	P=0.0035
Non-use (never/rarely)	0.188333333	0.45-1.35	-0.131666667	P=0.37
Situational Use (young/inexperienced horse, when jumping)	-0.276666667	1-2.33	-0.616666667	P=0.051
Usage Pattern	Odds Ratio (Amateur vs Professional)	95% CI	Z Value	P Value

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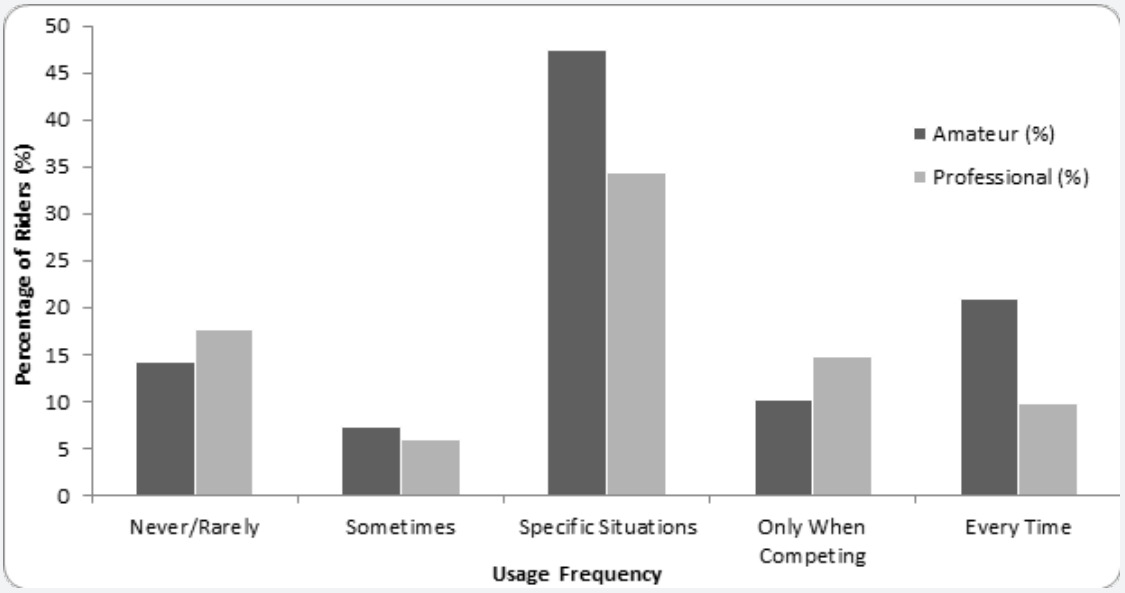

Figure 3: Distribution of body protector and/or air jacket usage frequency among amateur and professional riders. Percentages are calculated within rider group.

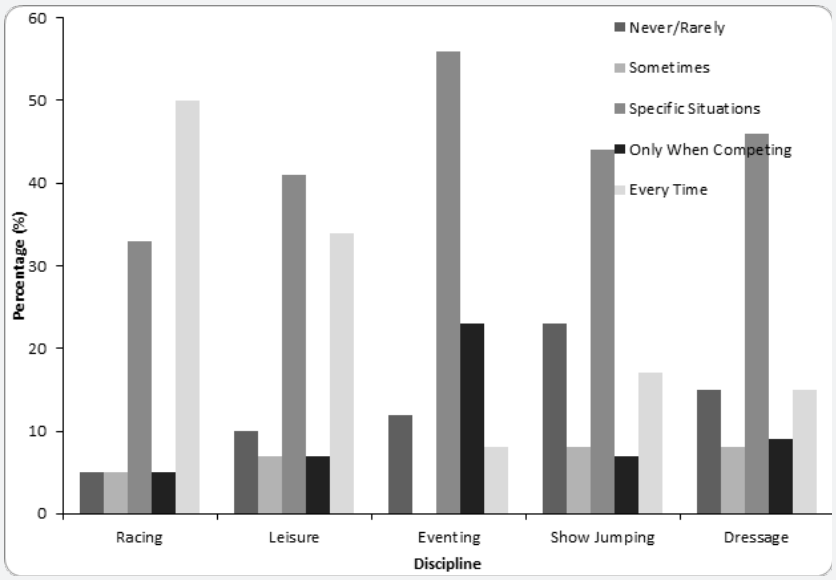

Figure 4: Body Protector and/or air jacket usage frequency by discipline.

Discipline-Specific Usage

Body protector and/or air jacket usage varied significantly by discipline (χ^2=187.89, df=28, p<0.001) (Table 4). Racing riders demonstrated the highest consistent usage (50% every ride). Leisure riders showed the second-highest consistent use (34.6%). Eventing/cross-country riders primarily used protectors situationally (56.2%, n=331) or only when competing (23.3%), with only 8.5% wearing them every ride.

Despite high risk, show jumping had the highest never/rarely use rate (23.2%). Dressage riders had the lowest overall usage, with 52.3% reporting situational use and 15.3% never/rarely using BP&/AJ.

Age and Usage Frequency

Age had a statistically significant association with usage frequency (p<0.001). Consistent use increased steadily with age: 15.1% (18–20 years), 16.9% (21–30 years), 20.4% (31–40 years),

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25.4% (41–50 years), 37.2% (51–60 years). Older riders (51–60) also had the lowest non-use rates (3.8%), compared with the highest rate among 18–20-year-olds (21.5%).

Fall Experience and injury outcomes

Among all respondents, 80.3% (n=803) had fallen while wearing a BP&/AJ. Most falls (77.4%) involved traditional foam body protectors, while 10.1% involved air jackets. Across all riders who had fallen (n=797), 63.6% (n=507) sustained no injury, while 36.4% (n=290) were injured. Among female riders wearing standard protectors (n=684), 65.3% were uninjured and 34.7% sustained injuries.

Body Protector Types, Brands, and Purchasing Factors

Traditional foam body protectors were used by 85.4% of participants (n=862), while 14.6% (n=148) used air jackets. Brand preferences: Racesafe (39.5%), Airowear (22.7%), and Point Two (13.8%) were the most common. Air jacket use remained comparatively low.

Body protector and/or air jacket age revealed suboptimal replacement patterns: 25.6% of riders used protectors older than the recommended replacement timeframe (>5 years).

Purchase Decision Factors

Figure 5 presents responses to a sixitem Likert scale assessing factors influencing participants' decisions when purchasing a BP or AJ. Seventysix percent of participants reported *strong agreement* that fit influenced their purchasing decision, identifying it as the most important factor. Weight was also highly influential, with 52% of participants indicating agreement, followed by aesthetic appearance (50% agreement). A similar proportion (52%) agreed that their decision was influenced by others' opinions, while 50% indicated that price affected their decisionmaking.

The method of fastening (e.g. Velcro or zip) was less influential overall, with 24% indicating agreement, although a substantial proportion of respondents selected neutral or higher agreement categories. Mean scores supported these patterns, with fit rated highest (M = 4.69, SD = 0.69), followed by weight (M = 4.06, SD = 0.85) and fastening type (M = 3.58, SD = 0.99), while price was rated lowest overall (M = 3.35, SD = 1.07).

Professional riders were significantly less influenced by others' recommendations than amateur riders (M = 3.27 vs 3.49; t = 2.224, p = 0.026), with no other significant differences observed between rider groups.

Perceived Impact on Riding Position

Fifty- seven percent (n= 579) of riders agree that a BP&/AJ alters their position and 43% felt wearing gone did not. Among female riders, 61% (n= 609) reported that BP&/AJ altered their riding position. The most common issues were Stiffness/rigidity (34.5%, n=200), Forward lean position (24.4%, n=141), Backward lean position (13.1%, n=76), Reduced flexibility (11.1%, n=64)

Discipline had no significant association with type of position change (χ^2=30.58, df=30, p=0.44). However, affiliated eventers and show jumpers reported the highest rates of stiffness (40–43%).

Non-users reported the highest rate of stiffness complaints (42.0%), frequent users reported fewer negative effects and were more likely to perceive positive posture changes (27.8% felt more upright). Non-users had over three times the odds (OR=3.28, CI 1.86-5.78, p≤ 0.001) of reporting stiffness/rigidity complaints compared with frequent users.

Air Jacket Maintenance and Problems

Among air jacket users (n=296), 83.8% reported no problems. Issues reported included: Loud inflation noise (9.5%), Failure to inflate (4.4%), Unexpected inflation (3.7%), Difficulty replacing cylinders (3.0%). User error was common: 38.1% had forgotten to unclip their jacket at least once.

Body protector comfort and barriers to use

Table 2: Thematic analysis of riders' perceptions of issues with body protectors

Higherorder theme	Lowerorder theme	Description	Illustrative participant quotes
Physical comfort and freedom of movement	Bulkiness and rigidity	Riders frequently described body protectors as bulky, stiff, and restrictive, limiting upperbody mobility and negatively affecting riding position.	"They are too rigid and movement is restricted." "Just how bulky they are – I always find them way too restricted and uncomfortable."
	Restricted movement during riding	Participants felt body protectors interfered with suppleness, balance, and technical riding, particularly for jumping and flatwork.	"Just so awkward to show jump freely in… it really impacts how someone is riding." "How much they restrict me."
	Weight and fatigue	The overall weight of body protectors was perceived as tiring and reduced willingness to wear them regularly.	"Some are just very heavy which makes me less likely to wear it." "Lighter with the same protection would be ideal."
	Heat retention and breathability	Heat buildup and lack of airflow, especially in summer, were common deterrents.	"Could be lighter and not make me so sweaty!!!" "How hot they are in the summer and the general bulkiness."

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Fit, body diversity, and design limitations	Inadequate fit for female body shapes	Many respondents highlighted poor accommodation for breasts, shoulders, and torso shape, leading to discomfort and breathing restriction.	"They don't accommodate larger breasts… it restricts my breathing even when fitted correctly." "Fit for women with bigger bust but smaller waist."
	Length and proportion issues	Riders, particularly shorter individuals, reported protectors being too long and interfering with the saddle or cantle.	"Sometimes my cantle interferes with the back of my body protector." "Even small sizes seem long in the back and catch on the saddle."
	Limited sizing and adjustability	Participants felt standardised sizing failed to reflect body diversity, calling for more customisation options.	"One size does not fit all." "More sizes available to fit every shape of person."
	Price and affordability	Cost was frequently cited as a major barrier, particularly for higherspecification protectors and air jackets.	"Wish they were cheaper!!" "Safety shouldn't be based on wealth."
Cost, accessibility, and social perceptions	Accessibility of advanced protection	Riders felt that more flexible or lighter designs were often priced beyond the reach of amateur and leisure riders.	"The more flexible ones are out of my price range." "Air jackets are far too expensive."
	Stigma and social attitudes	Social judgement and stigma around wearing body protectors reduced uptake outside compulsory contexts.	"People think you're a wuss for wearing one." "I want to wear one without looking novicey or scared."
	Aesthetics and discretion	Bulky appearance and lack of discreet designs were linked to reluctance to wear protectors regularly.	"If they were more discreet and less bulky, I'd wear one more often." "They are very bulky and look bulky."

Table 2 summarises the thematic analysis of riders' perceptions of issues associated with body protectors. Three overarching themes were identified. The first, physical comfort and freedom of movement, reflected widespread concerns regarding bulkiness, rigidity, weight, heat retention, and the perceived restriction of rider movement, which participants felt could negatively affect riding position and performance. The second theme, fit, body diversity, and design limitations, highlighted difficulties with standardised sizing, inadequate accommodation of female body shapes, and issues related to length and proportion, particularly for shorter riders or those with larger busts. The third theme, cost, accessibility, and social perceptions, captured barriers related to affordability, limited access to advanced protective designs, and the stigma and aesthetic concerns associated with wearing body protectors outside compulsory contexts. Collectively, these themes indicate that while riders recognise the protective value of body protectors, issues relating to comfort, fit, cost, and social acceptability may limit their consistent use.

Discussion

This study examined patterns of body protector and/or air jacket use, user concerns, perceived effects on riding position, and injury outcomes in a sample of predominantly female equestrian riders (n = 1,009). The participant profile is consistent with previous surveybased equestrian research [18-20]. The findings reveal a clear tradeoff between protection and usability, with many riders opting for situational rather than consistent body protector use. Discomfort, poor fit, and perceived interference with riding position were identified as key barriers to regular adoption. When situated within the broader literature on protective equipment in equestrian sport and comparable highrisk occupations, including policing, military service, and other sports [21-27], these findings underscore important implications for safety equipment design, rider education, and injuryprevention policy.

Injury Prevention: Effectiveness, Limitations and Real-World Outcomes

The injury data show that BP and AJ were perceived to prevented injury in approximately two-thirds of falls, but 34–42% of falls still resulted in injury despite protection indicating important limitations. This aligns with prior equestrian research: body protectors reduce certain types of injury (e.g., thoracic rib fractures, soft-tissue trauma) in cross-country and other contexts, but cannot prevent all outcomes, especially high-energy crush or rotational injuries. Airbag jackets may reduce the probability of severe chest injury compared with standard foam protectors in some scenarios, but modelling and field evidence is limited and caution against over-statement: airbags reduce risk but do not guarantee survival in catastrophic mechanisms (e.g., being crushed by a horse) [27]. More research is needed to evaluate the effectiveness of AJ in the prevention or reduction of injury across a range of equestrian mechanism of injuries.

Comparisons with police/military armour are instructive: there, armour reduces specific outcomes (penetrating trauma, blunt force) [28] but introduces trade-offs (heat, mobility) [29] and must be part of a systems approach to risk mitigation. Similarly in equestrianism, protective equipment should be one element of a broader safety strategy, such as training to avoid rotational falls, course design, horse and rider pairing, appropriate medical response [30].

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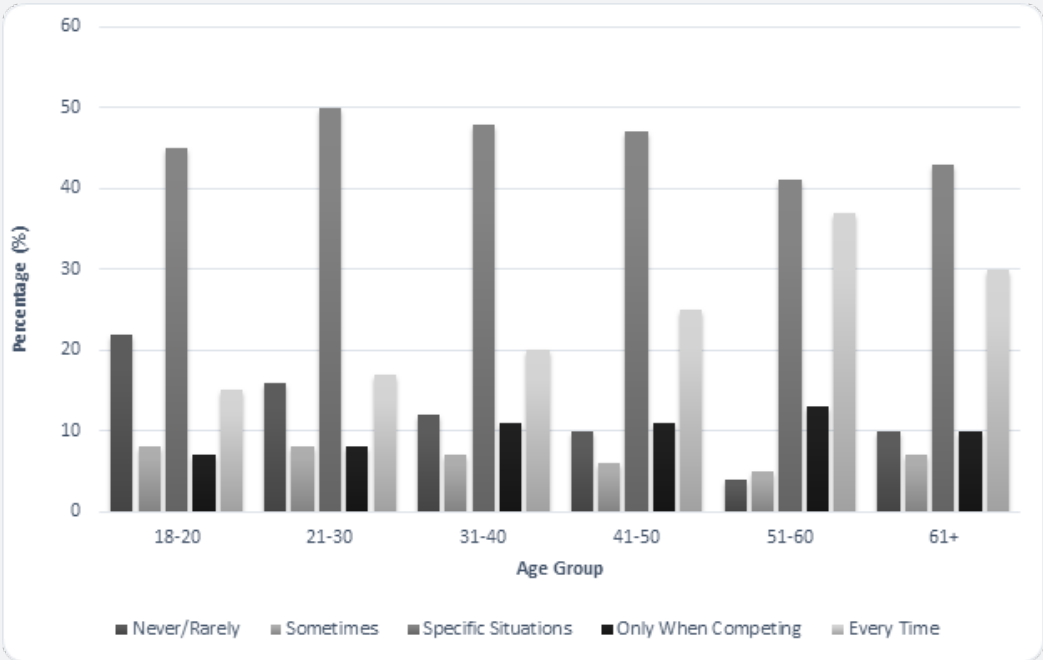

Figure 5: Age-related usage frequency. Usage - Never/rarely, Sometimes, Specific Situations (riding a young/inexperience horse, when jumping), Only when Competing; Every time riding.

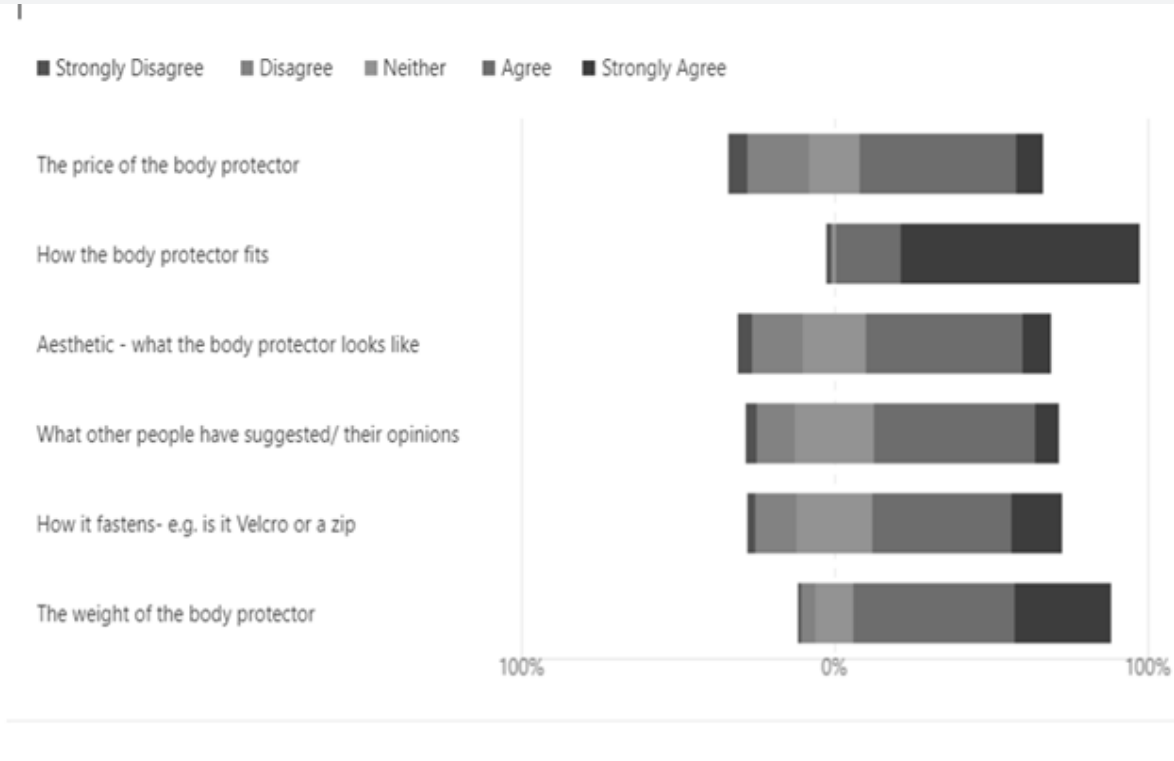

Figure 6: Factors influencing body protector or air jacket purchase decisions among riders

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Evidence from collision sports such as American football and rugby indicates that protective equipment can, under certain conditions, paradoxically contribute to more frequent or more severe injuries, not because the equipment is ineffective, but due to complex interactions between biomechanics, risk perception, and behaviour [31,32]. Risk compensation is a commonly proposed mechanism, whereby athletes who feel more protected may tolerate higher impact forces or adopt more aggressive techniques. In helmeted sports, the added mass and stiffness of protective equipment can increase collision momentum, thereby elevating both linear and rotational head accelerations, even as the risk of superficial injury or skull fracture is reduced [32]. Importantly, helmets and padding primarily protect external structures and are less effective at mitigating internal neurological or musculoskeletal loading, leading to a mismatch between perceived and actual protection that may unintentionally reinforce risktaking behaviours [23,24,32].

These mechanisms are highly relevant when interpreting patterns of BP&/AJ use in equestrian sport. Riders in the present study frequently reported discomfort, bulkiness, restricted movement, and altered riding position, suggesting that current designs may interfere with effective riding biomechanics in a manner analogous to altered tackling mechanics observed in contact sports. In equestrian contexts, falls typically involve high forward momentum, and the ability to manage impact through movement, such as the jockey "tuckandroll" technique, plays a critical role in injury mitigation. Nyland et al. (2022) [27] demonstrated that failure to perform a tuckandroll during a racing fall was strongly associated with highrisk landings (OR = 4.9; 95 % CI 1.65–14.44; $p = 0.001$). While body protectors are compulsory in racing (and eventing, where AJ are also increasingly worn in addition to the BP), serious and catastrophic injuries still occur, even alongside advances such as deformable fence technology [33]. Excessive stiffness, bulk, or restriction from protective equipment may limit riders' ability to dissipate forces through controlled movement, potentially redistributing load to the spine, shoulders, or neck. Consistent with findings from other highrisk occupations [25,26] these results suggest that improved body protector effectiveness in equestrian sport requires not only advances in design and fit, but also education regarding equipment limitations and integration within a broader safety system, rather than reliance on protective equipment alone.

Limited research has evaluated the impact of air safety jackets in motor sport [34] and skiing [35] but further research is needed to fully understand the effect of use in equestrian sport. Experimental work in air jacket use in injury prevention is limited but suggestive, Nyland et al. (2016) [27], report reduced injury incidence in cross-country when AJ are used, yet little is known about other discipline-specific performance impacts. Airbag jackets offer a partial solution deploying only on separation to avoid interfering with routine movement, but their real-world ergonomics (bulk when uninflated, attachment points, canister weight, accidental deployments) may still affect rider posture. Research is also needed to evaluate potential for chest-injury and rider biomechanics considerations with the use of air jackets, especially for the female rider.

Position and performance

These findings showed that 61.5% of riders believe AP&/AJ alter their riding position; common reports included stiffness and forward or backward lean. Non-users had over three times the odds of reporting stiffness/rigidity complaints compared with frequent users. This strengthens the argument that the perception of a negative impact on position is a major barrier to consistent use of body protectors. Riders who reported experiencing biomechanical disruption (stiffness, restricted movement) are significantly more likely to avoid wearing them. A rider's ability to maintain correct posture, including symmetrical weight distribution in the saddle and precise timing in the application and release of pressure through the seat, legs, and hands, has important implications for both rider safety and horse welfare [36]. Disruption to these processes, such as delayed release or inconsistent cues may result in unclear or conflicting signals to the horse, increasing confusion and the likelihood of conflict behaviours [37]. These behaviours not only compromise performance but may also elevate injury risk for the rider and negatively affect equine welfare [38]. Riders in the present study commonly reported that wearing a body protector restricted movement, increased fatigue, affected riding position and thereby altered timing of cues. Such effects may exacerbate preexisting asymmetries in the saddle, stirrup [39] and reins [40], contribute to chronic musculoskeletal pain [41], and reduce the rider's capacity to maintain postural stability over longer riding durations. These issues are likely to be particularly pronounced among amateur riders, who may have lower baseline conditioning [42], greater movement asymmetry, or less postural control than professional riders [43]. Consequently, while body protectors are intended to reduce injury risk, perceived interference with movement quality and rider–horse communication may discourage consistent use, particularly in contexts where riders prioritise precision, symmetry, and effective timing of cues to safeguard both their own safety and that of the horse.

Comfort: Heat, Bulk, Fit and the Barrier to Adoption

The most common barriers reported were bulky/heavy design, fit/comfort, and restriction of movement. These practical complaints closely mirror findings from research on occupational body armour and sports personal protective equipment (PPE): comfort and ergonomics are primary determinants of real-world compliance, often outweighing stated safety benefits in user decisions [44]. Evidence from police and military contexts suggests that greater torso protection is associated with increased discomfort, thermal load, and reduced mobility, which in turn can discourage sustained or consistent use of protective equipment. [26,45]. In equestrian settings the problems are magnified by micro-ergonomic needs: riders require fine trunk mobility, close

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contact and precise posture [40]. Even modest bulk or heat can disrupt balance, friction with the saddle, and perceived 'feel' of the horse by the riders, may be a reason to avoid regular use. Our finding that riders who never/rarely wore protectors reported the highest rates of stiffness complaints suggests a feedback loop: poor-fitting or poorly designed protectors cause position disruption, which in turn discourages future use.

Equestrian Tradition and Risk Culture

Equestrianism is characterised by a longstanding cultural narrative that valorises toughness, resilience, and rapid return following adversity, encapsulated in norms such as "getting straight back on after a fall" [46, 47]. This ethos is closely intertwined with the traditions of equestrian clothing and competition, which have historical roots in military uniform and aristocratic leisure, emphasising elegance, discipline, and an athletic silhouette. Conventional competition attire, such as fitted breeches, tailored show jackets, and tailcoats is designed to present a clean, streamlined aesthetic, and bulky body protectors may be perceived as disrupting this appearance [48]. Within this context, riding without visible protective equipment (BP&/AJ) can become a subtle marker of experience, confidence, and legitimacy, particularly in competitive and social settings. Informal comparisons with peers, often described as "keeping up with the Joneses," may further reinforce these norms, positioning nonuse of BP&/AJ as evidence of bravery, professionalism, or commitment to the horse–rider partnership [49]. The unique structure of equestrian sport, in which men and women compete on equal terms, may intensify pressures to minimise visible protection in order to demonstrate physical resilience and parity with male counterparts. While this cultural framework can promote perseverance and continuity of participation, it may also normalise risktaking behaviours and discourage consistent body protector use, even where riders recognise potential safety benefits. These dynamics highlight the need for culturally sensitive approaches to safety that acknowledge the powerful influence of tradition, identity, and aesthetics alongside performance and injuryprevention priorities.

Female Form: Breast Fit, Comfort and Injuries

Discomfort associated with BP&/AJ use should be understood within the broader context of female breast anatomy, breast support requirements, and thoracic equipment design. The breast is a complex structure of glandular and adipose tissue, ligaments, nerves, and skin [50–52] and, in the absence of intrinsic muscular support [90], is readily displaced by external forces [53]. Excessive breast movement is associated with exerciseinduced breast pain (EIBP), tissue strain, altered movement patterns, and reduced physical performance [50,54,55]. Evidence indicates that discomfort related to breast motion and compression is common among female equestrians and may be exacerbated by illfitting BP and AJ. Approximately 40% of female riders report EIBP during equestrian activities, increasing linearly with breast size [56,57,58], and over onefifth report that breast discomfort negatively impacts riding performance [56] and a barrier to participation [56]. Notably, 70% of respondents report that improvements in equipment design are required for equestrian use [57]. These findings mirror evidence from military and policing research, where standard body armour designs frequently fail to accommodate female anthropometry, resulting in poor fit, pressure points, breast pain, compromised breathing, reduced mobility, and altered posture [59,60,61]. Anthropometric studies consistently demonstrate that breast size and thoracic contour significantly influence perceived comfort and risk of breastrelated discomfort or injury when wearing rigid protective equipment. In equestrian sport, BPs that compress or misposition breast tissue are therefore likely to compound fatigue, restrict chest expansion, and disrupt rider posture and movement timing. When combined with the performance demands of disciplines that prioritise close contact, symmetry, and an elegant silhouette, inadequate femaleoriented BP and AJ design may further discourage consistent use. Collectively, these findings underline the need for manufacturers to incorporate femalespecific anthropometry more explicitly into BP and AJ design, integrating contouring, adjustability, and compatibility with effective breast support to improve comfort, function, and adoption among female riders who represent the majority of the equestrian population.

Practical Recommendations and Research Priorities

Based on the findings of this study and the cross-disciplinary literature, we propose the following research priorities: 1. User-centred design: develop female-specific and discipline-specific protectors with iterative field testing focusing on trunk mobility, heat management, and breast fit. 2. Biomechanical testing standards: require objective measures of how protectors affect rider posture and movement during riding tasks (not just laboratory drop tests). 3.Behavioural interventions: target cultural norms through rider education, influencer endorsements, and competition regulation where appropriate. 4. Surveillance and comparative effectiveness: establish longitudinal registries to compare foam protectors and air jackets across disciplines and mechanisms of fall. 5.Cross-sector learning: adopt relevant ergonomic assessment protocols from police/military armour research to evaluate comfort, heat strain and mobility in rider populations.

Limitations

While this study benefits from rich self-reported data, it relies on retrospective reporting and lacks objective biomechanical measures or direct injury verification. Comparisons with military and police studies should be interpreted carefully because exposure patterns and injury mechanisms differ. Future mixed methods work combining motion analysis, physiological monitoring and prospective injury tracking would strengthen causal understanding.

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Conclusion

Riders' choices regarding body protector use are pragmatic and context-sensitive: comfort, fit, and perceived interference with performance are powerful barriers that undermine consistent adoption despite evidence that protectors reduce many but not all injuries. Cross-sector evidence from policing and military ergonomics reinforces that protective performance must be balanced with user comfort and mobility to achieve sustained use. Tackling these challenges will require coordinated action from manufacturers, governing bodies and researchers focused design innovation, rigorous field testing, and targeted cultural change to close the gap between protection potential and real-world safety.

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