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UK Saddle Survey: Part 1 - Saddle Use & Preferences in Horses and Riders

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13 ABSTRACT

14

15 Saddles are almost certainly one of the most commonly used pieces of equipment and are
16 used by the majority of riders in many equestrian disciplines. Despite a large number of
17 studies relating to saddle fit and function, there appear to be no published data describing
18 the basic demographics of saddle use, rider preferences or discipline differences. This study
19 was designed as an online survey consisting of 20 closed questions and 4 open free text
20 questions split into three sections: 1) participant demographics; 2) saddle use; 3) impact of
21 saddle use on the horse and rider. The survey was live for 20 days and 65% of the responses
22 were obtained within the first 8 days. A total of 4527 horse owners/keepers undertook the
23 survey with 3624 complete responses (80.1% completion rate). The majority of respondents
24 were female (98.1 %, n = 3555). The four most popular disciplines respondents participated
25 in were pleasure riding/hacking (82.6 %, n = 2994), dressage (71.6 %, n = 2595), show
26 jumping (48.2 %, n = 1747) and eventing (33.3 %, n = 1205). Most horse owners and
27 keepers engaged in non-competitive or local / unaffiliated level competition (59.0 %,
28 n=2136). The majority of respondents (59.2%, n = 2145) did not use saddles on more than
29 one horse. When selecting a saddle, respondents valued comfort for the horse as essential
30 (92.6%, n = 4073), followed by injury prevention (essential; 66.5%, n = 2838) and then
31 performance related attributes (essential; 56.9%, n = 2459). When selecting a saddle to buy,
32 durability was the most important feature for respondents (92.5%), who also rated weight,
33 price, and leather (63.0, 66.5, 67.7%, respectively) as key attributes they would require.

34

35

36 **KEYWORDS:** Equestrian; Tack; Industry; Saddlery; Safety

37 INTRODUCTION

38 Riding of horses is estimated to have begun around 3500-3000 BCE in Kazakhstan, the
39 Caucasus Mountains, eastern Anatolia, the Danube valley, and Germany or possibly even
40 earlier in the Khvalynsk culture around the Volga in Russia around 4000 BCE (Anthony,
41 2011). However, saddles in the very primitive form of pad do not seem to have appeared
42 until significantly later. The Roman army adopted a new form of saddle in the 1st century
43 BCE which provided greater stability in combat but without any form of stirrup (Gawronski,
44 2004) Stirrups provided riders with even greater stability in the saddle and were initially
45 made of leather or cloth, and have been proposed to have originated in India in the 1st
46 century CE with metal stirrups suggested to have been invented by the southern Siberian or
47 Altaic nomads 400 years later (Littauer, 2015). These then spread to the rest of the world
48 via China, Korea, and Japan (Littauer, 2015).

49
50 The purpose of the saddle is essentially three-fold. First, to provide the rider with a degree
51 of stability in order that the risk of falling off is reduced. Second, to allow the rider to use
52 their hands and legs to give “aids” (non-verbal physical instructions) to the horse in order to
53 control the horses. Third, to protect the horse from the mass of the rider and its movement
54 by providing some distribution of that mass over a wider area. The latter is only possible
55 with a saddle with a relatively stiff tree. The saddles in use today, nearly 1500 years later,
56 have essentially changed little from the original themes. Whilst treeless saddles and semi-
57 rigid trees exist, anecdotally, saddles built around a wooden or synthetic tree are by far the
58 most common.

59
60 Despite the fact that saddles, along with a girth and bridle and reins are almost certainly the
61 most commonly used pieces of equipment and are used by the majority of riders, whilst
62 there are a large number of studies relating to saddle fit and function (Bystrom *et al.*, 2018;
63 Clayton *et al.*, 2018; Dittmann *et al.*, 2021; Greve and Dyson, 2015; Gunst *et al.*, 2019;
64 MacKechnie-Guire *et al.*, 2021; MacKechnie-Guire *et al.*, 2019; Martin *et al.*, 2015;
65 Michelotto *et al.*, 2016; Nankervis *et al.*, 2019), the basic demographics of saddle use, rider
66 preference for saddle choice or if differences in saddle choice occurs between riding
67 disciplines or for individual horses remain unknown.

68

69 The purpose of the present survey was therefore to gather information from UK based
70 riders on attitudes towards saddle fit and function, preferences, use, perception of muscle
71 profile in the saddle region and health issues in both riders and horses via a structured
72 online survey.

73

74 **MATERIALS AND METHODS**

75

76 *Participants*

77 Participants were recruited online via the sharing of a link to the survey onto social media
78 (Facebook®) on selected UK equine-related or discipline-specific groups including but not
79 limited to British Dressage, Endurance UK, Eventing UK, Horsepoo (regional) and via UK media
80 outlets. The survey invitation was targeted as widely as possible to include amateur and
81 professional riders, competing in either affiliated and unaffiliated competitions for or within
82 para-equestrian sport in the UK or working professionally in the equine industry e.g.,
83 veterinarians, veterinary physiotherapists, veterinary nurses, and grooms. Inclusion criteria
84 required participants to be over 18 years of age. Participants were incentivised to take part
85 through the chance to win one of three prizes. The survey was anonymous, and no personal
86 data were collected although respondents could optionally provide an email address for entry
87 into a prize draw. In order to reduce bias, the survey was promoted and disseminated by an
88 independent 3rd party media company (Fox Red Media, Crown House, Loughton, IG10 4LF).

89

90 *Survey Design*

91 The study was designed as an online questionnaire (Survey Monkey®, Momentive Europe UC,
92 Shelbourne Rd, Ballsbridge, Dublin 4, Ireland) consisting of 20 closed questions (including 1
93 ranking scale question) and 4 open free text questions. The questionnaire was split into three
94 sections: 1) participant demographics; 2) saddle use and 3) perceived impact of saddle use on
95 the horse and rider. The survey used inbuilt routing features in relation to the number of
96 saddles owned and respondents had the option of submitting information regarding between
97 1 and 3 of their own saddles. The draft survey was tested by 10 experienced users and edited
98 to correct any errors before being fully deployed.

99

100 Respondents were asked questions relating to their horses (e.g., number owned or cared for,
101 back health, saddle use, lameness, back muscling, use of professionals/para-professionals,

102 use of saddle pads, types of saddles owned). Respondents were also asked to provide
103 information about their age, gender, dominant hand, UK region, which ridden activities they
104 participated in, competitive level, and their physical health.

105

106 *Data analysis*

107 Data were exported from Survey Monkey™ to Microsoft Excel™ Version 2010 (Redmond, WA,
108 USA). Frequency analysis identified the nature of equestrian activities and disciplines
109 respondents engaged with, if they competed or not, saddle use and horse muscle profiles.
110 Additional analyses calculated the frequency of professional use. Respondents also rated the
111 importance of different saddle features across cohort level and at a discipline level for those
112 respondents who regularly participated in dressage, showjumping and eventing.

113

114 Data were categorical and met non-parametric assumptions, therefore a series of Kruskal-
115 Wallis analyses identified if differences occurred in participant ratings of the saddle fit, saddle
116 pad and cloth use, rider injury and features looked for in a saddle between disciplines and
117 competitive level. For factors where significant differences were found, Mann-Whitney U
118 post-hoc tests identified how ratings differed between the disciplines and competitive level.
119 Median rankings for individual factors were examined to identify the direction of differences;
120 where median values were the same, mean rank differences obtained from post hoc tests
121 differentiated between disciplines. Significance was set at $p < 0.05$.

122

123 *Discipline: Dressage, Show jumping and Eventing:* A series of Kruskal-Wallis analyses with
124 post-hoc Mann-Whitney U tests assessed if differences in saddle use occurred between
125 respondents who regularly competed in dressage, show jumping and eventing, features
126 related to selection and use, and aesthetics. Differences between respondents related to
127 competitive level: local unaffiliated, affiliated – local, affiliated – regional, affiliated – national
128 and international level were assessed using Kruskal-Wallis analyses with post-hoc Mann-
129 Whitney U tests.

130

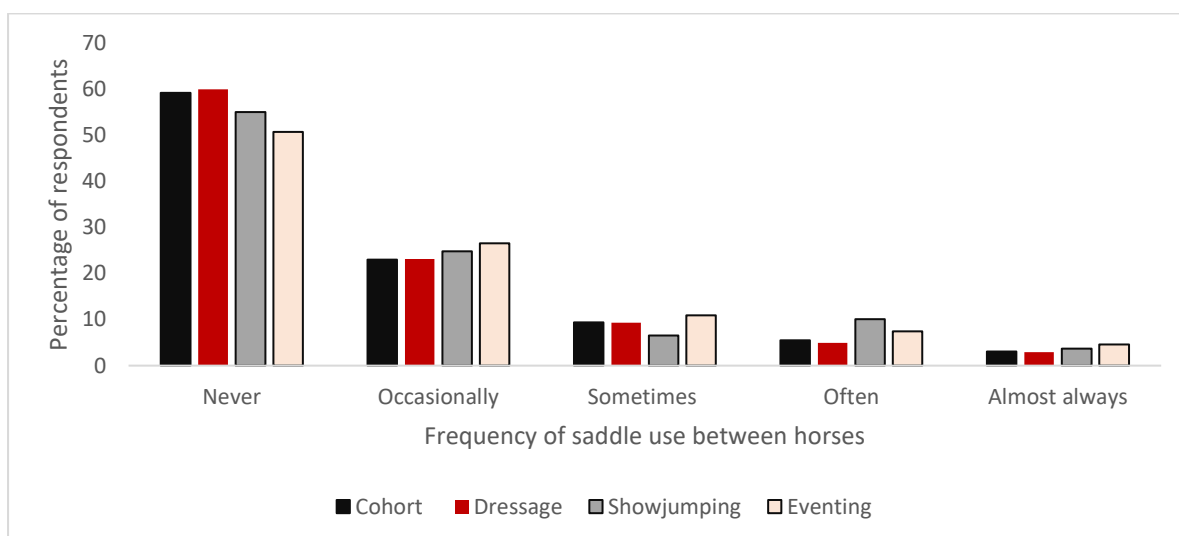
131 RESULTS

132 The survey was live for 20 days and 65% of the responses were obtained within the first 8
 133 days. A total of 4527 horse owners/keepers undertook the survey and 3624 (80.1%)
 134 completed the survey in full, which represents a $\pm 2\%$ margin of error at the 99% confidence
 135 interval for the UK equestrian population. The majority of respondents were female (98.1 %,
 136 n = 3555); age varied, with 14.9 % (n = 538) of respondents aged 18-24 years, 20.2 % (n = 732)
 137 25-34 years, 22.1 % (n = 800), 35-44 years, 24.3 % (n = 881) 45-54 years, 15.2 % (n = 552) 55
 138 – 64 years and 3.3 % (n = 121) 65+ years. Eighty-five percent (n = 3096) of respondents were
 139 right-handed, 10.7 % (n = 388) were left-handed and the remaining 3.9 % (n = 140)
 140 ambidextrous.

141
 142 The majority of respondents looked after 3 or less horses (1: 36.7%, n = 1662; 2: 27.5%, n =
 143 1243; 3-5: 25.1%, n = 1137; 6-10: 5.7%, n = 258; 10+: 5.0%, n = 227). The four most popular
 144 disciplines respondents participated in were pleasure riding / hacking (82.6 %, n = 2994),
 145 dressage (71.6 %, n = 2595), show jumping (48.2 %, n = 1747) and eventing (33.3 %, n =
 146 1205). Most horse owners and keepers engaged in non-competitive or local / unaffiliated
 147 level competition (59.0 %, n=2136).

148 *Saddle use*

149 Most respondents (59.2%) did not use the same saddle on multiple horses (Figure 1). This
 150 did not differ across the disciplines of dressage, showjumping and eventing.



151

152 Figure 1: Frequency of respondents across the cohort, dressage, showjumping, and eventing
 153 using the same saddle on different horses.

154

155 *Saddle features*

156 When selecting a saddle, respondents valued comfort for the horse followed by injury
 157 prevention for the horse and then performance attributes of the horse as very important or
 158 essential, although respondents rated importance higher for the horse than for the rider
 159 (Table 1). When selecting a saddle to buy durability was the most important feature for
 160 respondents (92.5%), who also rated weight, price, and leather (64-67%) as key attributes
 161 they would require (Table 2).

162 The use of a saddle pad / cloth alone (31.7 %, n =1863) under the saddle was the most
 163 popular choice of respondents, followed by a saddle pad / cloth with a sheepskin pad (18.4
 164 %, n = 1080), gel pad (16.7 %, n = 985), half pad (16.4 %; n = 968), no saddle cloth at all (11.9
 165 %, n = 698), and multiple pads / cloths (5.0 %, n = 293).

166 Table 1: Features valued by respondents when selecting a saddle

Feature	Not at all important % (n)	Somewhat important % (n)	Important % (n)	Very important % (n)	Essential % (n)
Comfort: Horse	0.0 (2)	0.1 (5)	1.1 (49)	6.2 (271)	92.6 (4073)
Performance: Horse	1.0 (45)	2.6 (114)	13.3 (575)	26.1 (1126)	56.9 (2459)
Injury prevention: Horse	0.2 (10)	2.2 (95)	10.2 (436)	20.8 (886)	66.5 (2838)
Comfort: Rider	0.3 (11)	3.4 (149)	18.1 (794)	37.1 (1633)	41.2 (1809)
Performance: Rider	1.3 (55)	5.1 (222)	23.1 (998)	33.6 (1447)	36.9 (1590)

Injury prevention: Rider	1.2 (53)	6.8 (286)	22.2 (938)	30.4 (1285)	39.4 (1664)
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168

169 Table 2: Key attributes rated as important when purchasing a saddle

Feature	Not at all important % (n)	Somewhat important % (n)	Important % (n)	Very important % (n)	Essential % (n)
Appearance	13.7 (583)	51.7 (2207)	25.3 (1081)	7.6 (323)	1.7 (72)
Brand	47.6 (2003)	34.6 (1456)	13.2 (555)	3.1 (132)	1.4 (60)
Weight	5.6 (236)	30.8 (1301)	39.8 (1682)	19.1 (808)	4.7 (198)
Durability	0.6 (25)	6.9 (301)	35.5 (1548)	37.9 (1652)	19.1 (833)
Price	6.1 (264)	27.3 (1172)	42.2 (1816)	18.8 (809)	5.5 (238)
Leather	16.8 (703)	15.5 (649)	22.6 (944)	21.7 (904)	23.4 (975)
Synthetic	80.2 (2460)	13.9 (425)	4.0 (124)	1.0 (31)	0.9 (28)
Endorsement: high profile rider / trainer	86.9 (3568)	9.6 (398)	2.7 (110)	0.6 (24)	0.2 (7)
Endorsement: leading veterinarian / scientist/ therapist/ saddler	35.8 (1426)	31.0 (1234)	20.9 (832)	8.6 (342)	3.7 (146)

170

171 *Saddle features – own saddle*

172 Details for 5084 personally owned saddles were submitted. Saddle size ranged from 14 to 19
173 inches; 17" (26.0 %) and 17.5" (38.7 %) were the most common sizes recorded. A wide range
174 of brands were represented in the sample. Key features respondents liked in saddle design
175 were adjustability (for the rider and the horse: blocks, gullets, panels, rolls), comfort (horse

176 and rider) and fit (horse more than rider; knee rolls; close contact / mono flap). Features
177 which respondents did not like were also fit (knee rolls, seat, girth straps) alongside the
178 weight and cost of the saddle. Most respondents used their saddles regularly, either daily or
179 whenever they undertook flatwork or jumping if they owned a dressage and a jumping
180 saddle, respectively. The most popular additional features respondents would like to see
181 incorporated into saddle design were features that enabled the saddle to be more
182 adjustable and the addition of a traceability feature (e.g., bar code, tracking chips).

183 *Disciplines: Dressage, Show jumping and Eventing*

184 Data from respondents who regularly competed in dressage (n = 2595), show jumping (n =
185 1747) and eventing (n = 1205) were analysed to determine if saddle use differed within
186 these disciplines. Most dressage riders used the same saddle consistently on one horse, just
187 over half of show jumping riders used the same saddle consistently on one horse, while just
188 under half of eventing riders used the same saddle consistently on one horse (Figure 1).

189 Comfort in a saddle, the capacity to prevent injury and a positive impact on performance for
190 the horse were considered highly important by the majority of respondents across all
191 disciplines (Table 3). Similarly, rider comfort, a positive impact on rider performance and the
192 capacity to prevent rider injury were highly valued by respondents across all disciplines
193 (Table 3).

194 Durability, being leather and weight were the three most important features in a saddle for
195 dressage riders; while durability, weight and price were the three most important features
196 in a saddle for showjumping and eventing riders. Most dressage riders had bought their
197 saddle second hand, while approximately equal numbers of showjumping and event riders
198 (across dressage, XC and showjumping) had bought their saddle new as buying their saddle
199 second hand. Across the three disciplines, approximately a third of respondents regularly
200 used a saddle pad or cloth under their saddle, between 13-18% used a saddle pad or cloth
201 plus a sheepskin pad, gel pad or no saddle pad, or no saddle pad at all; with >5% of
202 respondents using multiple saddle pads.

203

204

205

206 Table 3: Key attributes rated as important when purchasing a saddle

Feature	Discipline	Not at all important % (n)	Somewhat important % (n)	Important % (n)	Very important % (n)	Essential % (n)
Comfort	Dressage	0 (1)	0 (1)	0.6 (15)	5.1 (133)	94.2 (2445)
	Show-jumping	0.1 (1)	0.1 (1)	0.7 (12)	5.7 (93)	93.9 (1640)
	Eventing	0 (0)	0 (0)	0.4 (5)	5.7 (69)	93.9 (1131)
Positive impact on performance for the horse	Dressage	0.6 (15)	1.8 (45)	10.8 (277)	26.1 (670)	60.8 (1560)
	Show-jumping	0.5 (9)	1.8 (31)	10.8 (462)	26.1 (178)	60.8 (1058)
	Eventing	0.4 (5)	1.7 (20)	8.5 (102)	26.5 (318)	62.9 (754)
Capacity of the saddle to prevent injury to the horse	Dressage	0.2 (5)	2.3 (57)	9.3 (234)	20.9 (524)	67.3 (1691)
	Show-jumping	0.1 (2)	2.4 (40)	10.5 (178)	22.6 (383)	64.5 (1094)
	Eventing	0.2 (2)	2.6 (30)	10.9 (127)	22.7 (264)	63.7 (741)
Comfort in saddle for the rider	Dressage	0.2 (4)	2.9 (76)	16.3 (422)	36.6 (949)	44.0 (1141)
	Show-jumping	0.2 (3)	3.8 (66)	18.4 (321)	37.7 (658)	39.9 (696)
	Eventing	0.1 (1)	3.6 (43)	19.0 (229)	37.9 (456)	39.4 (474)
Positive impact of the saddle on rider performance	Dressage	0.9 (22)	3.6 (91)	21.0 (537)	34.8 (890)	39.9 (1021)
	Show-jumping	0.7 (13)	3.7 (65)	21.9 (380)	35.7 (620)	38.0 (661)

	Eventing	0.6 (7)	3.7 (44)	20.6 (247)	35.7 (429)	39.5 (474)
Capacity of the saddle to prevent rider injury	Dressage	0.8 (20)	21.0 (524)	6.3 (158)	30.8 (769)	41.0 (1022)
	Show-jumping	0.9 (15)	7.2 (121)	23.1 (388)	30.7 (515)	38.1 (639)
	Eventing	4.5 (53)	7.2 (86)	24.3 (277)	30.0 (357)	35.0 (416)

207

208 Significant differences occurred between disciplines related to saddle fit ($p = 0.0004$); post
 209 hoc analyses identified dressage riders used the same saddle on different horses less than
 210 showjumpers ($p = 0.001$) and eventers ($p = 0.004$). No significant differences occurred
 211 between disciplines for aesthetic features ranked as important when selecting a saddle,
 212 however comfort of the rider was significant ($p = 0.001$), with post hoc analyses identifying
 213 dressage riders placed increased emphasis on comfort compared to eventers ($p = 0.003$) and
 214 showjumpers ($p = 0.002$). The importance of a saddle to reducing rider injury also differed
 215 between disciplines ($p = 0.005$), post hoc tests found dressage riders place more emphasis
 216 on this feature than eventing ($p = 0.003$) and showjumping riders ($p = 0.02$).

217 When asked what other equipment was used with the saddle, only the use of a saddle cloth
 218 with a half pad ($p = 0.0004$) and sheepskin pad ($p = 0.015$) significantly differed between
 219 disciplines. Post hoc analysis found dressage riders were less likely to use a saddle cloth and
 220 a half pad than eventers and show jumpers ($p < 0.004$), and a saddle cloth and sheepskin
 221 pad than eventers ($p = 0.005$).

222 *Competitive level*

223 Significant differences occurred between competitive levels for riders using the same saddle
 224 in different horses ($p = 0.0004$); post hoc tests identified national and international riders
 225 were more likely to use a saddle on multiple horses compared to unaffiliated, local affiliated
 226 and regional affiliated riders ($p < 0.0004$). Differences between competitor groups also
 227 existed for key saddle fit features: performance to the horse ($p = 0.0004$), performance for
 228 the rider ($p = 0.0004$), prevention of horse injury ($p = 0.006$) and prevention of rider injury (p
 229 $= 0.05$). Post hoc analyses found unaffiliated riders rated horse and rider performance less
 230 than all other groups ($p < 0.0004$). Local affiliated competitors rated horse and rider

231 performance less than national and international riders ($p < 0.009$) while regional riders also
232 rated rider performance less than international competitors ($p = 0.008$). Horse injury was
233 ranked as a more important feature for national and international riders compared to
234 regional competitors ($p < 0.02$), and international to unaffiliated riders ($p = 0.04$).
235 International competitors ranked saddle influence on rider injury as more important than
236 regional riders ($p = 0.05$) and national riders ranked this feature higher than unaffiliated
237 riders ($p = 0.05$).

238 Across competition levels, a saddle's appearance ($p = 0.006$), brand ($p = 0.009$), weight ($p =$
239 0.002), being leather ($p = 0.0004$) and being synthetic ($p = 0.02$) differed across competitor
240 groups. Post hoc analyses found national level riders rated appearance as more important
241 than local and unaffiliated riders ($p < 0.001$), regional and international competitors rated
242 brand as more important than unaffiliated riders ($p < 0.009$) and international riders also
243 valued brand more highly than local level riders ($p = 0.02$). National and international riders
244 considered saddle weight more than unaffiliated and local riders ($p < 0.04$); international
245 riders also ranked this feature more than regional level riders ($p = 0.05$). Unaffiliated
246 competitors ranked a saddle being leather as less important than all other groups except for
247 international riders ($p < 0.02$) and local riders valued leather less than national riders ($p =$
248 0.002). International riders did not rate a saddle being synthetic as a key feature compared
249 to all other groups of riders ($p < 0.006$).

250 Differences existed between the groups for whether they used no saddle cloth/pad ($p =$
251 0.01), a saddle cloth and gel pad ($p = 0.0004$), a saddle cloth and sheepskin pad ($p = 0.002$)
252 or several pads and cloths ($p = 0.006$). Post hoc tests identified unaffiliated and local
253 affiliated competitors were less likely to use no saddle cloth compared to national and
254 international riders ($p < 0.03$), to use a saddle cloth with a gel pad ($p < 0.002$), a saddle cloth
255 with sheepskin pad ($p < 0.002$) or several cloths and pads ($p < 0.02$). International
256 competitors were also more likely to use a saddle cloth and sheepskin pad than regional
257 competitors ($p = 0.03$).

258

259

260

261 **DISCUSSION**

262 To the best of our knowledge, at the time of publication this survey represents the largest
263 poll of equestrian's views on saddle choice and saddle use. As the survey did not collect
264 demographic information on participants, we cannot be certain of the geographic regions.
265 However, as this was shared within primarily UK social media, we expect the majority of
266 respondents to be UK based. As is not unusual with equestrian surveys, by far the majority
267 of respondents were female so the views of male equestrians are not represented. There
268 was also a strong bias towards pleasure/hacking and dressage, although a high number of
269 respondents were also involved with showjumping and eventing.

270

271 The purpose of a saddle is to improve the rider's safety, security, and comfort (Clayton *et*
272 *al.*, 2018). Poorly fitted saddles have been shown to be associated with increased saddle slip
273 which can affect rider performance and potentially security which will reduce rider balance
274 and could be translated by the rider as uncomfortable and increasing their risk of injury
275 (Clayton, 2015) (Greve and Dyson, 2014). Therefore it is perhaps not surprising that saddle
276 fit, comfort and preventing injury for both horse and rider were the key features that
277 respondents identified they looked for from a saddle. The use of the same saddle on
278 multiple horses by 41% of respondents is a concern as it is assumed that the saddle had not
279 been fitted to the majority of horses it was used for, although there may be a proportion of
280 cases where the same saddle was adequate or had been fitted to two or more horses. Single
281 saddle use across multiple horses is more common in racing. In Thoroughbred racing in the
282 UK, it is the authors (DM) own experience that riders often have their own saddle and that if
283 saddles are provided by the trainer, any saddle can be used on any horse. In a recent survey
284 of 336 UK based riders and trainers involved in racing, only 15% said they used a saddle
285 fitter sometimes and 90% said that any saddle could go on any horse with only a few
286 exceptions (Marlin, unpublished data).

287

288 Poor saddle fit is not only associated with equine back pain (Dittmann *et al.*, 2021) (Dyson *et*
289 *al.*, 2015) (Greve and Dyson, 2015) (Tabor *et al.*, 2023) but has also been associated with
290 rider back pain (Greve and Dyson, 2015). In addition, Tabor *et al.* (Tabor *et al.*, 2023)
291 reported that using the same saddle on different horses was associated with an increased
292 likelihood of horses being reported to be "cold-backed"; a horse displaying symptoms of a

293 sensitive or painful back, especially before the horse has been warmed up, and often seen
294 during saddling, tightening of the girth and/or mounting.

295

296 Our results have identified the importance to riders that a saddle improves their own and
297 their horses' performance and prevents injury. The fit of the saddle to each party is critical
298 to underpin this as poor saddle fit is often associated with rider and equine back pain (Greve
299 and Dyson, 2014) which are likely to exert a negative impact on performance. Therefore,
300 regular saddle fit assessment is needed to prevent this. In an online survey of 113 leisure
301 riders and 135 competitive riders in Switzerland, 95% of participants responded that their
302 saddle was an ideal fit for their horse. Fifty-three percent of the participants stated that
303 their saddle was regularly checked by a qualified professional, whereas 47% did not have
304 their saddle checked on a regular basis (Dittmann *et al.*, 2021). On average, saddles had last
305 been checked by a qualified professional 10 months ago (range: 0–80 months) (Dittmann *et*
306 *al.*, 2021). Previous studies have identified that riders often do not possess the skills to be
307 able to accurately assess lameness (Rhodin, 2015) and the presence of musculoskeletal pain
308 (Dyson, 2020) Greve and Dyson (Greve and Dyson, 2014) also found poor saddle fit was
309 common when evaluating equine lameness and advocate better education for riders and
310 that saddle fit should be professionally checked more than once per year to lower the
311 number of ill-fitting saddles. Our results suggest that education that can showcase to riders
312 the relationship between saddle fit and performance and safety could help increase
313 engagement with more frequent saddle checks.

314

315 Use of the same saddle across horses at higher competitive levels and in showjumping and
316 eventing could be due to the choice of a saddle which fits the rider and is therefore used
317 across horses to support rider performance; however if this is the case, it also suggests
318 saddle fit may not be assessed regularly for individual horses, as it is unlikely the same
319 saddle would fit multiple horses optimally. Therefore fit, comfort and prevention of injury
320 for the horse could be compromised by this practice and potentially be detrimental to
321 performance and contradictory to what individuals appear to want from their saddle. A
322 challenge with the majority of saddles is that the tree determines the size and fit for both
323 the horse and rider and that these cannot easily be modified independently. Some
324 manufacturers have attempted to resolve this issue, such as BUA

325 (<https://www.BUAsaddles.com>) and Ipotane Saddles (<https://www.ipotanesaddles.com/>)
326 although to date there has been no formal assessment of the horse or rider performance of
327 these saddles to the authors best knowledge. Interestingly a similar scenario exists in cycling
328 where bike saddle fit and height it thought to influence cyclist comfort, injury and
329 performance however limited evidence exists to identify if this truly the case (Bini, 2022;
330 Ferrer-Roca, 2012). Future studies to understand why elite riders elect to use the same
331 saddle across different horses are warranted alongside behavioural and biomechanical
332 studies to elucidate the impact of this practice on horse and rider performance and welfare.

333

334 In order to reduce the risk of horses suffering pain and injury due to improper saddle fit, the
335 Society of Master Saddlers (www.mastersaddlers.co.uk) recommends that saddles should
336 be checked at least twice a year although in a survey of 205 (UK) riders, however only
337 approximately 12% of riders had their saddle-fit assessed professionally more than once
338 yearly (Greve and Dyson, 2015). This is reflected in a high prevalence of poorly-fitting
339 saddles report in two different studies; 43% (Greve and Dyson, 2015) and 74% (Dittmann *et*
340 *al.*, 2021). Of further concern is the observation that the majority of riders are unable to
341 identify that they have a poorly fitting saddle. In a UK study assessing 506 sports horses in
342 regular work, 18.4% were ridden in ill-fitting saddles with uneven contact along the length
343 of the horse's back and in 32.8% the saddle was unbalanced, tipping backward in 20.4% and
344 tipping forward in 12.5% (Greve and Dyson, 2014). This presumably reflects that a high
345 proportion of riders cannot detect poorly-fitting saddles and do not recognise the
346 importance of a correctly fitting saddle for both optimal horse comfort, injury prevention
347 and performance of the horse.

348

349 The majority of respondents in the present survey used a pad or half-pad between the
350 saddle and the horse. This is consistent with the results of an Australian survey of 1011
351 riders across 16 equestrian disciplines where it was found 98% used "some form of layer
352 between their horse's back and the saddle" (Hawson *et al.*, 2013). Improving saddle fit,
353 improving horse comfort and reducing back sores were some of the reasons cited for the
354 use of a saddle pad (Hawson *et al.*, 2013). In contrast, the Society of Master Saddlers
355 (www.mastersaddlers.co.uk) recommends that ideally saddles should be fitted with a cotton
356 saddle cloth. Whilst pads can be used to adjust saddle fit, they may also lead to imbalanced

357 saddles if not fitted by a professional saddle fitter. From the present dataset, the most
358 common pad choice was a plain pad or cloth followed by a pad/cloth with a sheepskin pad
359 (18.4% of respondents). The use of a half pad beneath a saddle which has not been fitted to
360 accommodate the increased thickness, may reduce the space in the saddle gullet or the
361 channel of the panel between the saddle and the horse's back leading to increased pressure
362 (MacKechnie-Guire et al., 2021). The type of pad used can also increase or decrease
363 pressure in different back regions under the saddle and therefore it is recommended that
364 pads are fitted with the saddle by a qualified saddle fitter (MacKechnie-Guire et al., 2021). In
365 a sample of 196 horses and riders in Switzerland, 44% with dressage saddles, 37% with show
366 jumping saddles and 18% with general purpose saddles, sheepskin pads were the most
367 common (57%) followed by thin, nonpadded saddle blankets or numnahs (37%) (Dittmann
368 *et al.*, 2021). Our results identified that rider competitive level was more influential to
369 decision making as to whether to use a pad/cloth rather than discipline, where no significant
370 differences were found. National and international level riders were more likely to use some
371 combination of pads/cloths with their saddles than unaffiliated and leisure riders, perhaps
372 indicative of the higher frequency reported in these groups for using a single saddle across
373 different horses to facilitate saddle fit.

374

375 Durability, weight, price, and being leather were all regarded as essential features in
376 selecting a saddle. A desire for saddles which possess increased adjustability is
377 understandable from an economic perspective and supports the aspiration for better fit and
378 comfort. Saddles represent a significant large investment for riders and increasing
379 adjustability would enable one saddle to potentially be adjusted as the horse changes
380 fitness and develops. The preference for leather may reflect that the equestrian industry is
381 still relatively conservative, although it may also be a reflection that leather is extremely
382 durable. The requirement for light saddles is also of interest. Saddles used in dressage,
383 jumping and leisure riding typically weigh in the region of 5-10kg. For a rider of 85kg on a
384 550kg horse, the total load from the rider and a 5kg saddle is 90kg, whilst for the 10kg
385 saddle it is 95kg. This represents 16.4% and 17.3% of the horse's body mass and is likely of
386 limited significance. A high level of chronic pain is reported in riders (85% in riders over 35
387 years, 76% in eventers and 74% in dressage riders (Lewis, 2018) (Lewis, 2023) (Lewis, 2017)
388 particularly within the upper body perhaps a lighter saddle could be perceived to be easier

389 to carry and lift during saddling up from a rider perspective as well as being beneficial to the
 390 horse. Price, understandably, was also identified as a factor influencing choice of saddle.
 391 There is a significant trade in used saddles (Sarah Lavelle-Huxley, Managing Director Saddles
 392 Direct UK, Personal Communication), but these may have been damaged in use or have
 393 worn unevenly so it is critical that these are fitted by a qualified saddle fitter to avoid injury.

394

395 This study provides an insight into rider, primarily female rider, saddle use and preferences
 396 within the UK. It is clear that a high proportion of riders may not be undertaking regular
 397 saddle fit checks and are using the same saddle on multiple horses. Saddle manufacturers
 398 should be aware that customers rate comfort for horse, injury prevention, performance (of
 399 horse), saddle durability, weight, price, leather and adjustability as key features.

400

401 **Conflict of Interest Statement**

402 This study was funded by Ergon Equine Ltd. DM works as a paid consultant for Ergon Equine
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405

406 References

- 407 Anthony, D.W., 2011. The Secondary Products Revolution, Horse-Riding, and Mounted Warfare.
 408 *Journal of world prehistory* 24: 131-160.
- 409 Bini, R.a.P.-Q., J., 2022. Methods to determine saddle height in cycling and implications of changes in
 410 saddle height in performance and injury risk: A systematic review. *Journal of sports sciences*
 411 40: 386-400.
- 412 Bystrom, A., Roepstorff, L., Rhodin, M., Serra Braganca, F., Engell, M.T., Hernlund, E., Persson-Sjodin,
 413 E., van Weeren, R., Weishaupt, M.A. and Egenvall, A., 2018. Lateral movement of the saddle
 414 relative to the equine spine in rising and sitting trot on a treadmill. *PLoS One* 13: e0200534.
 415 10.1371/journal.pone.0200534
- 416 Clayton, H.M., Dyson, S., Harris, P. and Bondi, A., , 2015. Horses, saddles and riders: Applying the
 417 science. *Equine Veterinary Education* 27: 447-452.
- 418 Clayton, H.M., Hampson, A., Fraser, P., White, A. and Egenvall, A., 2018. Comparison of rider stability
 419 in a flapless saddle versus a conventional saddle. *PLoS One* 13: e0196960.
 420 10.1371/journal.pone.0196960
- 421 Dittmann, M.T., Arpagaus, S., Hungerbuhler, V., Weishaupt, M.A. and Latif, S.N., 2021. "Feel the
 422 Force"-Prevalence of Subjectively Assessed Saddle Fit Problems in Swiss Riding Horses and
 423 Their Association With Saddle Pressure Measurements and Back Pain. *J Equine Vet Sci* 99:
 424 103388. 10.1016/j.jevs.2021.103388
- 425 Dyson, S., Carson, S. and Fisher, M., 2015. Saddle fitting, recognising an ill-fitting saddle and the
 426 consequences of an ill-fitting saddle to horse and rider. *Equine Veterinary Education* 27: 533-
 427 543.
- 428 Dyson, S.a.P., D., 2020. Application of a Ridden Horse Pain Ethogram and its relationship with gait in
 429 a convenience sample of 60 riding horses. . *Animals* 10: 1044.

- 430 Ferrer-Roca, V., Roig, A., Galilea, P. and García-López, J., 2012. Influence of saddle height on lower
431 limb kinematics in well-trained cyclists: static vs. dynamic evaluation in bike fitting. *The*
432 *Journal of Strength & Conditioning Research* 26: 3025-3029.
- 433 Gawronski, R.S., 2004. Some Remarks on the Origins and Construction of the Roman Military Saddle.
434 *Archeologia* 55: 31-40.
- 435 Greve, L. and Dyson, S., 2015. Saddle fit and management: An investigation of the association with
436 equine thoracolumbar asymmetries, horse and rider health. *Equine Vet J* 47: 415-421.
437 10.1111/evj.12304
- 438 Greve, L. and Dyson, S.J., 2014. The interrelationship of lameness, saddle slip and back shape in the
439 general sports horse population. *Equine Vet J* 46: 687-694. 10.1111/evj.12222
- 440 Gunst, S., Dittmann, M.T., Arpagaus, S., Roepstorff, C., Latif, S.N., Klaassen, B., Pauli, C.A., Bauer,
441 C.M. and Weishaupt, M.A., 2019. Influence of Functional Rider and Horse Asymmetries on
442 Saddle Force Distribution During Stance and in Sitting Trot. *J Equine Vet Sci* 78: 20-28.
443 10.1016/j.jevs.2019.03.215
- 444 Hawson, L.A., McLean, A.N. and McGreevy, P.D., 2013. A retrospective survey of riders' opinions of
445 the use of saddle pads in horses. *Journal of Veterinary Behaviour* 8: 74-81.
- 446 Lewis, V., Nicol, Z., Dumbell, L. and Cameron, L., 2023. A Study Investigating Prevalence of Pain in
447 Horse Riders over Thirty-Five Years Old: Pain in UK Riders Over 35 Years Old. . *International*
448 *Journal of Equine Science* 2: 9-18.
- 449 Lewis, V.a.B., K., 2018. , 2018. A preliminary study to investigate the prevalence of pain in
450 international event riders during competition, in the United Kingdom. . *Comparative Exercise*
451 *Physiology* 14: 173-181.
- 452 Lewis, V.a.K., R. , 2017. A preliminary study to investigate the prevalence of pain in elite dressage
453 riders during competition in the United Kingdom. . *Comparative Exercise Physiology* 13: 259-
454 263.
- 455 Littauer, M.A., 2015. Early stirrups. *Antiquity* 55: 99-105.
- 456 MacKechnie-Guire, R., Fisher, M. and Pfau, T., 2021. Effect of a Half Pad on Pressure Distribution in
457 Sitting Trot and Canter Beneath a Saddle Fitted to Industry Guidelines. *J Equine Vet Sci* 96:
458 103307. 10.1016/j.jevs.2020.103307
- 459 MacKechnie-Guire, R., MacKechnie-Guire, E., Fairfax, V., Fisher, D., Fisher, M. and Pfau, T., 2019. The
460 Effect of Tree Width on Thoracolumbar and Limb Kinematics, Saddle Pressure Distribution,
461 and Thoracolumbar Dimensions in Sports Horses in Trot and Canter. *Animals (Basel)* 9.
462 10.3390/ani9100842
- 463 Martin, P., Chateau, H., Pourcelot, P., Duray, L. and Cheze, L., 2015. Effects of a prototype saddle
464 (short panels) on the biomechanics of the equine back: preliminary results. *Comput*
465 *Methods Biomech Biomed Engin* 18 Suppl 1: 1990-1991. 10.1080/10255842.2015.1069591
- 466 Michelotto, P.V., Kozemjakin, D.A. and de Oliveira, E.A., 2016. Thermography and saddle fitting. *Vet*
467 *Rec* 178: 173-174. 10.1136/vr.i820
- 468 Nankervis, K.J., Bradley, F., Kosek, K. and Dyson, S.J., 2019. Investigation of the Reliability of Saddle
469 Fitters to Determine the Position of the Last Thoracic Vertebra of Horses Using Palpation
470 Techniques: A Pilot Study. *J Equine Vet Sci* 77: 1-7. 10.1016/j.jevs.2019.02.003
- 471 Rhodin, M., Egenvall, A., Andersen, P.H. and Pfau, T., 2015. Head and pelvic movement asymmetries
472 at trot in riding horses perceived as sound by their owner. . *Equine Veterinary Journal* 47:
473 10-11.
- 474 Tabor, G., Williams, J.M. and Marlin, D.J., 2023. Saddle related equine back pain, muscle condition
475 and behaviour. *Comparative Exercise Physiology* 18: S84.
- 476