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1 **GB apprentice jockeys do not have the body composition to make current minimum race weights:**
2 **is it time to change the weights or change the jockeys?**

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40 **Abstract**

41 Flat jockeys in GB are classified as apprentices if aged <26 and/or have ridden <95 winners. To gain
42 experience, apprentices are allocated a weight allowance of up to 7lb (3.2kg). Given that there is no
43 off-season in GB Flat horseracing, jockeys are required to maintain racing weight all year round. In
44 light of recent work that current apprentices are considerably heavier than previous generations with
45 smaller increases in minimum weight, the aim of this study was to assess if minimum weight in GB was
46 achievable? To make minimum weight (50.8kg) with maximal weight allowance, requires a body mass
47 of ~46.6kg whilst maintaining fat mass >2.5kg (the lowest fat mass previously reported in weight
48 restricted males). Thirty two male apprentice jockeys were assessed for body composition using DXA.
49 Mean (SD) total mass and fat mass were 56kg (2.9) and 7.2kg (1.8) respectively. Given that the lowest
50 theoretical body mass for this group was 51.2kg (2.3), only 1/32 jockeys was deemed feasible to
51 achieve the minimum weight with their current weight allowance, and maintaining fat mass >2.5kg.
52 Furthermore, urine osmolality of 780 mOsmol/L (260) was seen with 22/32 jockeys classed as
53 dehydrated (>700 mOsmols/L), indicating body mass would be higher when euhydrated. Additionally,
54 we observed that within new apprentice jockeys licensed during this study (N=41), only 1 jockey was
55 able to achieve minimum weight. To facilitate the goal of achieving race weight with minimal
56 disruptions to wellbeing, our data suggest that minimum weight for GB apprentices should be raised.

57 **Keywords: Jockey, Fat mass, Body mass, Weight-making, Hydration, Athlete Welfare**

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62 **Introduction**

63 Apprentice jockeys are young inexperienced jockeys at the start of their racing career aged under 26
64 years and/or having ridden less than 95 winners. As an incentive for racehorse trainers to employ an
65 apprentice jockey over a more experienced rider to race ride, apprentices are allocated weight
66 allowances (known in the industry as a 'claim') to reduce the racing weight on the horse and
67 consequently improving the horse's competitiveness (Wilson et al., 2014). Apprentices are therefore
68 under additional pressure to make the lightest of racing weights due to the 'claim' in comparison with
69 their senior counterparts (Cullen et al., 2015; Martin et al., 2017; Wilson et al., 2014). Furthermore,
70 with the recent advent of all-weather and floodlit Flat racing in Great Britain (GB) there is no off-
71 season for flat jockeys and hence, there is the additional challenge of being required to make weight
72 all year round (Martin et al., 2017; Wilson et al., 2014). The weight allowance given to apprentices in
73 GB Flat horseracing is allocated based upon the number of winning rides for each jockey, with 7lb
74 (3.2kg) , 5lb (2.3kg) and 3lb (1.4kg) being allowed until he/she has ridden 20, 50 and 95 winning races,
75 respectively. Considering that the minimum flat racing weight in GB is 50.8kg, this effectively means
76 that a young apprentice who is eligible to the highest 'claim' of 3.2kg, in order to make the reduced
77 minimum weight 47.6kg, will be required to have a total body mass of ~46.6kg, taking into account
78 the additional weight for lightest racing accessories (boots, breeches, silks, saddle) (Martin et al., 2017;
79 Wilson et al., 2014).

80

81 Establishing a minimum absolute amount of body fat for health in humans is, of course, highly
82 problematic and complicated by the lack of generally accepted definitions. In an attempt to establish
83 this minimum essential body fat classification, Friedl et al (1994) induced a 10% body mass loss over
84 8 weeks in healthy military personal during an intensive Ranger course combined with severe calorie
85 restriction, whilst also assessing changes in body composition using DXA. It was reported that 2.5kg of
86 absolute body fat was the lowest achievable fat mass without unacceptable losses of lean muscle mass
87 along with such severe food cravings that the study could not continue. Indeed, when 2.5kg of body
88 fat was achieved, the majority of the energy from body stores was derived from fat-free mass
89 suggesting significant muscle catabolism. Whilst these data are by no means suggesting 2.5kg is a
90 healthy absolute amount of body fat for all individuals, it can be concluded that it is unwise to reduce
91 body fat to lower than 2.5kg without compromising health. In reality, few athletes will ever achieve
92 such low body fat and still be able to perform optimally. Indeed, in our previous work from > 300 male
93 jockeys, the lowest absolute fat mass observed was 3.7kg (Wilson et al., 2018).

94

95 Using data obtained from apprentice jockeys presenting to our laboratory over an 20 month period, a
96 retrospective study was undertaken to assess if this group of apprentice jockeys were able to achieve
97 the minimum riding weights with their individual 'claim' at the time of testing, whilst maintaining at
98 least 2.5kg of body fat. Additionally, we accessed height and weight data on newly licensed male
99 apprentice jockeys from the British Horseracing Authority (BHA), to assess numbers amongst this
100 group who were able to race ride at minimum weight. It was hypothesised that the apprentice jockeys
101 tested would not be able to make minimum riding weight accounting for their current 'claim' whilst
102 maintaining euhydration and maintaining absolute fat mass greater than the theoretical minimum
103 safe level of 2.5 kg. It is hoped that the results from this research will provide essential information to
104 key stakeholders involved in horseracing with regards to the long term health and safety of apprentice
105 jockeys.

106

107 **Methods**

108 Thirty two male apprentice flat jockeys (mean [SD] age 19yrs [1.8]; height 169cm [4.7]; mass 56.0kg
109 [2.9] who at the time of testing were race riding in Great Britain (GB) on a regular basis and free from
110 injury, consented to participate in this study. Prior to testing, apprentice jockeys were given
111 participant information and provided written informed consent that had been granted National
112 Research Ethics Service approval (14/NW/0155).

113 Following an overnight fast, apprentice jockeys underwent measures of height and weight using a dual
114 height/weight stadiometer (SECA, Germany) barefoot wearing minimum clothing along with body
115 composition using Dual-energy X-ray Absorptiometry (DXA) (Hologic, USA) following the procedure as
116 described in Wilson et al., (2018). In addition, apprentice jockeys provided a mid-flow urine sample
117 and were tested for urine osmolality (UO) using a hand-held refractometer (Osmocheck, Vitech, USA)
118 as an indicator of hydration status (Sparks & Close, 2013). The testing was conducted over a 20 month
119 period from July 2017 up and until March 2019, at the Research Institute for Sports and Exercise
120 Sciences, Liverpool John Moores University. For each jockey tested, data were analysed to assess if
121 the jockey would be able to make minimum riding weight (50.8 kg) with their current 'claim' (3.2, 2.3,
122 or 1.4kg) at baseline body mass and then again with body fat adjusted to 2.5kg. This group represented
123 ~ 20% of the total male apprentice population licensed to race ride during this period (n=162).

124 Additionally, as part of the jockey licensing process, apprentices are assessed for height and weight
125 using a dual height/weight stadiometer (SECA, Germany) barefoot wearing minimum clothing and this
126 information on 41 newly licensed male apprentice jockeys was provided by the British Horseracing

127 Authority (BHA) (mean [SD] age 18yrs [1.8]; height 165cm [5]; mass 51.9kg [3.2]. Using the data
128 provided by the BHA we assessed how many jockeys from this additional 41 group could achieve
129 minimum weight with the allocated maximal 'claim' (3.2kg). This group represented ~26% of the male
130 apprentice jockeys available for testing during our study period.

131

132 **Results**

133 A comparison of the body composition of GB apprentice jockeys tested at LJMU, and the current
134 minimum flat racing weight in GB, factoring in the various riding allowances is presented in Table 1.
135 Of the 32 apprentice jockeys tested, only one jockey at baseline reported with a body mass ≤ 46.6 kg
136 allowing him to achieve the minimum race riding weight with his current 'claim'. For all the other
137 jockeys, even at the theoretical minimum body fat of 2.5kg, no additional jockeys were able to make
138 the lowest riding weight of 50.8kg. Only 9 of the 32 jockeys presented with UO of <700 mOsmol/L
139 (Table 1). From analysis of newly licensed apprentice jockeys baseline weight data only 1 of the 41
140 jockeys could make minimum weight taking into account the allocated maximal 'claim' of 3.2kg for
141 this group.

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145 **Discussion**

146 The aim of the present study was to assess the feasibility of apprentice jockeys riding in GB to achieve
147 the current minimum weights whilst taking into consideration their allocated 'claim'. To this end, we
148 recruited 32 apprentices and assessed their body composition using DXA and compared against the
149 minimum racing weights with a 'claim'. We report for the first time that the majority of jockeys tested
150 are unable to make weight whilst maintaining a minimum of 2.5kg of absolute fat mass. In addition,
151 we report that the majority of newly licensed apprentices, similarly, are unable to make minimum
152 race weight Therefore racing authorities in GB should consider increasing minimum weights or
153 potentially recruit smaller jockeys.

154

155 It has been reported that apprentice jockeys in the last decade are significantly heavier (~37%) than
156 previous generations (Dolan et al., 2011) despite trivial increases (~6%) in minimum racing weight
157 (Warrington et al., 2009). To achieve such low riding weights, many jockeys utilise deleterious
158 techniques to make weight largely based upon dehydration, sporadic eating and in extreme cases
159 forced vomiting (Wilson et al., 2014). Despite published guidelines (Martin et al., 2017) now being
160 available to help jockeys reduce their fat mass to make weight (Wilson et al., 2012; Wilson et al., 2015),
161 it is still not known if it is possible for jockeys to achieve their lowest required riding weight whilst
162 maintaining a "healthy" amount of body fat and remaining hydrated. Whilst there are no accepted
163 definitions as to what constitutes a minimum absolute amount of body fat, data on military
164 personnel has suggested that 2.5kg causes significant muscle catabolism along with feelings of hunger
165 that it was no longer tolerable even in highly motivated military personal (Friedl et al., 1994). As such,
166 we used this figure of 2.5kg of absolute fat mass as a theoretical minimum amount of body fat for
167 jockeys undergoing testing, although in reality such low levels are unlikely to be achieved in athletes
168 including jockeys. From our own studies over the past decade with over 300 professional male flat and
169 jump jockeys, the lowest body fat we have observed in any male jockey was 3.7kg (range 3.7kg to
170 10.4kg) (Wilson et al., 2018). Moreover, using the theoretical minimal absolute body fat of 2.5kg, we
171 report herein that only one jockey out of the 32 had the capacity to make the minimum riding weight.
172 Additionally, it should be noted that this jockey also presented with a urine osmolality of 850
173 mOsmol/L suggesting some degree of dehydration (Sawka et al., 2007) and whether he would have
174 been able to make minimum weight euhydrated remains unclear?

175 Given that the present data suggests the majority of apprentices were unable to make minimum
176 weights, it is interesting to speculate what would be a more realistic target. Following a 6 week
177 structured dietary intervention in jockeys that resulting in a daily 500-1000kcal deficit, the lowest

178 absolute amount of body fat reported was 5kg (Wilson et al., 2015). As such, it could be suggested
179 that it is more realistic to set a minimum fat mass target of ~5kg for professional jockeys. When
180 considered this way, this would allow 26 of the 32 jockeys tested to reduce body fat following a
181 structured diet and exercise regime. However, even if this more realistic fat mass target was achieved,
182 there would still only be one jockey capable of achieving the current minimum race weight of 50.8kg,
183 despite only 9 of the 32 jockeys presenting for testing euhydrated. On the basis of using 5kg as a
184 realistic minimum amount of body fat for jockeys which, given that the mean absolute body fat of the
185 group was 7.2kg with a mean mass of 56kg, we would propose a minimum riding weight of ~53.8kg
186 (56kg -2.2 kg body fat reduction = 53.8kg) which in-fact aligns with the current minimum race weight
187 in other major racing authorities such as Australia and New Zealand (Wilson et al., 2014). This
188 suggesting now needs further exploration in a larger sample size of apprentice jockeys. It is also
189 interesting to speculate with regards to a maximum height of apprentice jockeys which would allow
190 them to make weight safely. Through re-analysing our previous data (Martin et al., 2017; Wilson et
191 al., 2013; Wilson et al., 2018) along with the data presented here, the mean height of apprentice
192 male jockeys, (with a body fat mass of ~5kg) that would enable them to make minimum race
193 weight of 53.8kg is $\leq 166\text{cm}$.

194

195 In addition to those apprentices that underwent testing, we accessed data on newly licensed male
196 apprentices outside of this study in order to assess if greater numbers of apprentices also had issues
197 in making minimum weight. For each individual jockey, at licensing their weight is then registered in
198 the industry publications and therefore it is beneficial for newly licensed jockeys to present as light as
199 possible in order to be available for more race ride opportunities. Likewise, with the tested group, the
200 vast majority of newly licensed jockeys, who by definition are eligible to the maximal 'claim' of 3.2kg,
201 are unable to make minimum weight with only 1 of the 41 apprentices reporting with a baseline body
202 weight to achieve this. The findings here strengthen our previous suggestions of either increasing
203 minimum weight or recruiting smaller jockeys.

204

205 Despite providing novel data, this rapid communication is not without its limitations. Although we
206 reported on two groups of apprentices, it is important to note that these groups represent a fifth and
207 a quarter of all male apprentices available during the study period, respectively, and therefore that
208 there may be apprentices who do not have weight issues, and in the case of those who underwent
209 testing, do not require weight management advice. However, we do highlight that only 1 apprentice
210 in each group had a body mass to achieve minimum weight with their allocated 'claim'. Whilst we

211 acknowledge that for the newly licensed group we only have access to height and weight data, using
212 the average for the group (165cm and 51.9kg respectively) and calculating BMI at current minimum
213 weight of 46.6kg with 'claim' (3.2kg) this would result in a BMI of 17.1 which is at the very low end of
214 the underweight scale. Additionally, although current DXA recommendations suggest that athletes
215 should present fasted and euhydrated (Nana et al., 2015), we acknowledge that many jockeys were
216 dehydrated when scanned which could have affected the accuracy of the DXA scans (Bone et al.,
217 2017).

218 In summary, we propose, 1) the racing authorities may wish to consider increasing the minimum
219 weight for Flat jockeys, possibly to 53.8kg which would bring GB in line with other nations and (if
220 adopting the increased weight) set a maximum height target of apprentice recruits at ≤ 166 cm, 2)
221 consider revising the system of weight allowances and/or, 3) actively recruit potential jockeys who
222 have the anthropometric profile to allow them to make minimum weight safely. In acknowledgment
223 of the potential limitations of sample size in each group, we therefore also suggest that future studies
224 could be strengthened if testing was made a mandatory prerequisite to licensing/re-licensing for all
225 jockeys with the data then used to allocate each jockey their own minimum riding weight.

226

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229 recruitment and manuscript revision. J.P. Morton and G.L Close assisted with ethical approval, data
230 analysis and manuscript revision.

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279

280 **TABLE 1: Baseline body composition assessment from Dual-energy X-ray Absorptiometry (DXA), Urine**
 281 **Osmolality (UO) and adjusted fat mass, and assessments to make individual minimum weight with current**
 282 **claim allowance at time of testing of male apprentice GB Flat jockeys. * indicated mass once body fat was**
 283 **adjusted assuming a total body fat of 2.5kg**

ID	Age (yrs)	Height (cm)	Weight (kg)	Fat mass (kg)	Lean Mass (kg)	Claim (kg)	Hydration UO (mOsmol/L)	Minimum weight	Y/N	*2.5kg	Minimum weight Y/N
1	22	163	55.9	6.3	45	2.3	780	47.5	N	52.1	N
2	20	163	54.9	3.9	45.9	2.3	860	47.5	N	52.5	N
3	22	169	58.9	8.9	45.4	1.4	750	48.4	N	52.5	N
4	20	166	53.7	5.7	43.1	3.2	950	46.6	N	50.5	N
5	19	163	51.8	4.1	42.6	3.2	200	46.6	N	50.2	N
6	19	178	60	6.5	48.6	2.3	1070	47.5	N	56	N
7	17	165	46.6	5.1	36.9	3.2	850	46.6	Y	44	Y
8	19	174	55.6	7.1	43.8	3.2	1000	46.6	N	51	N
9	19	176	54.2	6.6	42.8	2.3	930	47.5	N	50.1	N
10	16	167	59.6	10.4	44	3.2	480	46.6	N	51.7	N
11	17	170	55.2	9.3	40.8	3.2	920	46.6	N	48.4	N
12	20	169	57.6	8.8	43.7	2.3	800	47.5	N	51.3	N
13	18	165	53.2	7.2	40.5	3.2	760	46.6	N	48.5	N
14	17	167	55.2	6.9	42.8	3.2	700	46.6	N	50.8	N
15	19	167	59	7.7	46.3	1.4	1080	48.4	N	53.8	N
16	17	171	62.2	8.9	48.8	3.2	770	46.6	N	55.8	N
17	18	175	51.7	3.7	42.1	3.2	1000	46.6	N	50.5	N
18	19	166	56.2	5.2	45	2.3	320	47.5	N	54.5	N
19	17	177	59.6	10.4	46	3.2	790	46.6	N	51.7	N
20	21	175	58.2	7.1	46.1	1.4	530	48.4	N	53.6	N
21	19	166	55.8	5.4	46.2	2.3	1070	47.5	N	53.2	N
22	21	177	54.2	7.0	46.2	1.4	1090	48.4	N	49.8	N
23	17	166	57.4	8.9	47.2	3.2	250	46.6	N	51	N
24	18	162	57.2	8.5	49	3.2	660	46.6	N	51.2	N
25	19	174	55.6	7.9	46.2	2.3	610	47.5	N	50.2	N
26	19	170	55.5	7.6	47.4	2.3	1070	47.5	N	50.4	N
27	21	169	55.2	8.4	45.6	2.3	1000	47.5	N	49.3	N
28	19	167	55.4	7.8	46.8	3.2	980	46.6	N	49.9	N
29	23	172	58	10.2	47	1.4	850	48.4	N	50.3	N
30	16	165	56.1	8.1	46.6	3.2	550	46.6	N	50.4	N
31	17	174	55.4	6.5	47.1	3.2	1020	46.6	N	51.4	N
32	19	168	55.8	5.1	46.8	3.2	280	46.6	N	53.2	N
Mean	19	169	56	7.2	45.1	2.6	780	47.2		51.2	
SD	1.8	4.7	2.9	1.8	2.6	0.7	260	0.7		2.3	