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Original Research

Husbandry, Use, and Orthopedic Health of Horses Owned by Competitive and Leisure Riders in Switzerland

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ABSTRACT

The use of horses in competitive sports receives increasing criticism from the public, mainly due to the potential for injury. However, it is unclear if orthopedic and other health issues are more common in competition horses than those in leisure horses. The aim of this study was to assess husbandry, use, and orthopedic health in Swiss riding horses and to compare these aspects between horses owned by selfidentified competitive riders (CR) and leisure riders (LR) in Switzerland. A total of 237 owners completed an online survey providing information on their athletic ambitions, their horse's husbandry, health, training, and tack. Two experienced veterinarians assessed gait irregularities, muscular development, and back pain in the horses and evaluated saddle fit. Compared with horses owned by competitive riders (CH), a higher proportion of horses kept by leisure riders (LH) were kept unshod, under more natural conditions, and turned out with other horses. LH were exercised less frequently, and LR trained less frequently with instructors. CR reported less time since the last saddle check and the use of more training aids during riding. No differences between the two groups could be found in orthopedic health, muscular development, or back pain, but LH had higher body condition scores and a slightly higher proportion of saddles with at least one fit problem. Our data revealed no increased prevalence of the assessed health problems in competition horses compared with leisure horses in Switzerland. However, suboptimal saddle fit and muscular development, back pain, and gait irregularity are frequent in both groups and deserve more attention.

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1. Introduction

In the past decades, equestrian sports have received increasing criticism from the public because of concerns about equine welfare (discussed in [1]). Welfare issues associated with equestrian sports include the use of potentially harmful equipment (e.g., whip or curb

bits [1]), the application of hyperflexion during dressage [2], orthopedic and metabolic problems during endurance races [3], or a general increased risk for traumatic injuries in competition horses [4]. There is evidence that the risk for specific injuries is increased in certain disciplines [5] and that there is a higher prevalence of pain of the sacroiliac region in show jumping and dressage horses than leisure horses [6].

Although the capabilities or talent of the horse can limit its athletic career, the initial decision whether it is used for competitions or for leisure is mainly down to the horse's owner. It is driven by the riders' skill and their financial situation, but also by their ambition to succeed in an equestrian discipline. This ambition can be viewed critically from an ethical perspective, as it poses the risk of instrumentalizing the horse to achieve personal athletic goals [7]. A recent study [8] found a negative association between the horse owner's emphasis on athletic success and the attitude toward sport horse welfare, and it has been proposed that competition-







Animal welfare/ethical statement: The experimental protocol was approved by the Animal Health and Welfare Commission and the Ethical Commission of the Canton of Zurich, Switzerland (TVB-Nr. ZH003/17-28698; BASEC-Nr. 2017-00188). All owners and/or participants gave written consent for their animals to be included in this study.

Conflict of Interest: The authors declare no potential conflicts of interest. None of the authors has any financial or personal relationships that could inappropriately influence or bias the content of the article.

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oriented equestrians might have a more instrumentalized view of their equine companion, that is as a tool to pursue athletic goals.

While equine athletes are performing in broad view of the public, health issues of leisure horses might be less obvious, but of concern nonetheless. Problems which have been identified in leisure horses include obesity [9–11], or a higher risk for irregular locomotion or lameness [12], the frequent use of potentially aversive riding aids, the lack of regular saddle checks, and a high prevalence of owner-reported behavior problems [13], some of which could be indicative of discomfort or pain.

Regardless of scientific findings, the question if leisure horses have a better quality of life than competition horses is one that frequently leads to lively debate among riders and equine professionals.

The objective of this study was to provide a general overview on husbandry, training, tack, and health issues of the Swiss riding horse population to identify critical issues and to allow international comparison. Furthermore, this study aimed to directly compare aspects of welfare and orthopedic health in horses owned by competitive and leisure riders within the same population in Switzerland to investigate if differences are associated with the owner's athletic ambition.

2. Material & Methods

2.1. Survey

Participants were recruited through an online survey, which was promoted as a "health study" in several national (horse) magazines and through the official publication of the Swiss Equestrian Federation. In addition, all persons registered in the national Swiss database for horse owners were contacted directly by post and invited to take part. Horse-rider pairs (HRPs) were eligible to take part if the following conditions were met: the horse was mainly ridden by its owner (for at least two third of the horse's ridden time); the horse was ridden at least twice a week; the owner was over 18 years of age; the horse was between 5 and 18 years; and the horse was used for either of the following activities: leisure, dressage, jumping, eventing, endurance, western riding, and gait competitions. Data collection was part of a larger project which included the investigation of saddle pressure and horse and rider kinematics during a riding test [14]. Owing to ethical reasons, horses (and riders) therefore also had to be free of acute disease, which could impair their ridden performance. Owners who were interested in participating received further information and were asked to sign a declaration of consent. Owners were then invited to have their horse and saddle examined by veterinarians (see below). Ten days before the examination, owners were given access to the online survey.

The survey consisted of 107 questions in total, 34 of which were investigated in this project (see supplementary item 1). Question topics included husbandry, training and use, tack, shoeing, and health of the horse.

In total, 248 horse owners completed the survey (recruitment details in supplementary item 3) and were assigned to one of two groups. When asked which statement best applied to them, participants had these options: "I am mainly a leisure rider or an ambitious rider, but I do not compete" (further referred to as leisure riders: LR; their horses: LH; both: L) or "I am mainly an ambitious sports rider, and I regularly take part in competitions" (competition riders: CR; their horses: CH, both: C). As the number of competitions unaffiliated to the Swiss Equestrian Federation in Switzerland is very limited, the competitions. The investigated sample size corresponds to approximately 0.33% of the national population

(76'209 horses in 2017 according to the Swiss Federal Statistical Office [15]).

2.2. Veterinary Examination of Horses and Saddles

Of all participants, 237 owners followed the invitation for an orthopedic examination of their horse by two experienced veterinarians at one of eight locations in Switzerland. The examination included a lameness assessment (where horses were walked and trotted in hand on an even surface), palpation of the back to assess painfulness, palpation of functionally important muscles to assess their development, and an assessment of the horse's body condition. Riders were weighed and horse weight was estimated as described by Gunst et al [14]. In addition, the saddle of each HRP was assessed manually for its fit (details on assessed parameters in supplementary items 1 and 2).

2.3. Statistical Analysis

Answer options which were presented to the participants in ordered categorical levels (e.g., frequency of turnout) were transformed into ordinal data (see supplementary items 1 and 2). To check for differences in the assessed parameters between L and C, 95% confidence intervals (95% CI) of the mean were calculated. In addition, t-tests, Mann-Whitney U-tests, or χ^2 tests were applied to test for differences between the two groups. Before testing, continuous variables were assessed for heteroscedasticity and normal distribution (Shapiro-Wilk Test). Statistical significance was defined as lack of overlap between 95% CIs, and a *P*-value below .05. All analyses were performed in R Studio (version 1.1.442, 2019) using the packages *Publish* and *DescTools*.

3. Results

The study population comprised similar numbers of L and C (113 vs. 135). Average values for the two groups are presented in Table 1. Where not stated otherwise in the text, 95% CI overlapped between groups and *P* was larger than .05. The riders were mainly female and of similar weight and body mass index. LR were on average slightly older than CR (95% CI overlapping, P = .009) and had a higher ratio of the rider's weight in relation to the horse's weight (95% CI not overlapping, P = .008). LR and CR had been riding for similar amounts of time, but compared with LR, CR had started riding earlier (95% CI not overlapping, P = .006) and rode and competed more frequently (mainly in dressage and show jumping) (for both parameters: 95% CI not overlapping, P < .001). A higher proportion of CR were holders of a Swiss Equestrian Federation license (95% CI not overlapping, P < .001). On average, LH were older than CH (95% CI not overlapping, P = .002). Compared with CH, a higher proportion of LH had been broken in after reaching the age of 3.5 years (95% CI not overlapping, P = .02). CH included a higher proportion of warmblood horses (95% CI not overlapping, P < .001) and slightly more mares (95% CI overlapping, P = .02) than LH. On average, LR had been partners with their horses for longer than CR with theirs (95% CI not overlapping, P < .001).

A bigger proportion of LH were kept under more natural conditions (free access to outdoors and sharing the same space with other horses) (95% CI not overlapping, P < .001). Weekly frequency and duration of turnouts did not differ between the two groups, but the proportion of horses with individual turnout was bigger in CH (95% CI not overlapping, P < .001). CH received more than twice as much concentrate food as LH (95% CI not overlapping, P < .001). Both groups received similar amounts of roughage (in addition to what was ingested during turnout).

#	Parameter (n)		Leisure Riders and Their Horses	Upper and Lower 95% CI	Competitive Riders and Their Horses	Upper and Lower 95% CI	Overlap in 95% Cl	P-Value
Genera	l information							
1)	Competitions per year (rider with horse)	Median (IQR)	0 (0; 1–5)	[1.2; 1.5] [†]	6-11 (1-5; 12)	$[3.1; 3.5]^{\dagger}$	No	<.001
2)	Weekly time spent riding (rider) (h)	Mean \pm s.d.	7.3 ± 3.4	[6.6; 7.9]	8.8 ± 4.5	[8.0; 9.6]	No	<.001
3)	License holders	Proportion (n)	17% (19)	[11%; 25%]	59% (85)	[51%; 67%]	No	<.001
4)	Age when person began to ride	Mean \pm s.d.	12.5 ± 9.3	[10.8; 14.3]	8.9 ± 4.2	[8.2; 9.7]	No	.006
5)	Years of riding experience	Mean + s.d.	25.1 + 11.3	[23.1: 27.5]	25.5 + 9.4	[23.8: 27.1]	Yes	.7
6)	Age of the rider (years)	Mean \pm s.d.	39.5 ± 11.6	[37.2; 41.7]	35.6 ± 10.6	[33.7; 37.5]	Yes	.009
7)	Sex of the rider	Proportion	91% (103)	[0.84; 0.95]	95% (128)	[0.90; 0.97]	Yes	.4
8)	Weight of the rider $^{\circ}$ (kg)	Mean $\pm s d$	65.4 ± 11.8	[63 1: 67 7]	64.4 ± 10.1	[62 7: 66 2]	Ves	8
9)	BMI of the rider° (kg/m^2)	Mean \pm s.d.	23.4 ± 3.4	[22.7: 24.1]	22.8 ± 2.8	[22.3: 23.2]	Yes	.0
10)	Ratio weight rider: weight horse [°]	Mean \pm s.d.	12.4 ± 2.6	[11.8; 12.9]	11.4 ± 2.0	[11.1; 11.8]	No	.008
11)	(%, n = 212)	Maria	11.2 . 2.6		07 01	[0.1, 10.2]	N	002
11)	Sex of the horse	Proportion \pm s.d.	11.2 ± 3.6 29% (33)	[10.5; 11.9] [22%; 38%]	9.7 ± 3.1 44% (60)	[36%; 53%]	Yes	.002 .02
		females (n)						
13) 14)	Proportion of warmblood horses Age when the horse was broken in	Proportion (n) Median (IOR)	42% (47) 3 5 (3 · 4 5)	[33%; 51%] [5 1: 5 7] [†]	83% (112) 35 (3-35)	[76%; 88%] [4.6: 5.1] [†]	No No	<.001 .02
,	(years, $n = 201$)	incentari (r.g.t.)	515 (51, 115)	[011, 011]	515 (5, 515)	[, 5.1]		
15)	Length of partnership (years, the	Mean \pm s.d.	6.2 ± 3.7	[5.5; 6.9]	4.5 ± 2.8	[4.0; 5.0]	No	<.001
Uuchar	rider with the horse)							
16)	Husbandry system with free access	Proportion (n)	43% (49)	[35%: 53%]	15% (20)	[10%: 22%]	No	<.001
,	to outdoors and sharing same space	···· · · · · · · · · · · · · · · · · ·		[,]	()	[]		
	with other horses							
17)	Weekly frequency of turn out $(n = 242)$	Median (IQR)	7 (5–6; 7)	[4.4; 4.7]	7 (5–6; 7)	[4.3; 4.6]	Yes	.3
18)	Duration of turn out $(n = 242)$ (h/	Median (IQR)	4-5 (3-4; >5)	$[5.1; 5.8]^{\dagger}$	4-5 (3-4; >5)	[5.0; 5.6] [†]	Yes	.4
10)	day)	Droportion (n)	719(01)	[62%, 70%]	40% (66)	[41%, 57%]	No	. 001
19)	same field	Proportion (II)	/1/6 (61)	[05%, 79%]	49% (00)	[41%, 57%]	NU	<.001
20)	Amount of roughage fed (kg/day,	Mean \pm s.d.	9.3 ± 4.7	[8.2; 10.4]	9.6 ± 3.2	[9.0; 10.3]	Yes	.2
21)	n = 1/9 Amount of concentrates fed (kg/	Mean ± s.d.	1.2 ± 1.1	[0.9; 1.4]	2.6 ± 1.5	[2.3; 2.9]	No	<.001
	day, n = 179)							
Exercis 22)	e and training Weekly frequency of exercise	Mean + s d	57 + 12	[55:60]	63 ± 09	[62:64]	No	<.001
,	(horse)			[,]		[,]		
23)	Weekly frequency of riding (horse)	Mean \pm s.d.	4.7 ± 1.2	[4.4; 4.9]	5.3 ± 1.0	[5.1; 5.5]	No	<.001
24)	Monthly frequency of training with	Median (IQR)	2-3(1;4)	[4.4; 5.0]	4 (2–3; 4)	[5.4; 5.9]	No	<.001
	the instructor (the rider with the horse)							
25)	Weekly frequency of hacking (the	Median (IQR)	3-4 (1-2; 3-4)	[4.3; 4.7] [†]	1-2 (1-2; 3-4)	$[4.0; 4.4]^{\dagger}$	Yes	.01
	rider with the horse)							
Tack ar	Id equipment	Modian (IOP)	1 (1.2)	[1.4, 1.6]	$2(1\cdot 2)$	[16.19]	No	005
20) 27)	Frequency of saddle checks	Median (IQR)	Not regularly	[1.4, 1.0] $[3.4, 4.2]^{\dagger}$	Z (1, Z) Every two years	[1.0, 1.0] [3.9· 4.7] [†]	Yes	.005
27)	requeries of suddre checks	Wiedian (IQIV)	only if there is a	[5.4, 4.2]	(Not regularly, only	[3.3, 4.7]	105	.05
			problem (Not		if there is a			
			regularly, only		problem; once a			
			if there is a		year)			
			problem; once					
28)	Time since last saddle check (years,	Mean ± s.d.	1.1 ± 1.2	[0.9; 1.3]	0.7 ± 0.6	[0.5; 0.8]	No	.003
	n = 218)	D	010/ (0.1)	-	60% (00)			0-
29)	Saddles with at least one fit problem ^o $(n - 234)$	Proportion (n)	81% (84)	[72%; 87%]	68% (89)	[60%; 76%]	Yes	.05
30)	Number of riding aids frequently	Median (IQR)	0(0;1)	[0.4; 0.6]	1 (0; 1)	[0.8; 1.1]	No	<.001
21)	used Unshod horses	Proportion (n)	27% (31)	[20%.36%]	11% (15)	[7% 18%]	No	002
32)	Shoeing interval (weeks, shod	Median (IOR)	7-8(7-8;7-8)	$[3.8; 4.2]^{\dagger}$	7-8(5-6;7-8)	$[4.0: 4.3]^{\dagger}$	Yes	.002
,	horses only, $n = 202$)				- ()			-
Horse l	nealth	Descent	20% (2.1)	[220/. 200/]	2200 (45)	1200/- 420/1	V	7
33)	Horses with orthopedic health issue diagnosed in the past	Proportion (n)	30% (34)	[22%; 39%]	33% (45)	[26%:42%]	Yes	./
34)	Horses treated by a manual	Proportion (n)	59% (67)	[50%; 68%]	65% (88)	[57%; 73%]	Yes	.4
35)	therapist in the past 6 months Horses with gait irregularity of	Proportion (n)	49% (51)	[39%. 58%]	59% (77)	[51% 67%]	Vec	1
55)	grade 2 in one or more legs°	rioportion (ii)		[35/0, 56/0]	55% (11)	[31/0, 07/0]	103	.1

(continued on next page)

Table 1 (continued)

	,							
#	Parameter (n)		Leisure Riders and Their Horses	Upper and Lower 95% Cl	Competitive Riders and Their Horses	Upper and Lower 95% Cl	Overlap in 95% Cl	P-Value
36)	Horses with BCS above 3 (moderate)°	Proportion (n)	38% (40)	[29%; 47%]	19% (24)	[13%; 26%]	No	.002
37)	Horses with signs of back pain in one or more locations°	Proportion (n)	27% (29)	[20%; 37%]	32% (41)	[24%; 40%]	Yes	.6
38)	Horses with suboptimal development of one or more muscles°	Proportion (n)	96% (101)	[91%; 99%]	94% (122)	[88%; 97%]	Yes	.8

Abbreviations: #, number of the question or parameter (listed in supplementary items 1 and 2); BMI, body mass index; BCS, body condition score; IQR, 25% and 75% interquartile range (for ordinal categorical data, the corresponding categories are presented); 95% CI, 95% confidence intervals.

When marked with \dagger , numbers refer to the ranks of ordered categorical parameters (see supplementary item 1 for transformation of categories into ranks). *P*-values are based on t-, χ^2 -, or Mann-Whitney *U*-tests. Parameters marked with \circ were assessed by the authors (n = 237); all other parameters are owner reported (n = 248). Where answers to survey questions were optional or where not all horses could be assessed, n is stated in the second column. Bold indicates statistical significance.

On a weekly basis, CH were exercised and ridden more often than LH (95% CI not overlapping, P < .001). CR trained more frequently with an instructor (95% CI not overlapping, P < .001), whereas LR went hacking slightly more frequently (95% CI overlapping, P = .01).

On average, CR used two different saddles in training, whereas LR only used one (95% CI not overlapping, P = .005), and CR frequently used one training aid (particularly martingale and/or spurs) during riding, whereas LR used none (95% CI not overlapping, P < .001). The average time since the last saddle check through a professional was 5 months longer in L than in C (95% CI not overlapping, P = .003). Overall, 43% (95% CI: 37%; 49%) of owners stated that they had their saddle checked at least once per year; all remaining owners reported longer intervals or no regular saddle checks. In the overall population, 74% (95% CI: 68%; 79%) of saddles had at least one fit problem and their proportion was slightly increased in L (95% CI overlapping, P = .05). No difference was found in the shoeing interval, which was 7 to 8 weeks on average. The proportion of unshod horses was higher in LH (95% CI not overlapping, P = .002).

Compared with CH, a higher proportion of LH was considered overweight (95% CI not overlapping, P = .002). None of the other parameters regarding horse health differed between L and C. Overall, 62% (95% CI: 56%; 68%) of horses had been treated by a manual therapist in the past 6 months, 32% (95% CI: 26%; 38%) had been diagnosed with orthopedic health issues in the past, 54% (95% CI: 48%; 61%) showed gait irregularity of grade 2 in at least one leg, 29% (95% CI: 24%; 35%) showed signs for pain on palpation in at least one location of the back, and 95% (95% CI: 91%; 97%) showed hypertrophy or atrophy in at least one of the assessed muscles.

4. Discussion

4.1. Differences Between LR and CR

Do horses owned by competitive riders have more health issues than horses owned by leisure riders? Our data provide little support to affirm this question. In fact, the two most critical aspects in which the two groups differ indicate a worse situation in LH.

A higher proportion of overweight horses in LH than CH is in agreement with previous studies, which highlighted the prevalence of obesity in leisure horses [9,11]. Reasons for higher body condition scores (BCSs) could be a higher food intake or a lower energy expenditure than sports horses. In our study, LH received less concentrate feed than CH, but they were also exercised less frequently, which is likely to have contributed to the higher BCSs.

The other critical differences in terms of welfare are the longer intervals between saddle checks and the proportion of saddles with at least one fit problem, which is slightly higher in LH. Interestingly, the proportion of horses showing signs of back pain or suboptimal development of back muscles was not higher in LH. Perhaps, the situation of an ill-fitting saddle had not prevailed long enough to evoke detectable pain in the horse, or the lower frequency and possibly intensity of riding in LH alleviated the consequences of an ill-fitting saddle.

Visser et al [12] reported a higher risk for irregular locomotion or lameness in horses used for recreation than in competition horses. Although our data revealed no statistical difference in gait irregularity between the groups, there was an opposite tendency: gait irregularity was slightly more prevalent in CH than that in LH.

A higher proportion of LH was kept under more "natural" conditions: free access to the outdoors, turnout with other horses, being kept barefoot, and receiving less concentrate food. Given that constant turnout with other horses was shown to reduce the risk of abnormal behavior in horses [16], these husbandry systems are likely to positively impact the horse's welfare. It could be that leisure riders have a more horse-centered approach to equestrianism. where the wellbeing of and the partnership with the horse are the primary aim, whereas competitive owners have an outcomecentered focus on equestrianism, that is to succeed at competitions. A horse-centered approach in LR would also be supported by the longer partnership between a horse and a rider in L. However, competitive riders too might prefer "natural" housing systems, but avoid them because they worry about the risk of injury. The potential severity of kick injuries in horses which need to be shod for their athletic activities might be an important reason why owners choose individual turnout, which was more frequent in CH.

An outcome-centered approach could explain a higher training frequency and an increased use of training aids in C, as well as a higher proportion of warmblood horses and slightly more mares among CH. As warmblood breeds dominate top-level show jumping and dressage competitions in Europe, the choice of breed is likely to be influenced by the competitive ambition of the owner. Ikinger et al [8] found a positive relationship between utility orientation and the importance of breed and pedigree among horse owners. Similarly, competitive owners might have more ambitions to partake in breeding and thus invest more frequently in mares, whereas leisure riders might prefer male horses because of their anecdotally less challenging personality. More training aids, the use of more saddles, more frequent saddle checks, and a higher proportion of horses being shod could indicate that competitive riders put more emphasis on equipment.

Perhaps, the differences between L and C not only reflect the owners' ambition but also their financial situation. The costs of competing, training with instructors, tack, regular saddle checks, and shoeing are considerable in Switzerland, and more "natural" husbandry systems (group housing or all year turn out) are often less expensive than individual housing.

4.2. General Findings

Some welfare issues are alarming in the overall study population. In particular, the frequency of saddle fit problems, suboptimal muscular development, and signs of back pain raise concern on the wellbeing of Swiss riding horses. Given the participants' willingness to take part in this "health study", we assume that they had a raised interest in their horse's wellbeing and that, rather than ignoring the before mentioned issues, they were unaware of them. This assumption is underlined by the fact that more than half the horses had been treated by a manual therapist in the past 6 months, which indicates that participating owners either suspected problems or at least cared for their horse's orthopedic health.

There is strong evidence that horse owners generally underreport diseases and that there is poor agreement with the veterinary assessment [17]. In a study from Australia, only 0.6% of the owners reported back problems in their horses [18]. Hypothesizing that there is a similar prevalence of back pain in the Australian population as found in this study, this indicates very limited owner awareness for back issues. In the case of obesity, there is clear evidence that owners have a limited ability to identify overweight in horses [9,11]. More than half the horses in this population showed grade two gait irregularity, which is comparable with other studies investigating the prevalence of lameness in owner-sound horses [17,19]. In conclusion, there should be efforts to train horse owners in the recognition of health issues and pain to prevent them from going unnoticed.

The high proportion of warmblood horses in the investigated population is in contrast to studies from Great Britain [20,21] or Australia [18], where Thoroughbreds made up the majority in similar surveys. This could reflect the breeding traditions of European warmblood horses or the comparably limited size of the Swiss racing industry and the consequently lower number of exracehorses.

On average, the horses investigated in this study had one day off work per week. This is comparable with the workload of sport horses in New Zealand [22] or riding school horses in Great Britain [23]. This indicates a comparatively intensive workload in Swiss riding horses, particularly when considering that very few of the participating horses belonged to professional riders. Compared with riders in Great Britain, the riders in this study also trained more often with an instructor: 78% (95% Cl: 72%; 83%) had lessons at least twice a month, compared with 39% in a similar study from Great Britain [24].

According to the owners, the median shoeing interval in this study was 7 to 8 weeks. Compared with standards in other countries, this appears long. In a study from Great Britain, only 5% of the participants stated that the last farrier visit was longer than 7 to 10 weeks ago. Given the biomechanical consequences of an increased hoof length, it is questionable if an average shoeing interval of 7 to 8 weeks is in the best interest of the horse. The overall proportion of unshod horses (19%, [95% CI: 14%; 23%]) was slightly lower to what was previously found in Great Britain (24%) [20], which might reflect an increased work intensity or more abrasive surfaces in Switzerland.

The proportion of owners reporting yearly (or more frequent) saddle checks (43% [95% CI: 37%; 49%]) is comparable with numbers from Britain (43% [25] or 61% [20]). However, given the high proportion of saddles with fit problems, it is concerning that half of the participants do not follow the current recommendation for yearly saddle checks [25].

Of all participants, 84% (95% CI: 79%; 88%) grant their horses longer access to pasture than what is required by Swiss law (a minimum of 2 hours daily access to an outdoor run). However, in a study from Great Britain [21], horses were turned out on average 8 (winter) to 23 (summer) hours, and a study on sport horses in New Zealand [22] showed that only 8% of horses had less than 6 hours daily access to pasture, whereas the majority of horses (68%) was on pasture 24 hours/day. This comparison shows potential for improvement in turnout duration, although the shorter grazing periods probably reflect the comparably limited availability of grazing land in Switzerland. In addition to what horses ingest during turnout, they received on average 1.7 \pm 0.6% of their body weight in roughage which is above the recommended minimum of 1% [26].

In light of the concern regarding the effect or the rider's weight on the horse's wellbeing, it is reassuring that the average ratio between the rider and horse weight was $12 \pm 2.3\%$, which has been classed as "light" in recent studies [27,28] and is below the commonly recommended 15% to 20% (e.g., [29]).

4.3. Limitations of This Study

It is likely that participating horses were on average healthier than the overall Swiss riding horse population: (1) for ethical reasons, participants had to be free of acute diseases, and (2) considering their motivation to take part in this study, they probably had raised interest in their horse's health. As with every survey, it should also be considered that some of the results are ownerreported and not measured objectively and that certain answers might be biased toward a more favorable situation than reality. As the human participants were mostly female, the results might not be representative for male horse owners.

Despite differences between LR and CR, the study population might have been too homogenous to detect an effect of rider ambition on certain aspects. Only a few of our participants were professional riders competing on an international level. It would be interesting to understand if and how ambition at the upper end of the scale (professional and/or international sports riders) affects horse welfare.

Finally, it should be noted that correlation does not imply causality, that is that differences between L and R could be due to other factors than the rider's ambition.

5. Conclusion

This study provides no evidence that Swiss riding horses owned by competitive riders suffer from more health issues than horses of leisure riders. In fact, obesity is more problematic in the latter. However, more natural husbandry conditions could indicate a higher mental and social welfare of leisure horses. Orthopedic health issues and saddle fit problems occur at high rates in both groups, emphasizing the need for an increased awareness of owners for these problems.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jevs.2020.103107.

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