Equine Veterinary Journal

Equine Veterinary Journal ISSN 0425-1644
DOI: 10.1111/evj.12126

Variation in training regimens in professional showjumping yards

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Summary

Reasons for performing study: Training regimens of showjumping horses under field conditions are largely undocumented.
Objectives: The aims of this study were to quantify and compare training regimens used in professional-level showjumping yards, with respect to time exercised and type of activity.
Study design: Prospective cohort study.
Methods: A prospective 6-month cohort study of showjumping horses in 4 European countries (The Netherlands, Sweden, Switzerland, Great Britain) was designed to analyse training and health data, in yards with several horses in training and riders competing at professional level. Riders documented the daily frequency and duration of all physical activities of the horses. Variation in training routines were compared between riders, location and time. Mixed-models analysis was used to examine factors associated with total time exercised and time spent in flatwork.
Results: In 4 countries, the 31 participating riders trained 263 European Warmbloods. The total days at risk (e.g. days in which the horses were considered fit for exercise) was 39,262. Mean time spent in daily exercise, including ridden work, lungeing and treadmill exercise, varied between riders from 19–52 min/day at risk. There was considerable variation in activities and level of heavy work and light exercise, i.e. turnout. Total time exercised and time spent in flatwork differed with month, country and proportion of days lost to training. Low variation of activities was associated with decreased total time trained and increased time spent in flatwork.
Conclusions: Riders at this elite professional level of showjumping used training regimens that vary substantially in time spent training and other physical activities and showjumping horses are challenged differently during training despite competing at the same level. Whether all training regimens prepare the horses equally for the demands of competition remains to be determined.

Keywords: horse; showjumping; epidemiology; training regimens; days lost; training diary

Introduction

Studies of equine exercise regimens and training have focused thus far on Thoroughbred racehorses and Standardbred trotters. In Thoroughbreds, exercise regimens may differ considerably between trainers [1]. Racehorse studies also show that training characteristics such as speed, amount and surface, may influence the incidence of fractures [2–4] and joint injury [5]. In riding-school horses differences in orthopaedic health are associated with differences in management [6]. One study has analysed the management and training practices of dressage horses [7], while another has identified the related patterns of injury [8]. There are no reports on training regimens of Warmblood showjumping horses under field conditions and these data are required if risk factors for injury and wastage in showjumpers are to be determined.

The objectives of this study were to quantify and compare training regimens used in professional-level showjumping yards, with regards to time exercised, type of activity and perceived intensity, and to examine whether there are substantial differences in management of horses competing at the same level in this discipline.

Material and methods

Design

The study was designed as a prospective cohort study to quantify and analyse training and health data at rider and horse level, in showjumping yards at a similar level of competition and with several horses in training. The riders participating in the study were based in The Netherlands, Sweden, Switzerland and Great Britain. The study was approved by the Ethical Committee for Animal Experiments, Uppsala, Sweden.

Rider selection and sample size

Selection was based on competition results data from the National Equestrian Federations including rider rankings. We aimed to recruit 300 horses from each country, assuming that horses would contribute 0.5 horse-year at risk each and allowing for substantial withdrawal (≤75%).

Inclusion and exclusion criteria

Riders with a minimum of 3 horses were recruited. In Sweden selected riders ranked in the National Federation top 110 competition rankings in 2008 and/or were riding at Advanced level. Recruitment in The Netherlands, Switzerland and Great Britain was done in collaboration with the national federations and also based on high competition rankings, including starts at Advanced level. Some recruited riders had stable riders engaged in training and/or competition. Riders based in yards with a high turnover of horses related to commercial activity and Swedish riders who had frequent competition trips abroad were excluded due to anticipated difficulties in maintaining consistent training records for individual horses. Figure 1 shows a flow chart of the recruitment process.

Horse selection

Riders selected horses that were aged ≥3 years and that were expected to stay in the yard for the study period. If possible, when a horse was sold or otherwise left the yard, a new horse was enrolled for this rider.

Study period

The planned study period was 6 months/year, during the outdoor riding season. Two seasons were included in Sweden, start dates were mid-April in 2009 and 1 May in 2010. In Switzerland riders started in a staggered manner from 1 May 2009, in The Netherlands from April 2009 and in Great Britain in August 2009.

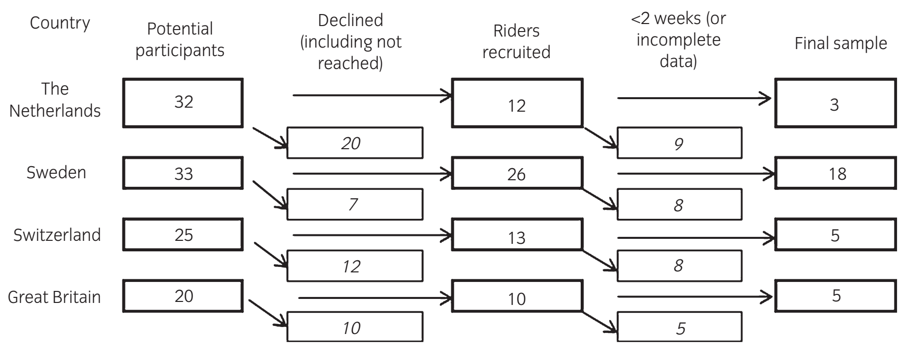

Fig 1: Flow chart showing recruitment process and compliance of riders by country.

Baseline protocols

All riders were visited before the start of the study by one researcher (A.O./The Netherlands, A.C.L./Sweden, C.B./Switzerland and C.A.T./Great Britain). Riders were asked to provide information on participating horses including year of birth, breed, gender, previous orthopaedic problems and time in the yard. Baseline information on training strategies was also recorded.

Training and health vs. disease data

Riders, or nominated members of staff, were instructed how to record daily training, competition and health information in standardised protocols either on paper or in electronic form (Table S1). Duration and intensity of activities, assessed subjectively by the riders using a visual analogue scale were recorded and expressed as a percentage of a 0–1 (low–high) scale. Competition data were registered as class(es) competed. Class information for Swedish riders was checked with the Swedish Equestrian Federation database[a]. Rider-determined illness/injury records for each horse were recorded as lameness, hoof/shoeing, back problems, medical conditions, clinical signs of unclear origin or otherwise defined as free text.

Definition of rest and days lost to training

Days lost to training [9,10] were defined as days when horses were not trained or trained less for health reasons, and included days of lighter work than originally planned as a response to perceived early signs of injury. Days lost to training included stable, paddock or field rest, being led in hand, work on the mechanical walker, lungeing, or hacking/flatwork at walk/trot and/or of short duration. Rest days were days horses were not trained or were in light work because of regular management decisions, i.e. normal weekly rest days. Days lost to training were categorised *post hoc* as due to nonacute orthopaedic, acute orthopaedic, medical, hoof and undiagnosed disorders (signs of disorders that remained undiagnosed, most often of short duration).

Data management

Data were entered into a spreadsheet designed in Excel[b]. Paper protocols from the riders were entered manually and electronic records were edited and coded. Consistency checks were made for all protocols with follow-up questions to riders. In 2% of records, single values within a session were missing for single horses. In those cases, an estimate was used based on horses in the same activity within the same yard on the same or adjacent days. The data were imported into SAS[c] for further analysis and descriptive analyses were performed.

Data analysis

Demographic information and data on days at risk, workload variables, rest and days lost to training were determined. Days at risk were calculated as the total number of days the cohort were monitored minus the days lost to training [9–11]. Total time exercised was the summed duration for hacking, fitness work, fitness hill work (climbing steep hills), flatwork (dressage), jumping, treadmill, lungeing, loose canter and loose jumping (e.g. a horse cantering or jumping fences without a rider in an arena), and competition time. Total time outside stables was the summed duration for all ridden and un-ridden exercise categories. Duration of light unridden exercise (e.g. horse walker, time led in hand and turnout combined) was calculated. Where actual duration for the competitions was not given, 40 min were added for one class and 60 min for 2 classes. Workload variables were calculated per rider, country and as a total and presented as mean exercise time in min/day at risk ± s.d., the s.d. representing the variability over the days trained and not directly interpretable at the horse level. Calculated horse-level variables are the number of days worked in each activity/7-day period, mean duration of the individual training sessions and the number of horses with at least one session of each activity during the study.

Modelling

Repeated models were created using the MIXED procedure in SAS[c]. Two models were created with total time exercised and time for flatwork as respective outcomes. Reasonable normality was deemed to be present when means and medians were similar, the standard deviations 'small', skewness around zero and kurtosis low. Data were analysed in weeks (i.e. 7-day at-risk periods) except where the final blocks were <7 days. Weeks were treated as repeated effects, horse within rider as subject effect (horses were repeated within riders) and with a compound covariance structure. A compound symmetry covariance structure was selected assuming that the correlation was the same for all horses within a rider.

The fixed-effect variables tested in the demographic models were: sex (male/female), age category (3–6, 6–8, 8–10, 10–12 and ≥12 years), history of orthopaedic problems the previous season, mean competition class in the season (not started or ≤100 cm, >100–120 cm, >120–140 cm and >140 cm), year (2009/2010), month (for each 7-day data block, the month with the largest proportion in a 7-day at-risk time period was selected [if 2 months had equal proportions in a 7-day at-risk period the first was selected]), whether the horse had days lost during the study period (0% of all days with data, >0–10%, >10–20%, >20–30%, >30%) and country. A variable representing the variation in the training for each week was also tested upon the reduced models. The following categories were used to assess grade of variation on time spent training in flatwork, hacking, fitness, lungeing, jumping, competition: >10–20%, >20–30%, >30–40%, >40–50% and >50%. To build the variable the highest category was selected, numerically higher categories representing low variation. Fixed effects were reduced from full main-effects models to those that contained only significant effects (all containing the random effect). Two-way interactions of variables left in the primary main-effects model were tested, ignoring those with month. The P value limit in all steps was 0.05.

The model was evaluated by inspection of residuals vs. predicted values and remaining covariates and using Akaike's information criterion, a measure of the relative goodness of fit. To assess the rider variation, the same fixed-effect models (without training variation or the time-varying variables month and study year) was run on a dataset with one observation per horse (except that one horse was included twice because of a change in riders during the study) and with rider as a random effect. Rider variation was assessed using the rider covariance parameter estimate from the MIXED procedure and dividing it by the sum of this estimate and the residual variance.

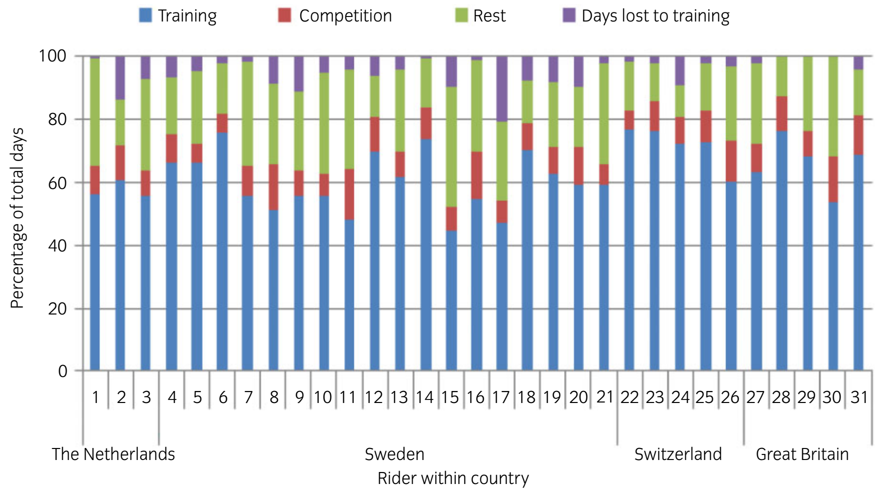

Fig 2: The percentage of days that were recorded as spent in each activity in 263 showjumpers with 31 participating riders in 4 countries.

Results

Compliance and drop out

Data were provided by 31 of 61 riders originally recruited (Fig 1). In Sweden, 10 riders participated for a second season in 2010 (9 of these had participated in 2009). Reasons given by riders who declined to take part or withdrew from the study were: time constraints, illness/accidents or planned stays abroad. In Sweden, software issues with electronic protocols also caused drop out. In The Netherlands, Great Britain and Switzerland, all but one of the riders with frequent international travel were lost to the study. Six of the riders in Sweden shared yards. In The Netherlands, Great Britain and Switzerland, each rider was based in a separate yard; thus data were collected from 28 yards in total.

Study population

The 263 horses included in the study were all European Warmbloods, aged 3–16 years, 46% mares, 42% geldings and 12% stallions (Table S2). The mean time of residence in the rider's yard was 3 ± 3 years. The mean competition level was 125 cm and ranged from novice (horses that had not yet started competing) to 160 cm international level (Grand Prix). The total days at risk were 39,262 (The Netherlands 5202; Sweden 25,539; Switzerland 7000; Great Britain 1521).

Days lost to training

The total number of horses with days lost to training during the study period was 127; the total days lost to training during the study period was 2393 and varied between riders (Fig 2). Reasons for days lost to training included: nonacute orthopaedic problems (n = 1339 days; 56%); acute orthopaedic problems (n = 520 days; 22%); medical disorders (n = 276 days; 12%); hoof problems (n = 172; 7%); and undiagnosed disorders (n = 86 days; 4%). Acute orthopaedic problems were mainly due to accidents/sudden trauma.

Workload and management

The training workload varied substantially between riders. For all riders, the ridden training was the major part of the total time exercised, with flatwork as the major component. Figure 3 shows that, while all riders had flatwork and jumping as part of their training regimen, the frequency of the activities varied between riders (Table S3). All riders, except 4 in Great Britain, used lungeing as part of their training regimen. Fitness hill work was used by 5 riders in Sweden. Loose jumping, loose cantering, treadmill training and long-reining were used by 1–2 riders in Sweden, for individual or several horses. Total time exercised varied per rider from 19–52 min/day at risk (mean 31 ± 24 min/day at risk) and between 4.0 and 6.2 sessions/week (mean 4.7 ± 0.7 sessions/week; Table S3). In low-variation regimens, flatwork was the main component, followed by jumping and competition. As a proportion of the total time exercised, riders used 19% for hacking, flatwork accounted for 41%, lungeing for 6%, fitness work for 6%, jumping for 10%, competition for 14% and hill work for 0.3%. Rider variation was marked, for example one rider hacked 47% of the time exercised, while 5 riders hacked <5% of the time exercised.

All riders except for 3 Swedish riders used mechanical walkers, in general daily for up to 1 h for most horses (Table S3). All riders except for 2 in Great Britain turned the horses out, with an overall daily mean of 3.8 ± 4.5 h; however, between-country variation was substantial. The total mean daily time outside the stable varied from 1.3 to 11.8 h (mean 4.7 ± 4.3 h).

Intensity

Information on intensity of the ridden exercise estimated by the riders is presented in Table S3.

Multivariable modelling

The 263 horses had 2–54 7-day observations (5406 data rows). The untransformed format fitted both models best (total time trained [h]; mean ± s.d. 3.7 ± 1.5, median 3.7, skewness 0.6; kurtosis 4.0. Flatwork time (h); mean ± s.d. 1.5 ± 1.0; median 1.4; skewness 0.7; kurtosis 1.0). The significant variables in the model of total time exercised (Table 1) were:

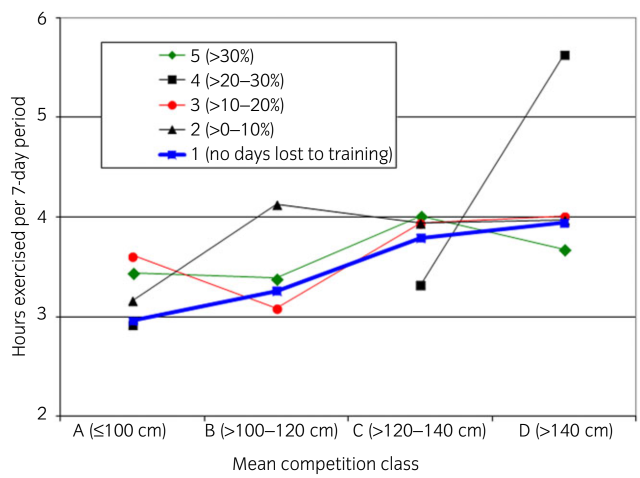

Fig 3: Interaction between mean class competed and proportion of days lost in the total time exercised model (hours exercised per 7-day period). Within Class A there were significant differences between 1 and 2, within Class B there were significant differences between 2 and 3, and within Classes C and D, 4 was significantly different to all other groups. Estimates were not produced for all groups (i.e. 4 in A-class).

TABLE 1: Factors associated with total time exercised in 263 showjumpers from 4 countries

Variable	Category		No. obs	Estimate	s.e.	95% CI		Group-P value
Intercept				2.46	0.17	2.1	2.8	
Proportion days lost	>30%		244	0.49	0.33	-0.2	1.1	0.003
	>20–30%		176	-0.04	0.52	-1.0	1.0	
	>10–20%		361	0.65	0.3	0.1	1.2	
	>0–10%		1865	0.21	0.4	-0.6	1.0	
	no days lost to training (RF)		2760	0				
Month	April		245	0.43	0.08	0.3	0.6	<0.0001
	May		895	0.2	0.05	0.1	0.3	
	June		1010	0.02	0.05	-0.1	0.1	
	July		870	-0.07	0.05	-0.2	0.0	
	August (RF)		843	0				
	September		741	0.15	0.06	0.0	0.3	
	October		596	-0.26	0.06	-0.4	-0.1	
	November		136	-0.48	0.11	-0.7	-0.3	
	December		70	-0.68	0.15	-1.0	-0.4	
Country	The Netherlands		718	-0.31	0.14	-0.6	0.0	<0.0001
	Switzerland		973	1.68	0.14	1.4	2.0	
	Great Britain		222	0.94	0.18	0.6	1.3	
	Sweden (RF)		3493	0				
Mean class competed	>140 cm		959	0.99	0.23	0.5	1.4	<0.0001
	>120–140 cm		2975	0.83	0.18	0.5	1.2	
	>100–120 cm		1015	0.3	0.2	-0.1	0.7	
	≤100 cm (RF)		457	0				
Mean class competed/proportion days lost	>140 cm/	>30%	69	-0.75	0.42	-1.6	0.1	0.0003
	>140 cm/	>20–30%	33	1.73	0.62	0.5	2.9	
	>140 cm/	>10–20%	73	-0.59	0.39	-1.4	0.2	
	>140 cm/	>0–10%	465	-0.18	0.43	-1.0	0.7	
	>140 cm/	no days lost to training (RF)	319	0				
	>120–140 cm/	>30%	123	-0.26	0.38	-1.0	0.5	
	>120–140 cm/	>20–30%	121	-0.43	0.55	-1.5	0.6	
	>120–140 cm/	>10–20%	197	-0.5	0.32	-1.1	0.1	
	>120–140 cm/	>0–10%	904	0.2	0.41	-0.6	1.0	
	>120–140 cm/	no days lost to training (RF)	1630	0				
	>100–120 cm/	>30%	36	-0.36	0.41	-1.2	0.4	
	>100–120 cm/	>20–30%	0					
	>100–120 cm/	>10–20%	50	-0.83	0.43	-1.7	0.0	
	>100–120 cm/	>0–10%	391	0.66	0.43	-0.2	1.5	
	>100–120 cm/	no days lost to training (RF)	538	0				
	≤100 cm (RF)/	>30%	16	0				
	≤100 cm (RF)/	>20–30%	22	0				
	≤100 cm (RF)/	>10–20%	41	0				
	≤100 cm (RF)/	>0–10%	105	0				
	≤100 cm (RF)/	no days lost to training (RF)	273	0				

CI = confidence interval; RF = reference category.

proportion of days lost to training, month, country and mean class competed. There was an interaction between mean class competed and the proportion of days lost to training (Table 1). The significant variables in the model of flatwork time (Table 2) were: proportion of days lost to training, month, country and year. Although not straightforward to interpret, the time trained increased through the competition classes (Fig 3); horses that competed in the highest classes trained the most and had >20–30% days lost to training.

The Akaike information criterion improved considerably when training variation was added (n = 263 horses, n = 5309 data rows). In the dataset with training variation (n = 5309) the observations were distributed as >50% (n = 2849), >40–50% (n = 1340), >30–40% (n = 920), >20–30% (n = 179) and on >10–20% (n = 21 [representing 5 riders and 16 horses]). When training variation was included in the model of total time exercised, training variation and the same variables were significant. Low-training variation was associated with less total time exercised, compared with regimens with the highest variation. When training variation was included in the model of flatwork, the same variables were significant. Training variation (P<0.0001) and its interaction with country (P = 0.03) were also significant. Low-training variation was associated with increased time spent in flatwork. Residual inspection was considered satisfactory. In the model of total time exercised, riders contributed 71% of the variation and 53% in the model of flatwork (n = 264, one horse counted twice).

Discussion

There were substantial differences in training regimens used by riders in this population of elite showjumping horses. Between-rider variation was highest for total time exercised. Time spent in flatwork was more stable

TABLE 2: Factors associated with time spent in flatwork time in 263 showjumpers from 4 countries

Variable	Category	n	Estimate	s.e.	95% CI		P value
Intercept			1.08	0.06	1.0	1.2	
Proportion days lost to training	>30%	244	0.23	0.09	0.1	0.4	0.0006
	>20–30%	176	0.08	0.11	-0.1	0.3	
	>10–20%	361	0.08	0.07	-0.1	0.2	
	>0–10%	1865	0.24	0.05	0.1	0.3	
	no days lost to training (RF)	2760	0	.			
Month	April	245	0.11	0.07	0.0	0.2	0.003
	May	895	0.03	0.04	-0.1	0.1	
	June	1010	-0.01	0.04	-0.1	0.1	
	July	870	0.11	0.04	0.0	0.2	
	August (RF)	843	0	.			
	September	741	0.14	0.04	0.0	0.2	
	October	596	0.02	0.05	-0.1	0.1	
	November	136	0.01	0.09	-0.2	0.2	
	December	70	0.19	0.12	0.0	0.4	
Country	The Netherlands	718	-0.17	0.08	-0.3	0.0	<0.0001
	Switzerland	973	0.98	0.08	0.8	1.1	
	Great Britain	222	0.44	0.11	0.2	0.7	
	Sweden (RF)	3493	0	.			
Year	2009	3995	0.1	0.04	0.0	0.2	<0.0001
	2010 (RF)	1411	0				

CI = confidence interval; RF = reference category.

between riders, but variation was still considerable. Several of the variables associated with outcome were similar in both the models of flatwork and total time in training, which was to be expected because flatwork constituted a large part of total time in training. Age was not significantly associated with total time exercised or time spent in flatwork. Country is a potential confounder because of the small sample size and low compliance.

Month was significantly associated with both time exercised and time in flatwork. There were several interactions with month (data not shown). Time exercised was higher in April and May and lower in November and December, probably reflecting seasonal differences in competition schedules at regional and national level, with a peak in spring–summer and fewer competitions in autumn–winter. The associations between month and time spent in flatwork were less consistent. In northern Europe and Sweden the main outdoor season starts in May, while this begins in March or April in The Netherlands, Great Britain and central Europe. Study year, included to control for confounding when riders participated a second season, was significantly associated with time spent on flatwork.

Days lost to training and rest

Days lost to training due to health reasons were excluded from the days available for training in the current calculations. The mean percentage of all days lost to training was 5%, which is substantially lower than in UK racehorse studies [9,10]. Days lost to training interacted with mean competition class for total time exercised. The workload for horses that jump >120 cm was greater than that of horses jumping at lower heights, probably because younger and less experienced horses train less intensely. Most of the days lost to training due to lameness and veterinary problems were related to specific types of activity when horses were in work. The causal direction and underlying mechanisms remain, however, undetermined. Veterinary advice was not sought in all instances when days were lost to work, and the cause of all days lost were not diagnosed in every case.

Some racehorse studies have demonstrated a protective effect of specific aspects of training such as high-speed (e.g. high-intensity) training, against ‘sore shins’ [2] and some fractures [1,3,12]. Other studies have emphasised the need to balance time vs. intensity [2,12] in racehorse training. These are potentially important observations that may be relevant to training of showjumping horses, but further data are needed with objective measures of intensity of training and competition and from larger groups of riders, before conclusions can be drawn on the relationships between specific elements of training and specific injuries. The horses in this showjumping study had a lower number of days lost to training compared with racehorses in similar studies possibly due to differences during training and competition. But age differences may also play a role.

The degree of fitness work varied substantially between the riders. Traditionally, showjump training promotes obedience, agility and jumping rather than fitness and strength, and flatwork was a major component of training for most riders in this study. Training variation was significantly associated with both total time exercised and time spent in flatwork. The total time exercised increased and flatwork time decreased with increasing variation. Variation in training is likely to be influenced by local facilities, topography, infrastructure and rider preferences. Nevertheless some riders had the same facilities but still had different regimens. Studies in human athletes [13] and British dressage horses [8] indicate that variation in training is beneficial for long-term orthopaedic health. Swedish Warmblood sport horses that had competed in at least 2 disciplines before age 7 years had significantly more years in competition than other horses, supporting the hypothesis of a protective effect of exercise variation [14].

There are substantial differences in the training variation found in the current study when compared with reports of exercise programmes used for dressage horses in Germany [15] and the UK [7]. In the current study, 19% of total mean time was used for hacking with not more than 5% reported in Advanced German dressage horses. The German dressage horses had 80% dressage training, no fitness or jump training, and 6% rest. They also spent less time competing (4% vs. 14% for the showjumpers). In the UK study, 95% of the dressage horses had nondressage training, including jumping and 98% had weekly paddock turnout.

Limitations of the study

The study has several limitations. Compliance was low and noncompliant riders were not random; those with frequent international travel were lost to a large degree and primary selection criteria varied among countries, introducing important bias. The study design anticipated low compliance and aimed to over-recruit to ensure analysis could be carried out, but the resulting small sample sizes limited between-country comparison. Training showjumpers includes many activities and thus the study entailed a high workload for participants. Compliance might have been improved if regular visits to yards had been conducted to offer support and guidance on the data-collection protocol.

Activities were not monitored and we made no structured attempt to quantify the physiological workload objectively, relying on the subjective assessments of numerous separate riders. Between-rider (i.e. between observer) variation in data from the visual analogue scale used here was large. Also, the data collection forms were sometimes filled out by other stable personnel, which may have introduced additional between-rider differences.

Conclusions

Showjumping horses and riders competing at similar professional levels vary substantially in the time spent in training and combination of activities included in training regimens. The average number of days lost to training for health reasons is relatively low at 5%, which is substantially lower than in racing. It is unlikely that different training regimens are equally efficacious for preserving health and optimising performance but further studies are required to establish the most effective formats for training regimens for showjumpers.

Authors' declaration of interests

None of the authors has any financial or personal relationship that could inappropriately influence or bias the contents of the paper.

Ethical animal research

The study was approved by the Ethical Committee for Animal Experiments, Uppsala, Sweden (permission number C266/8, Uppsala Djurförsöksetiska nämnd).

Sources of funding

We thank World Horse Welfare, the Swedish-Norwegian Foundation for Equine Research and UK Sport lottery funding for the British Equestrian Federation World Class Programme for providing monetary support.

Acknowledgements

We thank all the riders, who all performed outstandingly in documenting their daily activities and answering numerous follow-up questions.

Authorship

All authors contributed to the study design and approved the final version. Data collection and study execution were done by A.C.L., C.A.T., A.O., C.B. and A.E. Data analysis was done by A.C.L. and A.E., and statistics by A.E. Preparation of the manuscript was done by A.C.L., J.B., K.N., L.R. and A.E.

Manufacturers' addresses

[a]Swedish Equestrian Federation (http://tdb.ridsport.se).
[b]Microsoft Corporation, Redmond, Washington, USA.
[c]SAS Institute Inc., Cary, North Carolina, USA.

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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Table S1: An example of the diary sheet (English version) that was used by the riders to fill in the horses' daily activities.
Table S2: Demographic data from showjumpers with 31 riders from 4 countries.
Table S3: Time that horses in showjumping training with 31 riders from 4 countries spent performing both ridden and unridden exercise.