Management and exercise of Thoroughbred yearlings during preparation for yearling sales in the North Island of New Zealand

C.F. BOLWELL*, C.W. ROGERS, E.C. FIRTH and N.P. FRENCH

Institute of Veterinary Animal and Biomedical Sciences, Massey University, Private Bag 11-222, Palmerston North 4442, New Zealand
*Corresponding author: c.bolwell@massey.ac.nz

ABSTRACT

A cross-sectional survey was conducted to describe the management and exercise regimen at stud farms during preparation for the 2008 national yearling sales. A total of 1,166 yearlings were included in the survey, representing 82% of those offered at the Karaka sales in 2008. Ninety-two percent of farms (69/75) used a combination of both pasture turnout and stabling during yearling preparation, with most farms (47/75; 63%) giving yearlings access to pasture for >12 hours per day. Controlled exercise was performed on 80% (60/75) of stud farms, with most (54/60; 90%) farms exercising at walk. Management practices appeared to be relatively homogeneous across the farms surveyed. The provision of free exercise at pasture and controlled exercise were common practices during a sales preparation.

Keywords: survey; horse; Thoroughbred; yearling; exercise; management.

INTRODUCTION

Each year, around 1,500 young Thoroughbreds are catalogued to attend the New Zealand yearling sales series. The allocation of the yearlings to the different sales levels (Premier, Select and Festival) is determined by the sales company and is based on the strength / commercial appeal of the pedigree as to the top 5% of races in the pedigree and the conformation and "type" of the yearling. Therefore, producing a well-grown yearling with correct conformation is of importance to the vendors. However, despite the greater return for presentation of a correct, well-grown, yearling (Pagan *et al.,* 2006), there are limited data on the management practices of young Thoroughbreds from weaning through to yearling sales.

In the USA, Gibbs and Cohen (2001) conducted a survey of the management of weanlings and yearlings on 58 Thoroughbred and Quarter horse stud farms. Over half of the farms kept weanlings and yearlings at pasture for 24 hours a day. Controlled exercise as yearlings was conducted on 64% of farms. Recent studies have suggested the importance of early exercise in young horses for the development of the musculoskeletal system (Barneveld & van Weeren, 1999; Firth, 2006; Rogers *et al.* 2008b). However, it has been suggested that too much forced exercise when the horses are kept confined in a box for most of the day, may be detrimental compared to horses at pasture (Cornelissen *et al.,* 1999; van de Lest *at al*., 2002; Cherdchutum *et al*., 1999; Barneveld & van Weeren, 1999). A conditioning exercise programme imposed on foals, kept at pasture, produced no adverse effects on the musculoskeletal system (Nugent *et al.*, 2004; Doube *et al*., 2007; Stanley *et al.*, 2008; Rogers *et al.*, 2008b; van Weeren *et al.,* 2008; Moffat *et al.*, 2008) and some positive effects (Dykgraaf *et al.,* 2008).

These findings highlight the opportunity and importance of developing management protocols that optimise musculoskeletal health within the constraints of the existing production system. However, before modifications to management practices can be made, the current industry practices must be quantified. The aim of the current study was to obtain initial baseline data on the management and early exercise of young Thoroughbred horses at stud farms on the North Island, New Zealand.

MATERIALS AND METHOD

A cross-sectional survey was conducted at stud farms in the North Island of New Zealand, during March 2008. The source population consisted of all the 152 registered vendors at the 2008 Karaka yearling sales. An initial letter or email was sent to inform vendors of the survey and to request their participation. Within two weeks, a follow-up telephone call was made to arrange a suitable time to conduct the survey; stud farms not able to be contacted after four attempts were excluded from the survey. The survey was conducted as a face-to-face interview, lasting 10 to 15 minutes, with the stud or yearling manager of the farm during March 2008. The survey consisted of 33 questions to provide information related to all the yearlings on the farm that were involved in a sales preparation. The survey collected information on farm characteristics and the management and exercise of yearlings during sales preparation.

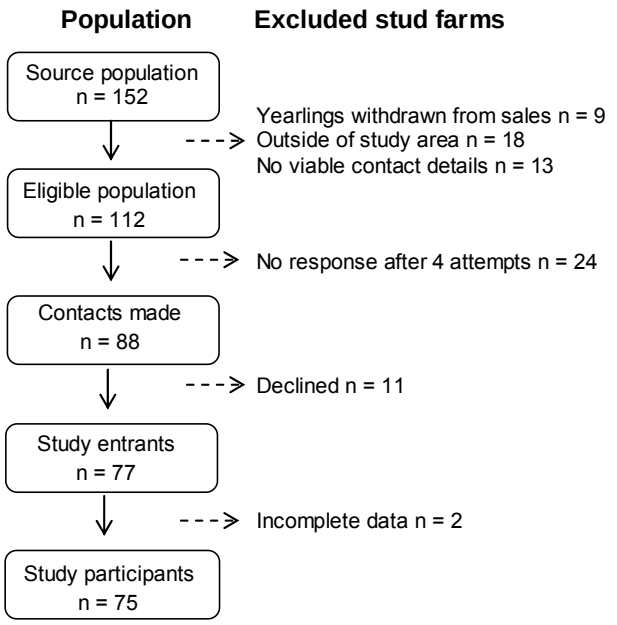
The data were collected by one interviewer (CB) using a proforma datasheet. Data were entered

twice into a data entry file created in EpiData Data Entry (Version 3.1, EpiData Association Odense, Denmark) and were then exported into Microsoft Excel 2003 (Microsoft Corporation, Redmond, Washington, USA). Stud farms were grouped into three categories based on the median sale price of yearlings at the 2008 sales, for each stud farm; farms in the upper 25% were classed as Commercial, farms in the middle 50% were Mid-range, and farms in the lower 25% were classed as Non-commercial. Median values and the inter-quartile range (IQR) are presented throughout, for the non-normally distributed data. Associations between explanatory variables and whether or not a farm exercised their yearlings, were investigated using logistic regression. Multiple correspondence analysis procedures were used to investigate the associations between stud farm demographic and management factors. Categorical variables of interest were selected for inclusion in the analysis and the results were projected onto a two-dimensional plot. All analyses were performed in R for Windows (Version 2.7.1; R Foundation, Vienna University of Technology, Vienna, Austria. www.r-project.org).

RESULTS

The selection of stud farms for inclusion in the survey is shown in Figure 1. The participation rate of those eligible (75/112) was 67% and response rate of those contacted (75/88) was 85%. A total of 1,166 yearlings were included in the survey, representing 82% of those offered at the Karaka sales in 2008.

FIGURE 1: The selection of stud farms from source population through to study participants. The number of stud farms excluded at each stage and the reason for exclusion is shown. Adapted from Elwood (2007).



During the 2007/2008 season, the median number of yearlings on farm was 15 (IQR 8-40), with a median of 10 (IQR 5-26) yearlings entering a sales preparation. Descriptive results regarding general management during yearling preparation are shown in Table 1. The median duration of yearling preparation was 12 (IQR 12-16) weeks. Using a combination of both pasture turnout and stabling during yearling preparation was a common practice (Table 1) with most farms (47/75; 63%) providing >12 hours per day at pasture.

Controlled exercise during yearling preparation was performed on 80% (60/75) of stud farms, with most (38/60; 63%) farms starting exercise from November onwards. The median number of weeks spent exercising was 10 (IQR 6-12). Walking was performed on 90% (54/60) of farms, with a few (6/60; 10%) also choosing to exercise yearlings at trot. Hand walking was performed on 40 (67%) farms and was the most common method used; other methods included a combination of hand walking and a mechanical horse walker (12/60; 20%), mechanical horse walker only (6/60; 10%), and exercising the horse at the end of a rope (lunging) (2/60; 3%). A total of 11 (18%) farms lunged their yearlings, with 9 (82%) of these farms using lunging in conjunction with other methods. On 18% (11/60) of farms controlled exercise was provided two to three times a week, with 45% and 37% of farms giving exercise five days a week and six to seven times a week, respectively. Of the farms giving controlled exercise, 66% (40/60) kept yearlings at pasture for ≥12 hours a day, whilst 53% (8/15) of farms not giving controlled exercise gave yearlings <12 hours a day at pasture.

A pre-determined exercise regimen was used on 18/60 (30%) stud farms, but none of the farms kept a record of the exercise that was done. On 26/60 (43%) farms the exercise programme was modified if the yearlings had a higher body condition score than desired (9/26; 35%), difficult to handle (6/26; 23%), were colts (3/26; 12%), or had variation in conformation (2/26; 8%), whilst on 5 (8%) farms the exercise programme was tailored to each individual yearling. The main reason for providing controlled exercise was for educating the yearling (31/58; 53%), as opposed to fitness (3/58; 5%). The main reason for not giving exercise (8/15; 53%) was that "yearlings exercised themselves whilst at pasture". Category, yearlings in preparation, percentage of yearling sent to a Premier sale and percentage of yearlings sent to a Select sale were associated with exercise ($P < 0.20$; Likelihood ratio test). None of these variables were significantly associated with exercise ($P < 0.05$) in a multivariable model.

TABLE 1: Description of general management factors during yearling preparation for the 2008 Karaka yearling sales expressed as the number of farms, proportion of the total and a 95% confidence interval. Central Districts = Manawatu and Wanganui, Northern Districts = Waikato and South Auckland.

Factor	Variable	Number of farms	Percentage	95% Confidence interval (%)
Location	Central Districts	66	88	78 - 94
	Northern Districts	9	12	6 - 22
Identify sales candidates*	Before/at weaning	27	36	26 - 47
	After weaning	29	39	28 - 50
	Bred to be sold	18	24	16 - 35
Month preparation started	September	3	4	1 - 12
	October	33	44	33 - 56
	November	30	40	29 - 52
	December	7	9	4 - 19
	January	2	3	0.4 - 10
Where yearlings kept	Pasture 24 hours	2	3	0.4 - 10
	Box 24 hours	4	5	2 - 14
	Both	69	92	83 - 97
Size of box* (m)	<3.6 x 3.6	14	19	11 - 30
	3.6 x 3.6 – 4.4 x 4.4	51	68	56 - 78
	>4.4 x 4.4	7	9	4 - 19
Measured height	No	72	96	91 - 100
	Yes	3	4	1 - 8
Measured weight	No	67	89	82 - 96
	Yes	8	11	4 - 17
Assessed condition	No	52	69	59 - 80
	By eye	15	20	11 - 29
	Score/grade	8	11	4 - 17

*Not all farms provided this information.

Results of the multiple correspondence analysis are shown in Figure 2. Farms positioned in the centre of the plot that only deviate slightly from the average profile were located in the Northern Districts. They prepared between 6 and 25 yearlings and exercised their yearlings. Figure 2 shows three distinct clusters of farm management characteristics. Farms were clustered together based on the number of yearlings they prepared, how many were sent to each sale type and the category of the farm. The total inertia or variance, explained by the plot was 80%.

DISCUSSION

To our knowledge, this is the first study to specifically describe the management and exercise regimens of yearlings during sales preparations, in New Zealand. The source population of the current study consisted of all farms registered as vendors for the national yearling sales in 2008. By selecting farms from this population, we aimed to include most of the farms, and subsequently most of the yearlings that would be prepared for sale in the North Island.

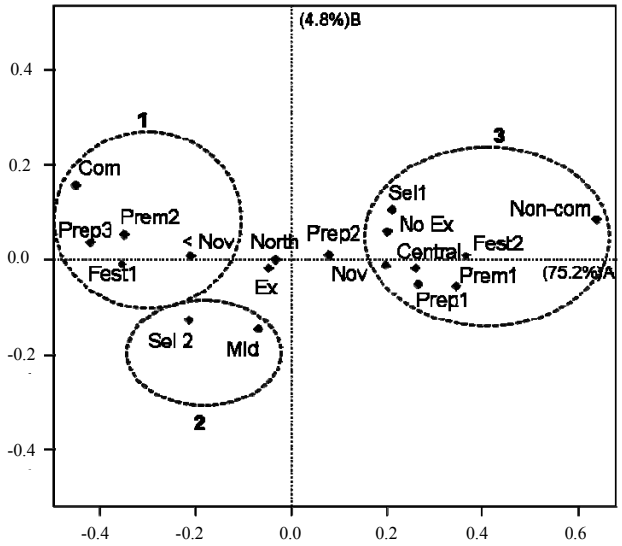
The decision to sell a yearling was made on most farms in March (pre-wean / weaning) or August (post weaning) coinciding with the New Zealand Bloodstock sales nominations or assessments. A small percentage of farms began preparation during December (9%) and January (3%), which probably reflected smaller numbers of yearlings being prepared, or that the yearlings were going to the Festival sale; as indicated by the multiple correspondence analysis results. Measuring the height or weight of the yearlings was not common practice during sales preparation. The additional time required to weigh and record height would probably outweigh the benefit gained, since most of the farms consider they can judge their progress visually. In agreement, most of the farms that monitored the condition of yearlings did so "by eye" and did not use a scale or keep a record of the assessment.

In agreement with a USA study (Gibbs & Cohen, 2001), 92% of the farms in this study used a combination of pasture and stabling during yearling preparation. However, in that study over half the farms kept yearlings at pasture for 24 hours a day and 78% kept yearlings at pasture for >12 hours a day, compared to 63% of farms in the current study. Previous studies have indicated free exercise at pasture to be a superior regimen compared to confinement, or confinement and forced exercise (Barneveld & van Weeren, 1999). Controlled exercise played a large role in the sales preparation with most (60%) farms providing some form of exercise to yearlings. These findings were similar to those in the USA study by Gibbs and Cohen (2001), but the frequency of exercise varied. In that study, most farms gave exercise every other day, in contrast to 5 days a week in the current study. Additionally, only 7% of farms in that study used hand walking, with most using a mechanical horse walker, compared to 67% hand walking and only 10% of farms using only a mechanical horse walker in our study.

Most farms gave controlled exercise in addition to >12 hours of free exercise at pasture. Recently, a large intervention trial investigated the effect of a conditioning programme in addition to free exercise at pasture (Rogers *et al.,* 2008b). Whilst the age at which exercise began was younger and the exercise regimen most likely more intense than during sales preparation, there was no evidence of any adverse effects on tendons (Moffat *et al.*, 2008; Stanley *et al.*, 2008) or cartilage (Nugent *et al.*, 2004; Doube *et al.*, 2007) and there was some indication of positive effects (Dykgraaf *et al.*, 2008). Additionally, after being broken and trained for racing, there were apparently no negative effects of early conditioning exercise on their careers as 2- and 3-year-old racehorses (Rogers *et al.*, 2008a). These findings suggest there may be scope to manipulate the intensity of exercise given during yearling preparation in order to adequately prepare young horses earlier for their training and racing campaigns.

After adjusting for other variables, exercise was not significantly associated with any farm management factors. Similarly, results of the multiple correspondence analysis showed that exercise was close to the average profile suggesting this was a common practice. Since farms need yearlings to be looking and behaving a specific way for the sales, regardless of the type of sale or the number of yearlings in preparation, it is perhaps not surprising that the provision of exercise is common, and does not vary with other management factors. In agreement with Rogers *et al.* (2007), management practices appear to be relatively homogeneous across the farms surveyed.

FIGURE 2: Multiple correspondence analysis results of stud farms participating in a cross-sectional survey of the management of yearlings during sales preparation. Projections are shown on the first two dimensions. Dotted circles highlight identified clusters 1, 2 and 3. A (Y axis) and B (X axis) = Percentage of inertia or variance, explained by the first and second dimension, respectively. Central Districts = Manawatu and Wanganui, Northern Districts = Waikato and South Auckland.



Explanation of abbreviations used.

Parameter	Variable	Abbreviation
Farm category		
	Commercial	Com
	Midrange	Mid
	Non-commercial	Non-com
Region of the North Island		
	Central Districts	Central
	Northern Districts	North
Exercised		
	Not exercised	No Ex
	Exercised	Ex
Number of yearlings prepared		
	Prepared <6 yearlings	Prep1
	Prepared 6-25 yearlings	Prep2
	Prepared >25 yearlings	Prep3
Time preparation started		
	Started prep before November	<Nov
	Started prep from November	Nov
Proportion sold by type of sale		
	<20 % sent to Premier sale	Prem1
	≥20% sent to Premier sale	Prem2
	< 42% sent to Select sale	Sel1
	> 42% sent to Select sale	Sel2
	<10% to Festival sale	Fest1
	≥10% to Festival sale	Fest2

Multiple correspondence analysis was an effective procedure to identify variations in the factors used to describe types of farms or breeding operations. Results suggest farms may be grouped together based on the number of yearlings prepared, the percentage sent to each sale, and farm category (Commercial versus Non-commercial). In agreement with Stowers *et al.* (2009), the findings suggest that the focus of Commercial farms is to prepare more yearlings and direct more of them towards the premier session and less to the festival session, whilst this is opposite for Non-commercial farms. This exploratory technique is a useful way of identifying patterns when a large number of variables are present. These findings could be used in future studies to classify farms into groups based on more than one factor, which better describes the type or group of farms.

The data were collected at farm-level in this study which may be seen as a limitation, since many farms tailored their preparations to suit individual yearlings. Therefore, future studies should consider collecting horse-level data so they can be specifically related to future training and racing performance.

CONCLUSION

Management practices appear to be relatively homogeneous across the farms surveyed, with most farms managing an adequate balance between confinement for preparation and the opportunity for exercise to stimulate musculoskeletal development. The study has provided data which may serve as baseline data for determining if degree/type of exercise prior to sale has an effect on later athletic performance.

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REFERENCES

Barneveld, A.; van Weeren, P. R. 1999: Conclusions regarding the influence of exercise on the development of the equine musculoskeletal system with special reference to osteochondrosis. *Equine Veterinary Journal Supplement* **31**: 112-119.

Cherdchutum, W.; Becker, C.; Smith, R.K.W.; Barneveld, A.; van Weeren, P.R. 1999: Age-related changes and effect of exercise on the superficial molecular composition of immature equine superficial digital flexor tendons. *Equine Veterinary Journal Supplement* **31**: 86-93.

Cornelissen, W.; van Weeren, P.R.; Ederveen, A.G.H.; Barneveld, A. 1999: Influence of exercise on bone mineral density of immature cortical and trabecular bone of the equine metacarpus and proximal sesamoid bone. *Equine Veterinary Journal Supplement* **31**: 79-85.

Doube, M.; Firth, E.C.; Boyde, A. 2007: Variations in articular calcified cartilage by site and exercise in the 18-month-old equine distal metacarpal condyle. *Osteoarthritis and Cartilage* **15:** 1283-1292.

Dykgraaf, S.; Firth, E.C.; Rogers, C.W.; Kawcak, C.E. 2008: Effects of exercise on chondrocyte viability and subchondral bone sclerosis in the distal third metacarpal and metatarsal bones of young horses. *The Veterinary Journal* **178:** 53-61.

Elwood, M. 2007: Critical Appraisal of Epidemiological Studies and Clinical Trials: Third Edition. Oxford University Press, Oxford, UK.

Firth, E.C. 2006: The response of bone, articular cartilage and tendon to exercise in the horse. *Journal of Anatomy* **208:** 513-526.

Gibbs, P.G.;Cohen, N.D. 2001: Early management of race-bred weanlings and yearlings on farms. *Journal of Equine Veterinary Science* **21:** 279-283.

Moffat, P.A.; Firth, E.C.; Rogers, C.W.; Smith, R.K.W.; Barneveld, A.; Goodship, A.E.; Kawcak, C.E.; McIlwraith, C.W.; van Weeren, P. R. 2008: The influence of exercise during growth on ultrasonographic parameters of the superficial digital flexor tendon of young thoroughbred horses. *Equine Veterinary Journal* **40:** 136-140.

Nugent, G.E.; Law, A.W.; Wong, E.G.; Temple, M.M.; Bae, W.C.; Chen, A.C.; Kawcak, C.E.; Sah, R.L. 2004: Site- and exercise-related variation in structure and function of cartilage from equine distal metacarpal condyle. *Osteoarthritis and Cartilage* **12:** 826-833.

Pagan, J.D.; Nash, D.M.; Koch, A.; Caddel, S.; Brown-Douglas, C.G. 2006: The influence of body weight, wither height and body condition score on sale price of Thoroughbred yearlings at public auction. *Proceedings Australian Equine Science Symposium* **1:** 27.

Rogers, C.W.; Firth, E.C.; McIlwraith, C.W.; Barneveld, A.; Goodship, A.E.; Kawcak, C.E.; Smith, R.K.W.; van Weeren, P.R. 2008a: Evaluation of a new strategy to modulate skeletal development in racehorses by imposing track-based exercise during growth: the effects on 2- and 3-year-old racing careers. *Equine Veterinary Journal* **40:** 119-127.

Rogers, C.W.; Firth, E.C.; McIlwraith, C.W.; Barneveld, A.; Goodship, A.E.; Kawcak, C.E.; Smith, R.K.W.; van Weeren, P.R. 2008b: Evaluation of a new strategy to modulate skeletal development in Thoroughbred performance horses by imposing track-based exercise during growth. *Equine Veterinary Journal* **40:** 111-118.

Rogers, C.W.; Gee, E.K.; Firth, E.C. 2007: A cross-sectional survey of Thoroughbred stud farm management in the North Island of New Zealand. *New Zealand Veterinary Journal* **55:** 302-307.

Stanley, R. L.; Edwards, L.J.; Goodship, A.E.; Firth, E.C.; Patterson-Kane 2008: Effects of exercise on tenocyte cellularity and tenocyte nuclear morphology in immature and mature equine digital tendons. *Equine Veterinary Journal* **40:** 141-146.

Stowers, N.L.; Rogers, C.W.; Hoskin, S.O. 2009: Management of weanlings on commercial Thoroughbred studs farms in the North Island of New Zealand. *Proceedings of the New Zealand Society of Animal Production* **69:** 4-9.

van de Lest, C.H.A.; Brama, P.A.J.; van Weeren, P.R. 2002: The influence of exercise on the composition of developing equine joints. *Biorheology* **39:** 183-191.

van Weeren, P.R.; Firth, E.C.; Brommer, H.; Rogers, C.W.; DeGroot, J.; Brama, P.A.J. 2008: Early exercise advances the maturation of glycosaminoglycans and collegen in the extracellular matrix in the horse. *Equine Veterinary Journal* **40:** 128-135.