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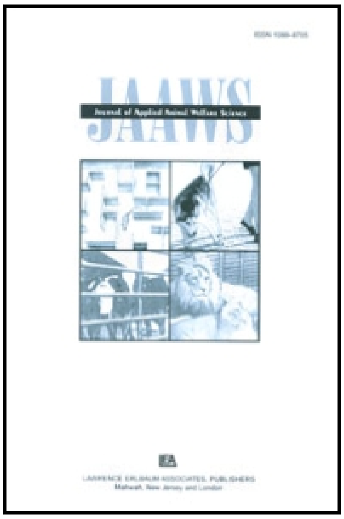

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Assessing the Rider's Seat and Horse's Behavior: Difficulties and Perspectives

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ARTICLES

Assessing the Rider's Seat and Horse's Behavior: Difficulties and Perspectives

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A correct seat and position are the basis for a good performance in horseback riding. This study aimed to measure deviations from the correct seat, test a seat improvement program (dismounted exercises), and investigate whether horse behavior was affected by the rider's seat. Five experienced trainers defined 16 seat deviations and scored the occurrence in 20 riders in a dressage test. Half the riders then carried out an individual training program; after 9 weeks, riders were again scored. The study took no video or heart-rate recordings of horses and riders. Panel members did not agree on the deviations in the rider's seat; the study detected no differences—with the exception of improvement of backward-tilted pelvis—between the groups. Horse behavior, classified as "evasive," increased; horse heart rate decreased in the experimental group. Heart rates of riders in both groups decreased. Seven of 9 riders in the experimental group had the impression that the exercises improved their riding performance. There is a clear need to develop a robust system that allows trainers to objectively evaluate the rider's seat..

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The relationships between horses and riders are complex (Visser et al., 2003). Riding performance is influenced by a large number of variables, including the rider's balance and body awareness and the horse's temperament, conformation, movements, and level of education (Meyners, 2004; von Dietze, 2005). A balanced, supple, and established position in the saddle is the vital base for a good performance in horseback riding (German National Equestrian Federation, 1997) and is essential to communicate efficiently with the horse, to minimize interference with the horse's natural movements and to avoid aversive responses in the ridden horse.

The base for a good performance in horseback riding is that the rider uses a correct seat and position. An effective seat is upright, balanced, elastic, solid, interactive—it follows the horse's movements. A vertical line between the rider's shoulder-hip-heel and a straight line between the elbow-forearm reins and horse's mouth are essential for a correct seat (Meyners, 2004). The pelvis has been identified as the most important part of the rider's seat because it is central in the transfer of movements by the horse to other parts of the rider's body (the head and the legs; Meyners, 2004; von Dietze, 2005). There are several muscle groups that are crucial for the elasticity of the pelvis: the deep back muscle, the gluteus, the front and rear thigh muscles, the hip flexor, the abdominal muscles, the external and internal oblique, and the lateral trunk muscles (Meyners, 2004). Thus, a seat fault of the pelvis may result in a problem somewhere else in the rider's body.

A correct seat of the rider is difficult to learn and also difficult to teach and to improve (Meyners, 2004; Zetterqvist, 2000). First, it is complicated for instructors to assess the seat of riders; second, it is also hard for riders to understand and follow instructors' directions. Moreover, it can also be difficult for the rider to control the body and to change relevant motor skills. Thus, instructors need innovative training systems, treatments, and schemes that may help to resolve specific problems with the rider's seat.

In recent years, the tremendous influence of riders on horse health, general functioning, and welfare has been emphasized. It has been shown that the welfare of the horse can be compromised when a rider uses an incorrect seat (de Cocq, van Weeren, & Back, 2004; Gómez-Álvarez, 2007). If, for example, the rider leans to one side or the other, this may—in the short term—simply be uncomfortable for the horse and result in subtle changes in behavior. However, in the long term, this may damage the horse's muscles and skeleton. This would cause suffering and may shorten the working life of the horse. Therefore, it is essential to study how the welfare of the horse is affected by the quality of the rider's seat. A first stage toward this is to compare horse behavior when ridden by different riders with different seat-position problems.

During the last few years, a number of methods have appeared that are intended to help the rider to find an ideal seat (Meyners, 2004; Swift, 2002; von

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Dietze, 2005). That said, because the rider and horse are in constant movement, it can be difficult to isolate and specifically train to improve a detail when the rider is sitting on the horse. Therefore, some complementary training without a horse has been suggested to train, for example, the rider's strength, body control, and suppleness in order to improve the seat (Meyners, 2004). However, to our knowledge, there are no scientific studies of how dismounted exercises affect the rider's seat.

The seat training evaluated in this study was that developed by Meyners (2004). Meyners has developed Balimo®—a specially designed stool with a mobile seat that can be used to improve the position and the flexibility of the pelvis. A pilot study (Brüggemann et al., 2006) showed that the use of the Balimo® stool contributed to an improvement of the muscular coordination and pelvis stabilization. To support riding instructors, Meyners has also developed a checklist for assessing the rider seat that contains the following six elements:

1. Head,
2. Sternum,
3. Tendon and muscle reflexes,
4. Spine and the ilio-sacral joint,
5. Pelvis and hips, and
6. Legs.

The riding instructor can use these points to assess aspects of the seat; there are specific exercises on the Balimo® that the riders can use to improve each of these elements.

The aim of this study was to systematically define and measure different problems with the rider's seat and to test the Meyners (2004) training program that may help to improve the identified problems. To assess effectiveness of the training, the behavior of horses ridden by riders from the experimental group—before and after the training program—was compared with horses ridden by the control group of riders.

MATERIALS AND METHODS

Subjects and Study Area

The study took place in an indoor arena (24 × 72 m) at The National Equestrian Centre (NEC) in Strömsholm, Sweden. One part of the arena (20 × 40 m) was used for the test, and the rest was used for warming up.

The riders were 20 experienced students (1 male, 19 females) from the equine program at the riding school Strömsholm (ages 21–28 years). The students were all on elementary level in dressage, and they had no prior experience with the horses they rode in the test.

Eleven Swedish warm-blood horses, 1 Andalusia, 3 mares, and 9 geldings—ages 6 to 13 years—were used in the study. All horses were kept at the NEC and trained in dressage and jumping. For the experimental tests, horses were ridden with a dressage saddle and either a single-jointed or double-jointed snaffle bridle with noseband (cavesson or flash) and side reins. The side reins were used to support a correct frame of the horses because this is thought to make it easier for the panel to concentrate on the quality of the rider's seat.

The panel consisted of five experienced trainers/judges approved by the Swedish Equestrian Federation. They were also active riders competing at Medium to Advanced level (1 male, 4 females).

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Procedures

A pilot study was carried out to categorize the riders' seat problems and develop a specific physical training program that may help to improve their seat on the horse. A pretest was first carried out on which the panel of trainers defined 16 different deviations by the riders during a standardized dressage test at elementary level lasting on average 4 min. The test contained a mixture of paces but no advanced movements, and the riders were riding three horses each. The panel members first used their own words to describe the riders' deviation and after discussion they agreed upon the 16 deviations. These focused on the middle part of the rider's body (from waist to knee) because this is considered the most important part of the rider's seat. The categories were as follows:

1. The middle part of the rider's body (holistic);
2. Pelvis, buttocks, hip joints, and groin; and
3. The thighs and knees (Table 1).

The panel scored the occurrence of these deviations in 20 riders (each riding 3 horses: 1 small horse (around 1.60 m), 1 medium-size horse (around 1.65 m), and 1 tall horse (around 1.70 m) during a standardized dressage test at elementary level, lasting, on average, 4 min. The test contained a mixture of paces but no advanced movements. The scoring system used in the test was binary (observed or not observed). After categorizing the riders' problem areas, riders were randomly grouped into a control (10 riders) and experimental (10 riders) group. This pilot study was followed by the first of two experimental sessions (Test 1). Test 1 was in September and Test 2 was in December 2006.

On a voluntary basis, experimental riders carried out daily physical exercises while dismounted over a period of 9 weeks between the two tests. The exercises were presented by Meyners (2004) and contained both a general warm-up

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TABLE 1
Description of the 16 Deviations in the Rider's Seat Identified by the Panel

	Middle Part of the Rider (Holistic)	
D1	Unbalanced seat	
D2	Unstable seat (loose, weak)	
D3	Stiff seat (stiff, tense)	
D4	Turned hip joints to the inside (rider sits more on the inside of the thighs)	
D5	Turned hip joints to the outside (rider sits more on the outside of the thighs)	
D6	Unequal (rider puts his/her weight more on one side than the other)	Crooked (shifts the weight more to one side)
D7		Collapsed (dropped) hip (collapsing in the hip)
D8		Turning to the right or left
	Pelvis, Buttocks, Hip Joints, and Groins	
D9	Pelvis	Tilted forward
D10		Tilted backward
D11	Lower back	Hollow lower back
D12		Straight lower back
D13	Buttocks	Tense buttocks muscles (rider sits "on top" of the horse)
	Thighs and Knees	
D14	Thighs	Gripping up with the thighs
D15		Clamping thighs
D16	Knees	Clamping knees

program (walking in four different ways, small jumps, arm swings, crossover movements, head shaking, shoulder-knee stretches) and individual exercises (including exercises on the Balimo® stool) to improve the riders specific problem areas. The riders were asked to carry out the exercises individually for 15–20 min each day. The other half of the group acted as control riders. After 9 weeks, both groups were scored again by the same panel while riding the same dressage test. The members of the panel did not know which riders had been in the experimental group and which in the control group. The experimental riders also answered a questionnaire about their reflections on the training program.

The dressage tests were recorded with a commercial, digital camera. For recording heart rates, both horses and riders were equipped with Polar heart rate monitors (Polar S810, Finland). The heart rate equipment was put on the horse and rider during the warming-up phase and recording started just before the horse entered the test arena. Using a time-sampling method with 10-s time intervals, horse behavior was analyzed from the video recordings. The ethogram used included the following behavior patterns:

TABLE 2
Behavior Patterns in the Ethogram Grouped Into the Category "Evasive" Behavior in Horses

Behavior	*Description*[a]
Head toss	Quick move of the head in forward-upward motion
Ears pinned back	Ears flattened with meatus directed backwards
Mouth open	Gaping mouth, may include retracted lips
Tail swish	Rotating, alternatively a quick lateral or vertical movement of the tail
Buck	Kicking with both hind legs
Rear	Lifting both front legs off the ground
Shy	Sudden change in direction

[a]Based on descriptions in de Cartier d'Yves and Ödberg (2005).

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1. The position of the horse's head and ears;
2. Tail movements; and
3. Mouth—open, closed, or the tongue visible.

Movements out of the rider's control—such as buck, rear, or shy—were also recorded. Because a main focus was whether horses were experiencing any form of discomfort, specific behavior patterns in our ethogram that have been suggested by de Cartier d'Yves and Ödberg (2005) to be associated with evasiveness of the horse were grouped into a category called "evasive" behavior (Table 2).

Data Analyses

In a first analysis, Fisher's exact test was used to examine the level of agreement between the panel members' assessment of the deviations in each rider's seat in the first session (Test 1). To check for the possibility that the panel members confused different deviations (different members observed the same deviation but called it differently), a comparison was made between the different panel members across different deviations.

In a second analysis, the riders from the control and experimental groups were compared using a logistic model including adjustments for "horse group" and "panel member." In addition to the p values, estimates and confidence intervals for the odds ratios of control and experimental groups were calculated. Odds ratios correspond to the relative risk of the groups' being judged as having the deviation.

The behavior of the horse was expressed as a proportion of total time that the horse showed each behavior. For the heart rate analysis, recordings from riders and horses were transferred to the computer software, Polar Precision

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Performance. Because 2 riders did not take part in Test 2, these horse-rider tests were deleted even from Test 1. In addition, 1 horse—an outlier in both behavior and heart rate—was removed from the analysis. So in the end, the behavior of 9 horses, each ridden by the same 3 riders in Test 1 and Test 2, was included in the ANOVA analysis. The model used was

$$Y = \text{Time} + \text{Treatment} + \text{Horse} + \text{Rider} + \text{Time: Treatment}.$$

RESULTS

Rider's Seat

Each rider in the study had between one and nine deviations. The most frequent deviations were unbalanced seat, unstable or stiff seat, gripping-up thighs, and clamping thighs or knees (Table 3 and Table 4).

Because the panel consisted of qualified, experienced judges and trainers, it was surprising to find no statistical agreement between their assessments of the deviations in the riders' seats. However, both groups of riders scored as having fewer deviations in Test 2 than in Test 1. There were also indications that the items—"unbalanced seat" and "unstable seat"—were, in some cases, either mixed up or interpreted in the same manner by the panel members. There were no significant differences between the experimental and the control group in Test 1, indicating that the two groups were equal, in the panel's esteem, before treatment.

Some panel members scored more deviations than others and the results showed that each had their favorite deviations that they recorded more often than others. The results also showed that some horses caused more deviations of the rider's seat than others. Only one deviation ("backward-tilted pelvis") showed a significant difference between the control and the experimental group in Test 2 ($p = .019$, odds ratio = 5.7, confidence interval (1.3, 24.1)). The corresponding comparison showed no significant result. All riders in the experimental group scored the exercises as very useful (felt more elastic and flexible in the hips, more relaxed in the neck and the inner side of the thighs and suppler when sitting on the horse); 7 of 9 riders thought that the dismounted exercises improved their riding performance. They found the exercises with the Balimo® stool the most useful to improve their position, especially when used immediately before riding.

Horse Behavior

There were no significant differences in horse behavior between the control and treatment group and Test 1 and Test 2. However, the category of behavior

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TABLE 3
Deviation of the Riders Scored by the Panel in Test 1 (R = Riders and D = Deviations; Asterisks Show the Number of Panels That Scored Each Deviation)

	D1	*D2*	*D3*	*D4*	*D5*	*D6*	*D7*	*D8*	*D9*	*D10*	*D11*	*D12*	*D13*	*D14*	*D15*	*D16*
R1	*****	*****	*	*	****	***	****	***	*****		**	*	*	*****	***	**
R2		*	****	*	*	**	**	**	****	**	*****	***	**	****	*****	**
R3	***	**	***		*	*****	***	**	***	***	**	**	**	***	**	**
R4	****	***	***		*****	****	***	***	**		***		***	***	***	*
R5			****	**		****	***	*		*	**	*****		***	****	****
R6	*		*****		**	*	*	*	**		*	**	***	****	****	***
R7	*	**	***	*	*****	**	****	**	*****	*	*	***	***	*****	***	****
R8	*	*	*****		****	**	*		****	*	**	***	***	*****	****	*****
R9	**	***	**	****	***	***		**	***	**	*	**	***	*****	****	***
R10	**	*	*****	**		**	*			***		**	***	*****	*****	***
R11	*****	****	****	***	*	***	***	*	*	**	***		*****	*****	*****	***
R12	****	****	***	****	*	*	**	**	*	***	**		*****	**	*****	***
R13	***	*****	**	**	**	****	****	*	****	**	*	**	**	*****	****	*****
R14	*****	****	****		**	***	****	**	***	**	**	**	****	*****	*****	****
R15	*****	*****	**	*	**	****	***	**	*****	***		****	****	****	*****	*****
R16	*****	*****	**	*	**	****	**	**	**		*		**	****	****	****
R17	**	***	*****	*	*	****	****	***	*	**		****	***	*****	*****	***
R18	**	**	****	**	**	*	**	**	*	***	*	*	****	***	****	*****
R19	**	**	**		*****	*****	***	***	***	*	***		*	*****	****	*****
R20	**	*	****	*	***	*****	***	*	*	***		*****	***	****	****	****

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TABLE 4
Deviation of the Riders Scored by the Panel in Test 2 (R = Riders and D = Deviations; Asterisks Show the Number of Panels That Scored Each Deviation)

	D1	*D2*	*D3*	*D4*	*D5*	*D6*	*D7*	*D8*	*D9*	*D10*	*D11*	*D12*	*D13*	*D14*	*D15*	*D16*
R1																
R2			****		*		**	*	*	*****	*****			****	***	**
R3	****	***	****		***	***	***	**	*	**	**		***	**	***	*
R4	**		*****	*	*	****	****	**				****	****	*	****	**
R5			***	*	*	***	**	**					*	****	****	****
R6	*		*****		*	***	*	*	****			***	****	***	***	**
R7	**	**	****		****	***	*****	*	*****	*		***	***	*****	****	*
R8	*****	****	*****	*	***	***	****	****	***	***	**	**	***	*****	**	***
R9			**	**		*	*						*	****	*****	****
R10	*		***	*					*	**		*		*****	****	****
R11	*****	**	*****	****		****	***	**	***	*	*		****	*****	****	*****
R12	****	*****	***	*	***	**	**	**	*****	**		***	****	****	****	****
R13	****	*****	**		*	*****	**	**	****			*	***	*****	****	****
R14	*****	*****	***	**	***	*****	***	*	*****	*		**	***	*****	****	***
R15	*****	*****	**		***	****	****	*	*****	*		****	****	*****	***	***
R16																
R17	*****	****	***	*	*	*****	****	****	**	*		**	***	*****	****	****
R18	*	****	***		*	*	***	**	****			****	**	****	****	****
R19	*	***	***		***	****	***	**	*		**	**	*	*****	****	***
R20	*	*	****		**	***	****	***	****			*	**	*****	*****	**

TABLE 5
Proportion of Observations Where Horse Was Recorded as Performing an Evasive Behavior

Test	*Control Group*	*Experimental Group*	*F Value*	*p Value*
1	0,19	0,13	7.87	$p < .05$
2	0,18	0,23	1.38	$p = .25$

classified as "evasive" occurred significantly less often in the experimental group than among the controls in Test 1 ($F = 7.87$, $p < .05$) but increased significantly (Table 5) from Test 1 to Test 2 in the experimental group ($F = 4.21$; $p < .05$).

Heart Rates of Horses and Riders

Heart rates of horses were lower in Test 2 than in Test 1 (Table 6), and there was a tendency for a treatment test occasion interaction ($p = .07$) with this decrease being greater in the experimental group. When the horses in the two groups were analyzed separately, a significant decrease in heart rates was observed from Test 1 to Test 2 in the experimental group ($F = 8.54$, $p < .01$). Heart rates of riders decreased from Test 1 to Test 2 ($F = 4.45$, $p < .04$) (Table 6). When the two groups were analyzed separately there was no significant difference.

DISCUSSION

In this study, it was hypothesized that it is possible to define and systematically measure different problems with the rider's seat. The results clearly show that

TABLE 6
Heart Rates (HR; Means + *SE* Beats per Minute) of Horses and Riders in the Control and Experimental Group in Test 1 and Test 2

	Control Group		*Experimental Group*	
Horse	*Mean HR*	$\pm SE$	*Mean HR*	$\pm SE$
Test 1	136	9,12	129	10,2
Test 2	134	6,74	101	9,67
Rider				
Test 1	157	3,9	154	4,62
Test 2	150	4,07	144	3,88

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different judges struggle to assess and agree upon deviations in a given rider's seat. This questions the validity of the riding instructor's evaluation of the rider's seat and indeed the correct focus of any remediate instruction and training. It may also question the validity of jury evaluations in, for instance, dressage competitions. Although it must be stressed that in this study we focused on the seat of the rider while in dressage competitions, the judges focus more on the gaits and the precision of the horse.

There are many subjective factors involved in the scoring of a rider's seat. The results showed that some members of the panel scored more deviations than other members. It also seems that the scoring results may have been influenced by differences in the conformation and movements of the horses—riders were given more deviations when riding one horse than when riding another horse.

The results clearly indicate that deviations of the rider's seat need to be better described and agreed upon. Possibly, equestrian coaches need to take a more holistic view to be able to compare the seat of the rider in a similar way rather than using many separate deviations. This is also called "looking beyond the seat of the rider" and is suggested to improve trainers' abilities to give more appropriate instructions to the riders (Meyners, 2004).

We also hypothesized in this study that it is possible, using a specific training, to remediate identified problems and, as a consequence, at the same time improve the welfare of the horse. The results did not clearly show that an individual training program can improve the rider's seat. The odds ratios of the control and experimental groups were larger in Test 2 than in Test 1; however, only one significant difference was obtained: "backward tilted pelvis" showed improvement. This may to some extent be caused by the low number of riders per group.

However, the riders in the experimental group described the dismounted exercises as very useful to improve their position. The exercises on the Balimo® stool were considered the most useful. Because these were especially aimed to improve the flexibility and the position of the rider's pelvis, there is a possibility that these exercises could have influenced the seat—even if this could not be confirmed.

The finding that the number of evasive behaviors shown by horses increased significantly in the experimental group between the two tests is noteworthy. Originally, one would have predicted that an improvement in the rider's seat in the experimental group would have led to the horses showing less evasive behavior in Test 2. Although we cannot exclude that the exercises for the riders had a detrimental effect on their riding ability, a more likely explanation is that these riders were in some way more demanding of the horse in the second test occasion and that this resulted in horses showing more evasive behavior. There are two potential explanations for riders in the experimental group being more demanding of the horse's performance. The first could be psychological.

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Riders knew they were in the experimental group and "believed" that they had improved. This is in line with the results of the questionnaire. The second is that the physical exercises led to improved muscle strength, so riders in the experimental group were physically more capable of demanding a better performance from the horses. Neither of these options necessarily implies that the rider had actually changed riding or seat position.

The differences in heart rate can best be explained by the better physical condition of the horses in Test 2, although why this occurred only in the experimental group is not clear. Nevertheless, the findings align with earlier results from de Cartier d'Yves & Ödberg (2005) in that heart rate did not correlate with the frequency of evasive behavior. Better physical condition may also explain the slight decrease in rider heart rate, a result that may also be attributable to riders being less nervous on the second test occasion.

The results may also suggest that horses detect minor changes in rider psychological or physical state.

CONCLUSIONS: SUGGESTIONS FOR FUTURE STUDIES

The aim of this study was to find a scoring system that can be used to systematically categorize and measure different problems with the rider's seat and to test the effects of one specific training method on these variables.

The results confirm that the relationship between horse and rider is interactive and complex and that the deviations from the ideal equestrian seat are difficult to define and assess. This study shows that there is a need to further test, refine, and evaluate the methods to assess the rider's seat. It is suggested that it might be useful to assess the rider's seat in a more holistic approach—instead of splitting it up in many small pieces. If a successful method to objectively assess and subsequently improve riders' seats could be identified, the next step would be to further implement and test this system in practice, for example, in riding schools.

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