DOES ORAL MAGNESIUM ASPARTATE SUPPLEMENTATION AFFECT REACTION SPEED IN HORSES OF DIFFERENT BREEDS?

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Introduction

There is a plethora of magnesium (Mg) supplements available on the market claiming to have a calming effect on horses. However, there is little published scientific evidence that Mg supplementation has such an effect on horses.

In our first study, using 6 Standardbred geldings from the same training stable, feeding magnesium aspartate at 0.06 g/ kg daily for 7 days significantly reduced horse reaction speed (RS) by 40% (Dodd *et al*. 2015). However, it could be argued that the aspartate might have been responsible for this effect in its role as an amino acid neurotransmitter (Cavallero, Marte & Fedele, 2009).

Therefore, to demonstrate whether these results were repeatable and due to Mg or not, we undertook a second study with horses of different breeds, backgrounds and sex.

The aim of this study was to confirm and explore the potential role of magnesium or aspartate in modifying reactive behaviour in different breeds of horse.

Materials & Methods

Six Thoroughbreds, 6 Arabians and 6 Ponies (Table 1) were fed 3 different treatments based on clover-ryegrass hay (fed at 2% BW) plus 200 g pellets (Cool Conditioner, Coprice). As a positive control, the horses were initially individually scored for sedation and RS measured, in a blind crossover test, when administered either a mild anxiolytic (0.04 mg/kg BW acepromazine) or a placebo (normal saline).

In a randomised Latin square design, the following treatments were fed:

A. Control: 0.03 g Mg/kg BW;

B. Control plus magnesium aspartate: 0.05 g Mg/kg BW;

C. Control plus sodium aspartate: 0.03 g Mg/kg BW.

The aspartate supplements were fed once daily, mixed with the dampened pellets. Each treatment was fed for 7 days; with a 7-day washout between each change of treatment. The study was run with 3 replicates of 6 horses (2 Thoroughbreds, 2 Arabians, 2 Ponies).

Table 1. The breed, sex, age and bodyweight of study horses (n = 18).

Breed	Sex	Mean Age (years)	Mean Bodyweight (kg)
Thoroughbred	5 geldings, 1 mare	6 ± 1.3	488 ± 26
Arabian	1 gelding, 5 mares	11 ± 5.3	386 ± 86
Pony	4 geldings, 2 mares	10 ± 5.3	281 ± 36

Reaction speed was measured and sedation score (SS) was assessed on Days 1 and 7.

Measuring RS required each horse to be led into a secure straight race which faced its conspecifics, the lead rope was unclipped and the horse then startled. The horse's speed of departure over the first 2 m was measured using electronic timing equipment.

A linear mixed model for RS and a generalised mixed model for SS were fitted to the data, with *Day, Breed* and *Treatment* as fixed effects and *Horse* and *Group* as random effects, using ASReml-R. A sample size of 6 in each group had a 95% power to detect a difference between means of 2.3 m/s with a significance level of 0.05.

Results

With acepromazine administration, there was a higher SS ($P = 0.001$) and a reduction in RS ($P = 0.004$) versus the placebo for all horses (Table 2).

There were ambivalent and nonsignificant differences for RS between treatments, breed (Table 2), and sex and no significant differences in SS after either one or seven days of treatment.

Table 2. Mean (±SD) reaction speeds after horses were fed the different treatments for 7 days or administered acepromazine at 0.04 mg/kg BW.

Breed	Control (m/s)	Mg Aspartate (m/s)	Na Aspartate (m/s)	Acepromazine (m/s)
Thoroughbred	5.4 ± 1.8[a]	5.2 ± 2.1[a]	4.1 ± 1.9[ab]	2.6 ± 1.8[b]
Arabian	3.5 ± 1.8[ab]	5.8 ± 1.8[a]	5.3 ± 2.4[a]	3.1 ± 1.3[b]
Pony	4.8 ± 1.3[a]	4.5 ± 1.1[ab]	4.5 ± 2.5[ab]	3.5 ± 2.0[b]
All horses	4.6 ± 1.7[a]	5.2 ± 1.7[a]	4.6 ± 2.2[a]	3.1 ± 1.7[b]

[a,b] Means sharing the same superscripts within rows are not significantly different from each other ($P < 0.05$)

Discussion

We found no conclusive evidence that Mg, fed at 0.05 g/kg BW, had an anxiolytic effect or reduced reaction speed. These results may indicate that either Mg must be fed at a minimum 0.06 g Mg/kg BW; or that the results of the first study were confounded by all horses originating from the same training stable as a homologous group. ***At no time did horses demonstrate any characteristics of being either sedated or more excited when given either Mg or Na aspartate.***

Recommendations

Magnesium supplementation cannot be relied on to modify reaction speed in performance horses.

Horse managers would be advised to seek alternative strategies to manage reactive behaviour such as training and habituation to stressful situations.

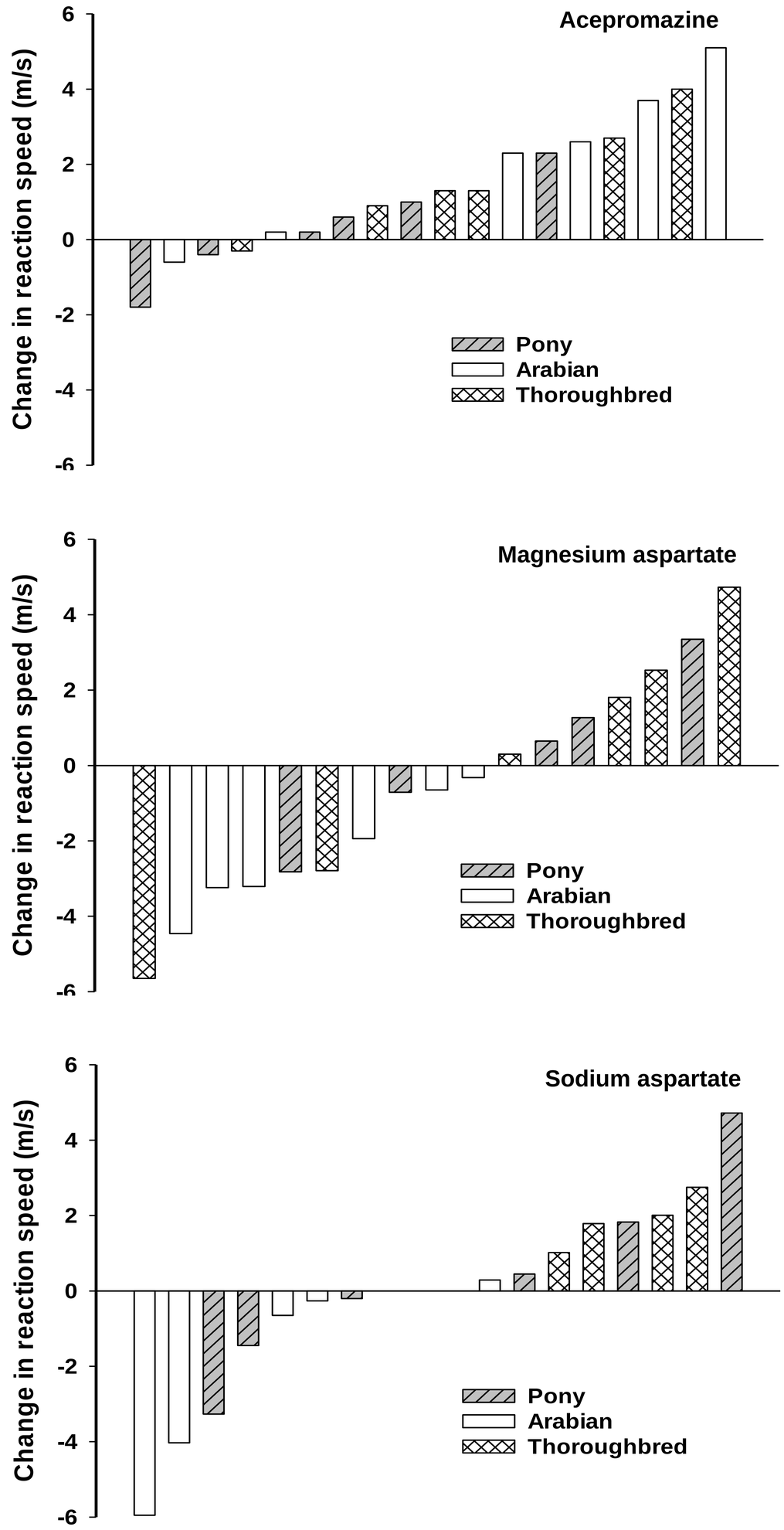

Figure 1. Difference in reaction speed (Control minus Treatment) after receiving acepromazine or 7 days supplementation for individual horses (n = 18). A positive value indicates that the horse travelled at a slower speed compared to the Control; a negative value indicates that the horse moved faster compared to the Control.

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Cavallero, A., Marte, A. and Fedele, E. (2009). l-Aspartate as an amino acid neurotransmitter: mechanisms of the depolarization-induced release from cerebrocortical synaptosomes. *Journal of Neurochemistry*, 110, 924–934.
Dodd, J.A., Doran, G., Harris, P. and Noble G.K. (2015) Magnesium aspartate supplementation and reaction speed response in horses. *Journal of Equine Veterinary Science*, 35, 5, 401-402.