The Use of EGM System as Feedback Feature for the AGSM Training

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INTRODUCTION

Fighter pilots are constantly submitted to physiological effects due Gz+ acceleration e.g. G-force induced loss of consciousness (G-LOC). It`s occurs from difficult to keep the blood supply in the brain. Anti-G straining maneuver (AGSM) is a corporal maneuver, which needs a complex muscle contraction and quick breathing to avoid central-peripheral blood redistribution and to support high levels of Gz+. The surface electromyography (EMG) has been used as a tool to assess AGSM efficacy. The aim of this study was assess the use of EMG to analyze muscle activity during two consecutives AGSM attempts providing feedback between them.

METHODS

Nine fighter pilots novice in AGSM were volunteers. The electromyographic data of the rectus abdominis (RA), vastus medialis (VM), and gastrocnemius (G) muscles were assessed (Noraxon DTS system, 1500Hz) following the SENIAM protocol. The experiment consisted of two sessions of 30s of AGSM, with an interval of one minute. Temporal data were digitally filtered (Butterworth, 4th, band [10-500 Hz] and [60 Hz] with their harmonics) and analyzed by windowed normalized RMS (nRMS) at one-second intervals with a half-second overlap. Two-way ANOVA, with interwindow and session factors (repeated measure), accompanied by post hoc Holm tests were performed, and Cohen`s d effect size was calculated ($p < 0.05$).

RESULTS

A nRMS increase of 8.44%, 12.9% and 11.6% for RA ($P < 0.01$; ES = 0.2), VM ($P < 0.01$; ES = 0.3), and G ($P < 0.01$; ES = 0.3), respectively on second execution indicates an improvement of AGSM performance (Figure 1 and Table 1).

DISCUSSION AND CONCLUSION

nRMS seemed to be a good EMG feature to analyze muscle activity during AGSM and provide session-by-session feedback. The results indicate that EMG system was able to assist the AGSM training. This experimental design has to be tested in human centrifuge.

PRACTICAL IMPLICATIONS

NON APPLICABLE

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FIGURES AND TABLES

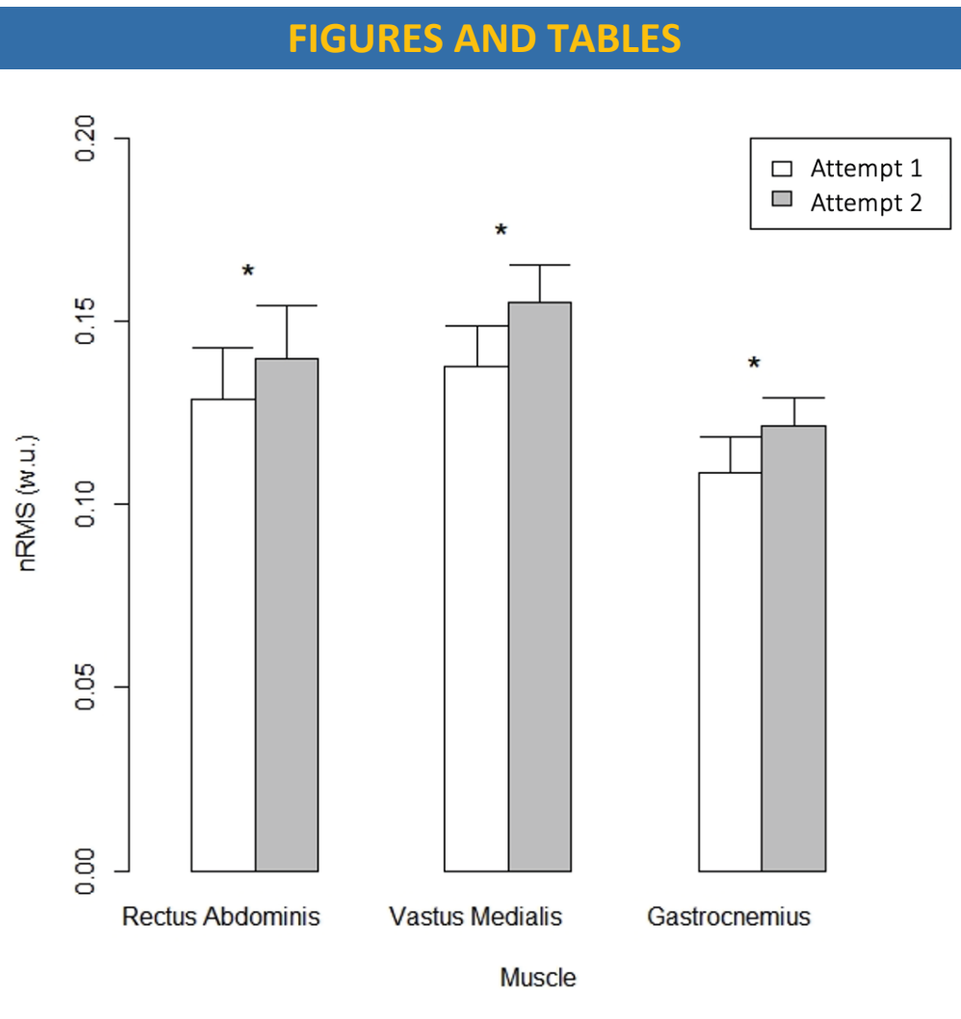

Table 1: ANOVA comparison of muscles between 2 attempts

	ANOVA – Attempt Factor: 1st vs. 2nd							
		Mean	95% Interval				*Post Hoc*	
nRMS	**n**	**Difference**	**Confidence**		**F**	**p**	***(t)***	***p*** *(Holm)*	***Cohen's d***
Rectus Abdominis	9	-0,011	-0,015	-0,006	21,859	< 0.01	-4,758	< 0.01	-0,207
Vasto Medialis	9	-0,018	-0,022	-0,013	53,675	< 0.01	-7,640	< 0.01	-0,332
Gastrocnemius	9	-0,013	-0,016	-0,009	44,739	< 0.01	-6,867	< 0.01	-0,298

CONFICT OF INTEREST

The authors declare that they have no conflicts of interest.