

MULTIFACTORIAL APPROACH TO IMPROVING PERFORMANCE OF THE NOVICE VITREORETINAL SURGEON: IMPLICATIONS IN SURGICAL PRACTICE

Marina Roizenblatt, MD;

Co-authors: Raul Vianna; Kim Jiramongkolchai; Peter Gehlbach;
Michel Farah; Rubens Belfort Jr; Mauricio Maia

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SUMMARY

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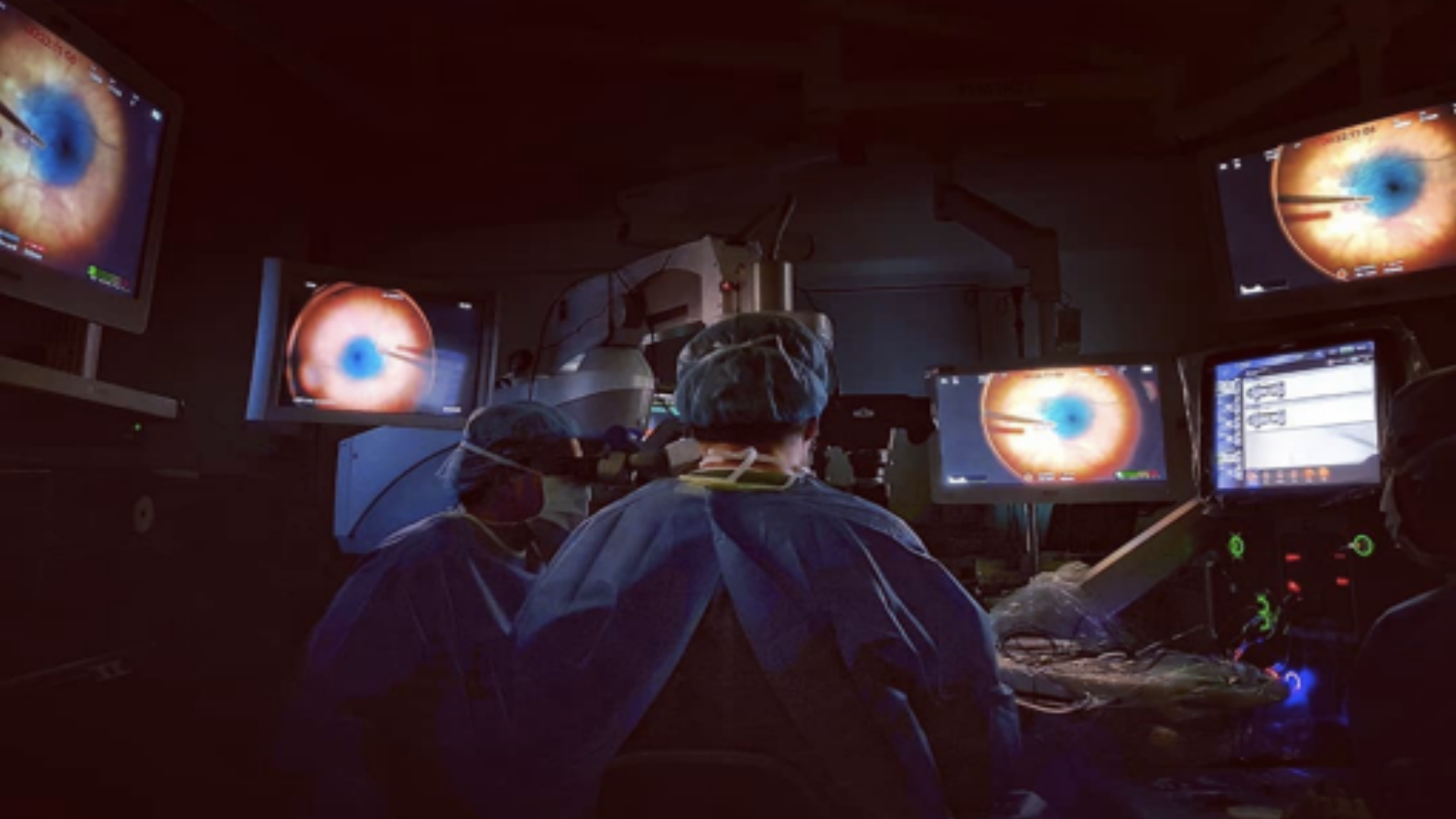
Authors. Marina Roizenblatt, MD; Raul Nunes Galvarro Vianna, MD, PhD; Kim Jiramongkolchai, MD; Peter Louis Gehlbach, MD, PhD; Michel Eid Farah, MD, PhD; Rubens Belfort Junior, MD, PhD; Mauricio Maia, MD, PhD.

Purpose. To quantitatively analyze the surgical performance of in-training vitreoretinal surgeons following exposure to propranolol, alcohol, physical activity, or polysomnographic recorded sleep interruption.

Methods. We conducted a cross-sectional study with 15 vitreoretinal fellows with less than 2 years of surgical experience. Surgical performance using the Eyesi simulator (VRmagic, Mannheim, Germany) was quantitatively assessed after each exposure on 4 nonsequential days, as follows: day 1: placebo, 0.2 mg/kg propranolol, and 0.4 mg/kg propranolol (total=0.6 mg/kg). Day 2: baseline simulation, wine consumption with breathalyzer reading of 0.06-0.10% of blood alcohol concentration (BAC), followed by 0.11-0.15% BAC. Day 3: baseline simulation, 4 series of push-ups with 50% of maximum repetition (RM) training load, followed by 4 series of push-ups with 85% RM. Day 4: sleep restriction of 3 hours of total time in bed. The Eyesi surgical simulator was used to obtain total surgical score, task completion time (minutes), tooltip intraocular trajectory (mm), and tremor-specific task score. The data was analyzed using the Friedman test with the Bonferroni's adjustment for multiple comparison and the Wilcoxon test for paired comparison and p-value was set at 0.05.

Results. The simulated surgical performance worsened with increasing alcohol exposure, as measured by total score ($X^2 = 7$, $df=2$, $p=0.03$) and intraocular trajectory ($X^2 = 6.86$, $df=2$, $p=0.03$). BAC of 0.06-0.10% and 0.11-0.15% worsened performance compared to improvement after 0.6 mg/kg and 0.2 mg/kg propranolol, respectively, in terms of total score ($\Delta = -22$ vs. $\Delta = +13$, $p=0.02$; $\Delta = -43$ vs. $\Delta = +23$, $p=0.01$); anti-tremor task score ($\Delta = -7.5$ vs. $\Delta = +5$, $p=0.008$; $\Delta = -15$ vs. $\Delta = +8$, $p=0.009$), and task completion time ($\Delta = -0.05$ min vs. $\Delta = -1.35$ min, $p=0.008$; $\Delta = +0.46$ min vs. $\Delta = -0.83$ min, $p=0.009$). Intraocular trajectory was negatively impacted by 0.11-0.15% BAC compared to 0.2 mg/kg propranolol ($\Delta = +204.84$ mm vs. $\Delta = -221.7$ mm, $p=0.006$). No changes were observed in surgical performance after 4 series of push-ups with 85% RM or following sleep restriction of 3 hours in bed.

Conclusions. Alcohol exposure worsened overall surgical performance in a dose dependent manner. Propranolol 0.2 mg/kg positively affected surgical dexterity compared to alcohol levels of 0.06-0.10% BAC.



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Association of Weight-Adjusted Caffeine and β -Blocker Use With Ophthalmology Fellow Performance During Simulated Vitreoretinal Microsurgery

Marina Roizenblatt, MD; Vitor Dias Gomes Barrios Marin; Alex Treiger Gruenmacher, MD; Felipe Muralha, MD; Jean Faber, PhD; Kim Jiramongkolchai, MD; Peter Louis Gehlbach, MD, PhD; Michel Eid Farah, MD, PhD; Rubens Belfort Jr, MD, PhD; Mauricio Maia, MD, PhD

— CONCLUSIONS —

This study suggested that young vitreoretinal surgeons who ingest caffeine before performing a surgical procedure may benefit from receiving a partially neutralizing dose of propranolol.

PROPRANOLOL



ALCOHOL



PURPOSE

EXERCISE



SLEEP



METHODS



METHODS

INCLUSION CRITERIA



< 2 yrs real surgical experience



> 2hrs experience with Eyesi

EXCLUSION CRITERIA



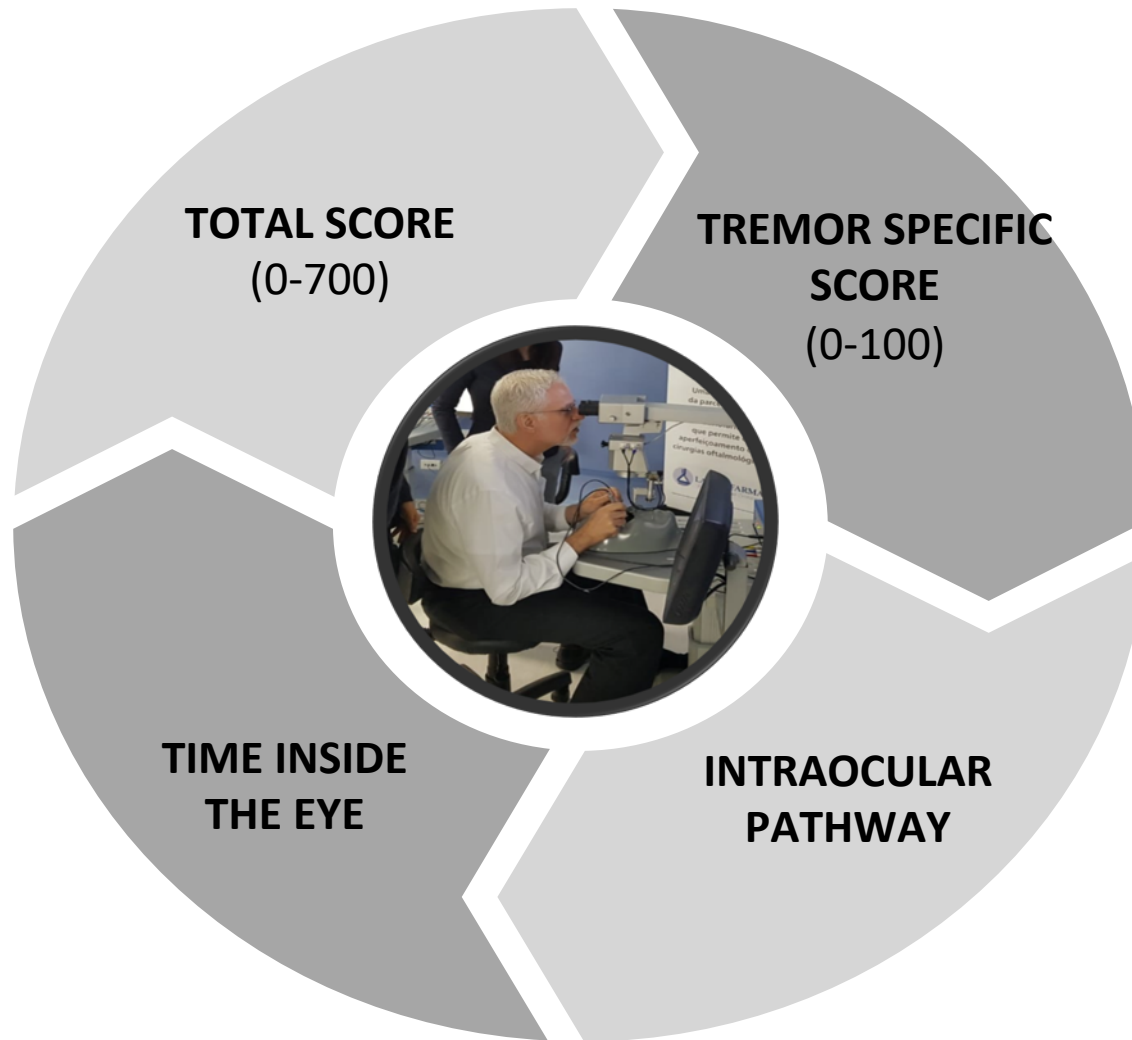
Having any previous
systemic disease



alcohol intake >
3 standard drinks/ day

Before the study: ECG + 0.6 mg/kg propranolol

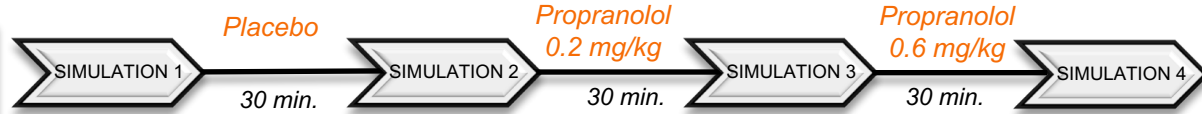
METHODS



STUDY PROTOCOL



DAY 1 PROPRANOLOL



DAY 2 ALCOHOL



DAY 3 EXERCISE



DAY 4 SLEEP DEPRIVATION



15 VR fellows (60% men)

29.6 ± 1.4 years

Time →

BAC: Blood Alcohol Concentration

RM: Repetition Maximum

PSG : Polysomnography

MEDIAN COMPARISON OF PERFORMANCE DATA BETWEEN DIFFERENT LEVELS OF THE SAME EXPOSURE

RESULTS

ALCOHOL	Baseline	Post-exposure	p *
SCORE			
Baseline vs. 0.11-0.15% BAC	596.5 (562.0, 617.2)	537.5 (459.5, 585.7)	0.02
TREMOR-SPECIFIC SCORE			
Baseline vs. 0.06-0.10% BAC	68.5 (46.0, 80.7)	54.0 (42.00, 63.2)	0.04
Baseline vs. 0.11-0.15% BAC	68.5 (46.0, 80.7)	52.5 (36.50, 63.2)	0.03

BAC: Blood Alcohol Concentration

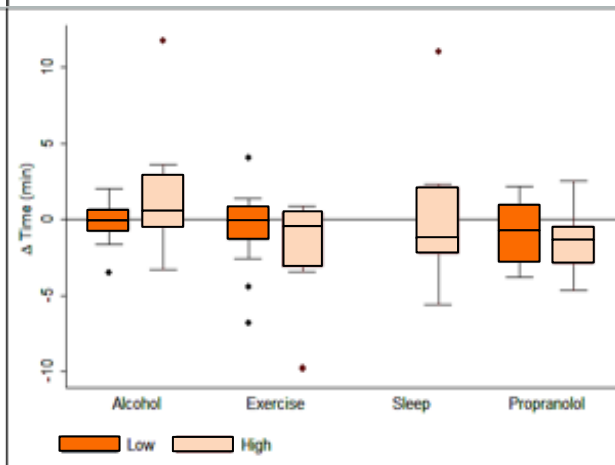
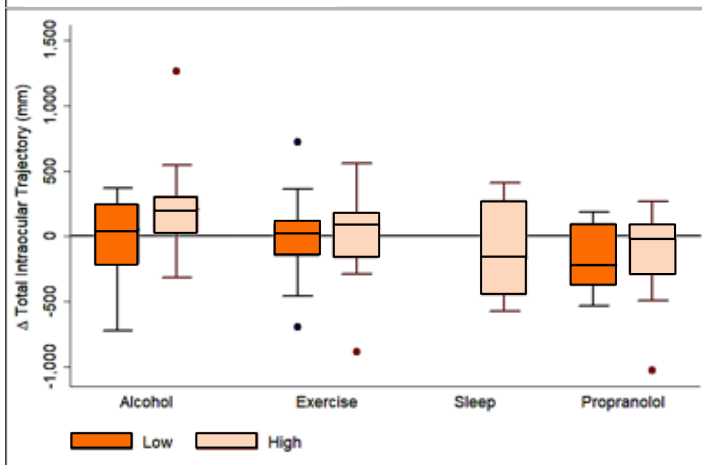
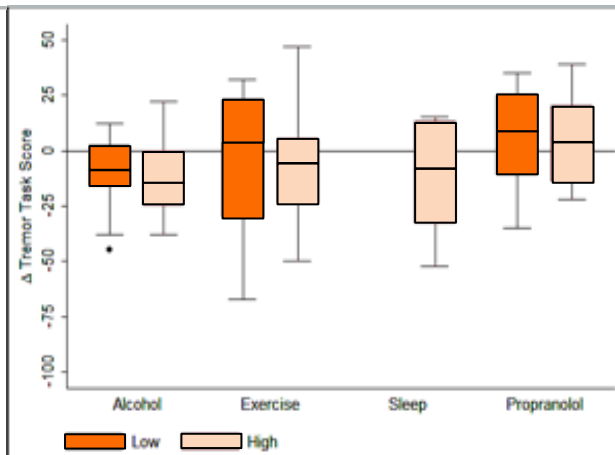
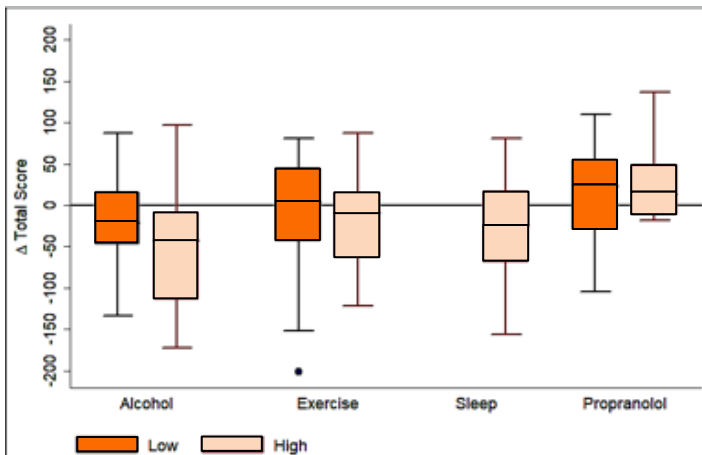
COMPARISON OF THE MEDIAN DELTA OF PERFORMANCE DATA BETWEEN DIFFERENT EXPOSURES

RESULTS

ALCOHOL vs. PROPRANOLOL	Δ Exposure 1	Δ Exposure 2	p *
SCORE			
0.11-0.15% BAC vs. Propranolol 0.2 mg/kg	-43.0 (-120.5, -5.7)	+23.0 (-29.0, +54.0)	0.01
0.06-0.10% BAC vs. Propranolol 0.6 mg/kg	-22.0 (-62.0, +16.5)	+13.0 (-12.0, +49.0)	0.02
0.11-0.15% BAC vs. Propranolol 0.6 mg/kg	-43.0 (-120.5, -5.7)	+13.0 (-12.0, +49.0)	0.007
TREMOR-SPECIFIC SCORE			
0.11-0.15% BAC vs. Propranolol 0.2 mg/kg	-15.0 (-26.2, +1.25)	+8.0 (-11.0, +25.0)	0.009
0.06-0.10% BAC vs. Propranolol 0.6 mg/kg	-7.5 (-19.0, +2.7)	+5.0 (-14.0, +20.0)	0.008
TIME (minutes)			
0.11-0.15% BAC vs. Propranolol 0.2mg/kg	+0.46 (-0.52, +2.91)	-0.83 (-2.76, +0.94)	0.009
0.06-0.10% BAC vs. Propranolol 0.6 mg/kg	-0.05 (-0.78, +0.84)	-1.35 (-2.94, -0.51)	0.005
0.11-0.15% BAC vs. Propranolol 0.6 mg/kg	+0.46 (-0.52, 2.91)	-1.35 (-2.94, -0.51)	0.01
INTRAOCULAR TRAJECTORY (mm)			
0.11-0.15% BAC vs. Propranolol 0.2 mg/kg	+204.8 (-25.5, +338.8)	-221.7 (-374.9, +93.1)	0.006

BAC: Blood Alcohol Concentration

RESULTS



CONCLUSIONS



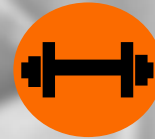
ALCOHOL

worsened surgical
performance in a dose
dependent manner



PROPRANOLOL

Improved performance
compared alcohol intake



PHYSICAL EXERCISE

No change in
performance



SLEEP DEPRIVATION

No change in
performance

THANK YOU FOR YOUR ATTENTION!

Marina Roizenblatt, MD

maroizenb@gmail.com

