Early Detection of Hypoxic Cognitive Impairment Using the King-Devick test

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Disclosure Information
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I have financial relationships to disclose:

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I will not discuss off-label use and/or investigational use in my presentation
Introduction

- 90% of concussed collegiate athletes have a significant decrement in K-D performances immediately after the injury *(Galetta 2011)*

- The K-D test showed its utility in identifying unrecognized concussions on the sideline in rugby players *(King 2013)*

- K–D test decrements are associated with reductions in Immediate Memory scores in ice hockey players *(Galetta 2013)*

- A significant correlation between K-D performance and fatigue has been also reported *(Davies 2012)*
King-Devick Test (K-D)

Galetta et al., Journal of the Neurological Sciences 2011
Learning Objectives

• Evaluate the effect of hypoxia on K-D test performance (completion time, error rate) in comparison to test performance in normoxia

• Evaluate K-D test potential on detecting early cognitive impairment in the pre-symptomatic phase of an acute exposure
Methods

- 25 subjects (M:F=14:11)

**Step 1:** K-D learning process (3 tests)

**Step 2:** K-D Pre-baseline test in Normoxia

**Step 3:** 3 min Hypoxia (8% O₂ = 22000 ft or 6705 m)

**Step 4:** K-D Hypoxic test

**Step 5:** 3 min Normoxia

**Step 6:** K-D Post-baseline

- Incidence and severity of hypoxic symptoms
Results

O2 Saturation

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**Graph:**

- X-axis: Time points (Pre-Baseline KD Test, 1 min, 2 min, 3 min, KD Test in Hypoxia, 1 min, 2 min, 3 min, Post-Baseline KD Test)
- Y-axis: O2 Saturation (%)
- Data points and error bars indicating fluctuations under Hypoxia and Normoxia conditions.

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**Legend:**

- Hypoxia
- Normoxia
Results
K-D Test Time

- K-D Pre-Baseline
  46.3 ± 10.4 sec

- K-D Hypoxia
  54.5 ± 12.4 sec

- K-D Post-Baseline
  47.6 ± 10.6 sec

\[ p = 0.75 \]
Results
K-D Test Time

K-D Normoxia

K-D Hypoxia
Results

Percent Change K-D Test Time

• 18% increase in K-D completion time
Results
Total Number of Errors during K-D

- K-D Pre-Baseline
  total of 10 errors

- K-D Hypoxia
  total 40 errors

- K-D Post-Baseline
  < 10 errors
Results

Hypoxic symptoms

- 4 light-headedness
- 4 dizziness
- 2 increased rate/depth breaths
- 2 loss of concentration
- 1 warmth
- 1 lip paresthesia
- 1 blurred vision
- **No major symptoms of hypoxia reported**
Conclusions

- K-D test results a reproducible and quantitative tool to detect early signs cognitive impairment at a presymptomatic stage of hypoxia.

- Further testing is warranted using this tool in acute hypoxic exposures that may be of relevance in the operational aerospace environment.
Grazie!