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Sport and Exercise Science Consultancy Unit

Para-Monte Open Day 28th January 2017





Less Oxygen – NO!

Lower atmospheric pressure = Lower PO₂

- Less oxygen gets into lungs and blood
- Haemoglobin becomes less saturated with oxygen
- Lower saturation is known as hypoxia



WHAT ARE THE DIFFERENT TYPES OF ALTITUDE?

Figure 1 : Two conditions of hypoxia	Where? How?	Pressure of O₂ in the inspired air	Fraction of ○ ₂ in the inspired air	
Hypobaric / hypoxia Low ambient pressure	"true" altitude Artificial environments		¢	
Normobaric / hypoxia Low oxygen content	Artificial environments Image: Second system Image: Second system	\leftrightarrow	Ļ	



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HOW DO WE MEASURE INDIVIDUALS AT ALTITUDE?

Severity	Altitude (m)	Oxygen (%)	Air Pressure (mmHg)	PO ₂ (mmHg)	Oxygen Saturation (%)
	0	20.93	760	159	97
	1000	20.93	680	142	96
Moderate	2000	20.93	600	125	94
High	3000	20.93	523	109	90
Very High	4000	20.93	450	94	80
Extreme	8848 (Everest)	20.93	255	53	40







HOW DO WE DEFINE ALTITUDE?

Altitude can be categorised according to varying heights of above 1500m:

Moderate altitude: 1500 - 2500m **Oxygen Saturations at Altitude** $SaO_{2} > 90\%$ (AMS) 120 100 Pa02 (mmHq) High altitude: 2500 - 3500m Sa02 (%) 100 90 $SaO_{2} < 90\%$ (AMS) ⊃aO2 (mmHg) 80 80 Sa02 (%) Very high altitude: 3500 - 5800m 60 70 $SaO_2 < 85\%$ (AMS+) Extreme altitude: 5800m + 40 · 60 Everest Summit = 8850m 20 50 0 2000 4000 6000 8000 10000 Unconscious within 30s Altitude (m)







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WHY STUDY ALTITUDE?

Human Performance – Mexico City 1968

Clinical Applications – Caudwell Xtreme Everest Expedition

Human Physiology – Prediction, Adaptations & Illnesses





Para-Monte: Study Individual responses to Altitude Exposure



altitude syncope, flatulence, anxiety

ACUTE MOUNTAIN SICKNESS (AMS)





Dr Howard Donner



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ACUTE MOUNTAIN SICKNESS (AMS)

- Generally occurs above 2,500m
- Limited understanding of mechanisms behind AMS and individual responses
- Occurrence of AMS is dependent upon the elevation, the rate of ascent, dehydration and <u>individual susceptibility</u>
- Symptoms (occur 1-24 hours after arrival, typically resolve 24-48 hours)

Headache

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Nausea & Vomiting Dizziness Loss of Appetite Shortness of Breath Disturbed Sleep Fatigue



A. A	Am I Hydrated? Urine Color Chart
1	This urine color chart is a simple tool your can use to assess if you are drinking
2	enough fluids throughout day to stay hydrated.
3	If your urine matches the colors numbered 1, 2, or 3 you are hydrated.
4	If your urine matches the colors numbered 4 through 8 you are
5	for more fluid.
5	Be Aware1 If you are taking single vitamin supplements or a multivitamin
6	supplement, some of the vitamins in the supplements can change the color of your urine for a few hours, making it bright yellow or discolored.
7	If you are taking a vitamin supplement, you may need to check your hydration
0	Handout #15: Hydration Check: Body Weight Log



Symptoms of Dehydration and AMS can be confused

WHAT IS THE PREVALENCE OF AMS?





Age is a determinant of the incidence for experiencing AMS reinforcing the need for EDUCATION

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DIAGNOSING ACUTE MOUNTAIN SICKNESS (AMS)

Lake Louise Score (LLS) for the diagnosis of Acute Mountain Sickness (AMS)

A diagnosis of AMS is based on:

1. A rise in altitude within the last 4 days

2. Presence of a headache

PLUS

- 3. Presence of at least one other symptom
- 4. A total score of 3 or more from the questions below

Total score of:

titude Sicknos

www.paramonte.or

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- 3 to 5 = mild AMS
- 6 or more = severe AMS

SELF-REPORT QUESTIONNAIRE

Add together the individual scores for each symptom to get the total score.

Headache	No headache	0
	Mild headache	1
	Moderate headache	2
	Severe headache, incapacitating	3
Gastrointestinal symptoms	None	0
	Poor appetite or nausea	1
	Moderate nausea &/or vomiting	2
	Severe nausea &/or vomiting	3
Fatigue &/or weakness	Not tired or weak	0
-	Mild fatigue/ weakness	1
	Moderate fatigue/ weakness	2
	Severe fatigue/ weakness	3
Dizziness/lightheadedness	Not dizzy	0
5750	Mild dizziness	1
	Moderate dizziness	2
	Severe dizziness, incapacitating	3
Difficulty sleeping	Slept as well as usual	0
2.8 9.7.9 975.6	Did not sleep as well as usual	1
	Woke many times, poor sleep	2
	Could not sleep at all	3
	TOTAL SCORE:	



Lake Louise Score – Self Assessment be take Louise Score in for self days of AMS, it is based on: i. Sens of a leadache Persone al leadache on the sung 140%. The state Louise of the self days of the self of the

LLQ on Para-Monte website -





Arrival to Advertisements on Altitude Sickness

"There is unfortunately no way of predicting whom AMS will seriously trouble and who will escape it." (BMC web site)



CAN WE PREDICT WHO WILL RESPOND TO ALTITUDE?





20-30 min after exposure to simulated hypoxia equivalent to 2,300-4,200 m, seem to be the most useful predictors of AMS susceptibility (Burtscher et al., 2008)

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WHAT HAVE WE DONE IN THE PAST?







- 24 students + 5 staff to Peru
- Education talks
- Resource Packs and Presentations



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Screening for hypoxic tolerance and AMS susceptibility using a 6 minute walk test

WILDERNESS & ENVIRONMENTAL MEDICINE, 26, 205-210 (2015)

BRIEF REPORT

Prediction of Physiological Responses and Performance at Altitude Using the 6-Minute Walk Test in Normoxia and Hypoxia

Oliver R. Gibson, MSc; Alan J. Richardson, PhD; Mark Hayes, PhD; Ben Duncan, BSc; Neil S. Maxwell, PhD From the Centre for Sport and Exercise Science and Medicine (SESAME), Welkin Human Performance Laboratories, University of Brighton, UK.







The 6MWT is a simple, time-efficient tool for predicting physiological responses to simulated and actual altitude, which are comparable. The 6MWT is effective at monitoring elements of acclimatization to moderate altitude.



CAN PERFORMANCE PROFILE SCREENING BE USED AHEAD OF ASCENT TO ALTITUDE?

Physiological profiling of hypoxic tolerance



Exercising Blood Lactate

Av % Difference = 18%

The inside box represents **your hyposic value** in relation to the required for each parameter. The nearer your line is to the hypoxic (red) line, the better. The values are reported as % difference from the Normoxic value since some parameters would expect to higher in hypoxia not less.

Tolerant?





CAN PERFORMANCE PROFILE SCREENING BE USED AHEAD OF ASCENT TO ALTITUDE?

Physiological profiling of hypoxic tolerance





Intolerant?



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OUTCOME OF RESEARCH STUDY

Within Environmental Physiology 3rd year module (HB627) with 30+ students and over a summer studentship





- Highlight an individual's susceptibility to AMS prior to travelling to altitude
- Individual information for trek, holiday and expedition
- \uparrow educational awareness of signs/symptoms and what to do
- Published research article
- Awareness of Para-Monte and use of tools such as LLQ/App/Website

PROPOSED PLAN

Launch Day

Raising Awareness of Para-Monte

> Educational Seminars

Research Dissemination Open Session

Marketing Material

FMORIAL

www.paramonte.org

Research Project and summer studentship

New equipment to help with screening and predicting AMS

School / College Talks

Impact of Partnership







SO FAR.....

40+ students from BHASVIC learn about Altitude Illness & Investigate their own individual responses



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THANK YOU

Lab demonstration, App Launch, speeches and bubbles.....





The ECHO Grants

Promoting excellence, community and heritage opportunities



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