Sleep and Wellbeing: Why it Matters

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Training Optimally Yields Best Outcomes

![Graph showing the relationship between exercise dosage and immune function vs. disease susceptibility.]

Physiology of Sport and Exercise 5E Kenny, Wilmore, Costill; Data from DC Nieman 1997
**Recommended Dietary Allowances for Normal Healthy Persons in Singapore (Children & Adolescents)**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Height</th>
<th>Weight</th>
<th>Protein</th>
<th>Iron</th>
<th>Vit A</th>
<th>Vit D</th>
<th>Thiamin</th>
<th>Riboflavin</th>
<th>Niacin</th>
<th>Equiv</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>cm</td>
<td>kg</td>
<td>g</td>
<td>mg</td>
<td>mcg</td>
<td>mcg</td>
<td>mg</td>
<td>mg</td>
<td>mg</td>
<td>mg</td>
</tr>
<tr>
<td>1 – 6 mths</td>
<td>7</td>
<td>16</td>
<td>7</td>
<td>300</td>
<td>10.0</td>
<td>0.28</td>
<td>0.42</td>
<td>4.6</td>
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</tr>
<tr>
<td>6 – 9 mths</td>
<td>8.5</td>
<td>17</td>
<td>7</td>
<td>300</td>
<td>10.0</td>
<td>0.32</td>
<td>0.43</td>
<td>5.3</td>
<td></td>
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</tr>
<tr>
<td>9 – 12 mths</td>
<td>9.5</td>
<td>18</td>
<td>7</td>
<td>300</td>
<td>10.0</td>
<td>0.38</td>
<td>0.57</td>
<td>6.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – 2 yrs</td>
<td>11</td>
<td>19</td>
<td>7</td>
<td>250</td>
<td>10.0</td>
<td>0.46</td>
<td>0.69</td>
<td>7.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 – 5 yrs</td>
<td>13.5</td>
<td>22</td>
<td>7</td>
<td>250</td>
<td>10.0</td>
<td>0.54</td>
<td>0.81</td>
<td>8.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 – 5 yrs</td>
<td>16.5</td>
<td>26</td>
<td>7</td>
<td>300</td>
<td>10.0</td>
<td>0.82</td>
<td>0.93</td>
<td>10.2</td>
<td></td>
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</tr>
</tbody>
</table>

**SLEEP DURATION RECOMMENDATIONS**

National Sleep Foundation

[Sleep Foundation Chart Image]

[More information on SLEEPFOUNDATION.ORG and SLEEP.ORG]

[More context or details necessary for the chart image]
Sleep is almost universal...

Outline

• Short adolescent sleep in East Asia as a fertile target for intervention
• Cognitive effects of multi-night sleep restriction in adolescents – experimental data
• Benefits of afternoon naps on vigilance and memory
• How can I improve my sleep?
I. Adolescent Sleep In East Asia

East Asians Sleep Less- 500,000 nights of data say so

Ong JL; Sci Rep (2019)
II. Cognitive Effects of Adolescent Sleep Restriction: Empirical Data
The Need for Sleep Studies

- Healthy, no sleep or neuropsychiatric disorders
- 15-18 years of age
- High performing students
- No habitual short sleepers (avg <6h/night)

Need For Sleep Study 1.0 Schematic

Healthy teens ages 15 - 18 years (many elite students)

Lo, Ong, Leong, Gooley, & Chee; Sleep (2016)
Sustained attention

Psychomotor Vigilance Task

Sustained Attention vs. Sleepiness

Psychomotor Vigilance Task

Karolinska Sleepiness Scale

Lo, Ong, Leong, Gooley, & Chee; Sleep (2016)
Speed of processing

Mental Arithmetic Task

\[ 31 + 38 = \]

Symbol Digit Modalities Test

Lo, Ong, Leong, Gooley, & Chee; Sleep (2016)

Mood

Positive & Negative Affect Scale

Excited

Lo, Ong, Leong, Gooley, & Chee; Sleep (2016)
REM Sleep May Strip Off Emotions From a Memory


Cumulative Effects of Multiple Nights of Sleep Restriction

Lo, Lee, Teo, Lim, Gooley, & Chee; Sleep (2017).
Incomplete Recuperation After Two Nights of Recovery Sleep

Re-exposure to sleep restriction compounded performance degradation

Lo, Lee, Teo, Lim, Gooley, & Chee; Sleep (2017).
6.5h of nocturnal sleep isn’t enough for optimal vigilance performance

Lo, JC; Sleep (2019).

Economic Impact of Insufficient Sleep

Increased mortality
Increased morbidity –
Diabetes
Cardiovascular disease
Mental Illness
Dementia
Absenteeism
Presenteeism
Accidents

Notes: RAND Europe analysis
III. Benefit of Afternoon Napping

Afternoon naps can make a **huge** difference to vigilance

Lo JC et al.; Sleep 2017
A similar pattern for subjective sleepiness

[Graph showing KSS score over days with different conditions: Control, Nap, No nap]

Lo JC et al.; Sleep 2017

Daily Afternoon Naps Do Not Compromise Nocturnal Sleep if It is Restricted To 5H-TIB

[Graphs showing TST (min) and NREM stages (N1, N2, N3) over nights with nap and no nap conditions]

Ong JL et al.; Sleep 2017
What About Memory?

Memory Consolidation and Evolution with Sleep

- Sleep also plays an important role in enhancing learning and strengthening memory
  - Performance on a newly learned task is often better the next day if adequate sleep is achieved during the night
  - Information is repackaged during sleep.
  - ACTIVE processes at work!
Consolidation protects memories from forgetting and interference

You must sleep sometime between lunch and dinner, and no half-way measures. Take off your clothes and get into bed. That's what I always do. Don't think you will be doing less work because you sleep during the day. That's a foolish notion held by people who have no imagination. You will be able to accomplish more. You get two days in one—well, at least one and a half, I'm sure. When the war started, I had to sleep during the day because that was the only way I could cope with my responsibilities.

—Sir Winston Churchill"
Cousins JC Sleep (2018)
Sleep provides a nightly ‘detox’ for the brain
IV. PRACTICAL TIPS ABOUT IMPROVING SLEEP
Improving sleep

• Prioritize waking activities
• Give time to wind down
• Keep a relatively regular sleep-wake cycle
• **Turn off e-devices at bedtime**
• **Lights off!** QUIET; Cool temperature
• Avoid coffee, tea, cola-drinks
• Sleep earlier (if sleeping past 11pm-midnight)
• Allow for afternoon naps
A Student At Risk

NEW ‘PRIME TIME’ FOR MOBILE?
Usage of key activities peaks during late night

Source: Nielsen Informate Mobile Insights July 2013

All figures represent time spent in minutes

We need strong action to moderate e-device use

**Usage in last 30 days**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Do (%)</th>
<th>Say (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Browsing</td>
<td>25 MINS/DAY</td>
<td>40%</td>
</tr>
<tr>
<td>Social Networking</td>
<td>25 MINS/DAY</td>
<td>80%</td>
</tr>
<tr>
<td>Chat</td>
<td>25 MINS/DAY</td>
<td>50%</td>
</tr>
<tr>
<td>SMS</td>
<td>6 MINS/DAY</td>
<td>50%</td>
</tr>
</tbody>
</table>

Source: Nielsen Informate Mobile Insights 2013

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Caffeine - the most widely used drug in the world

- Caffeine is a stimulant
- The half-life of caffeine is about five hours
- Taking caffeine in the afternoon or evening can make it more difficult to fall asleep at night

About a third of JC students drinks caffeinated beverages to help keep them awake
Going to bed earlier is associated with better grades

Hysing M; J Sleep Res (2016)

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Nocturnal Sleep And Grades

Yeo SC; Sleep Med (2019)
Commentary: A necessity
Singaporeans cannot afford – more sleep

More sleep or more work - this is a core dilemma every Singaporean must confront at some point in their lives, says Ng Chua Wee.
Sleep your way to the top

http://www.bbc.com/sport/0/football/32276547

Acknowledgements

National Medical Research Council: STaR Award, Far East Organization; National Research Foundation (Science of Learning Grant)

Papers available from website

http://www.cogeneuro-lab.org

DukeNUS Medical School
Sleep Research Camp

• Learn about your sleep habits!
• Understand how sleep affects the brain and body

14 June 2019 - 28 June 2019
Venue: School dormitory
We are looking for:
Healthy, 15 – 19 year-olds

More information:
www.cogneuro-lab.org
neeforsleepstudy@gmail.com

Sign up:
www.tinyurl.com/nfs5signup