O SONO E A ESCOLA IDEAL
SONO → TAREFA
Sono como “abrigo” contra a interferência
Sleep

Learn

Consolidate

Sleep

Recall
Consolidação é um processo que transforma memórias lâbeis em representações mais estáveis e integradas a redes neurais pré-existentes.
“insight occurs, that is, when explicit knowledge of a hidden abstract rule is gained, leading to an abrupt, qualitative shift in responding.”
Figure 2. Effects of sleep and wakefulness on the occurrence of insight. Columns indicate percentage of subjects gaining insight into the hidden rule in the three experimental conditions of the main experiment (grey), in which subjects either slept (at night) or remained awake (at night or during daytime) between initial training and retesting, and in two supplementary conditions (hatched), where subjects were tested after nocturnal sleep or daytime wakefulness in the absence of initial training before these periods.
Physiol Rev 93: 681-766, 2013

HIPÓTESE SEQUENCIAL
FIGURE 3. A model of active system consolidation during sleep. A: during SWS, memories newly encoded into a temporary store (i.e., the hippocampus in the declarative memory system) are repeatedly reactivated, which drives their gradual redistribution to the long-term store (i.e., the neocortex). B: system consolidation during SWS relies on a dialogue between neocortex and hippocampus under top-down control by the neocortical slow oscillations (red). The depolarizing up phases of the slow oscillations drive the repeated reactivation of hippocampal memory representations together with sharp wave-ripples (green) and thalamo-cortical spindles (blue). This synchronous drive allows for the formation of spindle-ripple events where sharp wave-ripples and associated reactivated memory information becomes nested into succeeding troughs of a spindle (shown at larger scale). In the black-and-white version of the figure, red, green, and blue correspond to dark, middle, and light gray, respectively. [Modified from Born and Wilhelm (125).]
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Procedure</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonnet (1991)</td>
<td>104 healthy males aged 18–30 years</td>
<td>Between-groups comparison of 2-, 4-, and 8-h naps, with no nap during two nights of sleep deprivation</td>
<td>Naps improved vigilance, addition, logical reasoning, and alertness, only on the first night</td>
</tr>
<tr>
<td>Song et al. (2002)</td>
<td>8 male medical students aged 20–22 years</td>
<td>30-min naps during 40 h of sleep deprivation</td>
<td>Naps improved reaction time, but no change in accuracy</td>
</tr>
<tr>
<td>O’Connor et al. (2004)</td>
<td>41 healthy individuals (37 male) aged 21–47 years</td>
<td>Between-groups comparison of two 2-h naps, one 2-h nap, and no nap, per 24 h during 3.7 days of sleep deprivation</td>
<td>Dose-response trend with neurobehavioral performance improving most for the two 2-h nap group, and least for the no-nap group</td>
</tr>
<tr>
<td>Sallinen et al. (1998)</td>
<td>14 male industry workers aged 31–52 years</td>
<td>Within-subjects comparison of 30- and 50-min naps, at both 01:00 and 04:00 hours, with no nap</td>
<td>Naps reduced number of lapses on reaction time task and reduced physiological sleepiness and subjective fatigue</td>
</tr>
<tr>
<td>Purnell et al. (2002)</td>
<td>24 male engineers aged 21–59 years</td>
<td>Within-subjects comparison of 20-min and no-nap conditions during shift work</td>
<td>Naps improved performance on reaction time and vigilance tasks but no change in subjective sleepiness</td>
</tr>
<tr>
<td>Smith et al. (2007)</td>
<td>9 hospital workers (3 male), mean age 45.7 ± 13.2 years</td>
<td>Within-subjects comparison of 30-min and no-nap conditions during shift work</td>
<td>Naps improved psychomotor speed and subjective sleepiness; these improvements persisted to the end of the shift</td>
</tr>
<tr>
<td>Gillberg (1984)</td>
<td>12 healthy males aged 20–25 years</td>
<td>Within-subjects comparison of 1-h naps at 21:00 and 04:30 hours, with no nap after a night restricted to 4 h of sleep</td>
<td>Naps improved reaction time, reduced sleep latency, and reduced subjective sleepiness</td>
</tr>
<tr>
<td>Takahashi and Arito (2000)</td>
<td>12 healthy students (7 male), mean age 22.1 ± 1.6 years</td>
<td>Within-subjects comparison of 15-min and no-nap conditions after a night restricted to 4 h of sleep</td>
<td>Naps improved accuracy but reaction time was unaffected</td>
</tr>
<tr>
<td>Betrus (1986)</td>
<td>17 young adults (8 male), aged 18–32 years</td>
<td>Within-subjects comparison of 10- and 30-min naps, with 30-min bedrest and control-active conditions</td>
<td>Naps increased vigor, decreased fatigue, decreased confusion, decreased reaction time, and increased number of correct additions</td>
</tr>
</tbody>
</table>

Naps in school can enhance the duration of declarative memories learned by adolescents

Nathalia Lemos¹,², Janaina Weissheimer³,⁴ and Sidarta Ribeiro¹,²,⁴**

¹ Laboratory of Memory, Sleep and Dreams, Brain Institute, Federal University of Rio Grande do Norte, Natal, Brazil
² Department of Physiology, Psychobiology Graduate Program, Federal University of Rio Grande do Norte, Natal, Brazil
³ Department of Foreign Languages and Literatures, Federal University of Rio Grande do Norte, Natal, Brazil
⁴ ACERTA Program, Education Observatory CAPES/INEP, Natal, Brazil
Goodnight book: sleep consolidation improves word learning via storybooks

Sophie E. Williams and Jessica S. Horst*

School of Psychology, University of Sussex, Brighton, UK

FIGURE 2 | Children’s word learning on each test for each of the four conditions. Chance is 0.25. Error bars indicate one standard error of the mean.
Sleep spindles in midday naps enhance learning in preschool children

Laura Kurdziel\textsuperscript{a}, Kasey Duclos\textsuperscript{b,c}, and Rebecca M. C. Spencer\textsuperscript{a,b,1}

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Insert graphs and figures here.
The Effects of Napping on Cognitive Function in Preschoolers

Janet C. Lam, MD,* E. Mark Mahone, PhD,†‡ Thornton B.A. Mason, MD, PhD,§ Steven M. Scharf, MD, PhD¶

Nap-dependent learning in infants

Almut Hupbach, Rebecca L. Gomez, Richard R. Bootzin and Lynn Nadel

Research Report

Naps Promote Abstraction in Language-Learning Infants

Rebecca L. Gómez, Richard R. Bootzin, and Lynn Nadel
A brief nap is beneficial for human route-learning: The role of navigation experience and EEG spectral power

Erin J. Wamsley, Matthew A. Tucker, Jessica D. Payne, and Robert Stickgold

Center for Sleep and Cognition, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts 02215, USA

Learning & Memory 2010

Figure 1. The virtual maze task
In this spatial memory task, subjects first learned the layout of a complex maze (Left, level 3 shown). Route memory was then probed across a series of trials, as subjects repeatedly navigated to a specified goal point, beginning from pseudorandomized starting locations. An example view of the maze environment is pictured (Right). For summary of task-related mention, see Supplemental Table S1.
Figure 3. Effect of sleep on problem-solving. Bars show the percentage of subjects in each group. Blue represents the percentage of subjects who solved the problem; yellow represents the percentage of subjects who did not. Sleep group n = 14 (solvers n = 12, non-solvers n = 2). Control group n = 15 (solvers n = 7, non-solvers n = 8).

doi:10.1371/journal.pone.0084342.g003

After Being Challenged by a Video Game Problem, Sleep Increases the Chance to Solve It

Felipe Beijamini*, Sofia Isabel Ribeiro Pereira, Felipe Augusto Cini, Fernando Mazzilli Louzada

Laboratório de Cronobiologia Humana, Departamento de Fisiologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil
Reativação durante o sono
Odor Cues During Slow-Wave Sleep Prompt Declarative Memory Consolidation

Björn Rasch, Christian Büchel, Steffen Gais, Jan Born

![Diagram showing the relationship between odor cues and sleep stages.](image)

- **Learning**
- **Sleep**
- **Odour/vehicle**
- **Retrieval**

### Odor during learning and SWS

- **Recalled card locations**
  - Placebo: 80%
  - Odor: 100%

### Odor only during SWS

- **Recalled card locations**
  - Placebo: 90%
  - Odor: 85%
Strengthening Individual Memories by Reactivating Them During Sleep

John D. Rudoy, Joel L. Voss, Carmen E. Westerberg, Ken A. Paller

A  Learning – 50 object locations
   Subsequently cued    Subsequently uncued

   meow
   whistle

B  Nap – 25 sound cues
   Stimulation period
   0 min               75 min
   Awake
   Stage 1
   Stage 2
   Slow-wave sleep
   meow

C  Test – 50 object locations
   Cued    Uncued
   x
   meow
   whistle
Chegada ao Laboratório | Montagem da Polissonografia | Sessão treino | Almoço | Intervalo de retenção (Sono ou Vigília) | Sessão teste
12h | 12h30m | 13h | 13h30m | 13h45m | 15h15m | 16h
Never Enough Sleep: A Brief History of Sleep Recommendations for Children

AUTHORS: Lisa Anne Matricciani, BA, Tim S. Olds, PhD, Sarah Blunden, PhD, Gabrielle Rigney, BA(Hons), and Marie T. Williams, PhD

![Graph showing historical trends in recommended sleep duration compared to actual sleep duration. The graph displays data points from 1900 to 2000, with a downward trend indicating a decrease in recommended sleep duration over time. Open circles represent the recommended sleep duration, and solid circles show the actual sleep duration. The dotted line indicates the decrease in recommended sleep duration.]

**FIGURE 2**
Historical trends in recommended sleep (minutes per day, adjusted for age). Open circle and solid line indicate trends in recommended sleep duration. Filled circles and dotted line indicate actual sleep duration.
610 adolescents starting classes at 7:30am

<table>
<thead>
<tr>
<th>Commuting to school</th>
<th>Sleep onset time</th>
<th>Wake up time</th>
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<td>1-12 min.</td>
<td>23:06</td>
<td>6:51</td>
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*Chronobiology International*, 2014; 31(1): 87–94
610 adolescents starting classes at 7:30am

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610 adolescents starting classes at 7:30am

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<td>23:03</td>
<td>6:31</td>
</tr>
<tr>
<td>23-60 min.</td>
<td>22:57</td>
<td>6:20</td>
</tr>
</tbody>
</table>
# School Schedules Affect Sleep Timing in Children and Contribute to Partial Sleep Deprivation

Tâmilo Stella Anacleto¹, Taisa Adamowicz¹, Laura Simões da Costa Pinto⁴, and Fernando Mazzilli Louzada¹

## MIND, BRAIN, AND EDUCATION

<table>
<thead>
<tr>
<th>Table 2</th>
</tr>
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<tbody>
<tr>
<td>Sleep Parameters According to School Schedule and Days of the Week</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sleep days</th>
<th>School days</th>
<th>Weekend</th>
<th>F; p*</th>
<th>E; p*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MG</td>
<td>AG</td>
<td>MG</td>
<td>AG</td>
</tr>
<tr>
<td>Sleep onset*</td>
<td>10:12 p.m. (54)</td>
<td>11:31 p.m. (54)</td>
<td>11:05 p.m. (50)</td>
<td>11:58 p.m. (57)</td>
</tr>
<tr>
<td>Sleep offset*</td>
<td>6:28 a.m. (18)</td>
<td>8:57 a.m. (58)</td>
<td>8:31 a.m. (37)</td>
<td>9:09 a.m. (66)</td>
</tr>
<tr>
<td>Sleep duration (min)b</td>
<td>473.78 (50.93)</td>
<td>538.42 (41.84)</td>
<td>534.60 (44.79)</td>
<td>524.37 (53.36)</td>
</tr>
</tbody>
</table>

**Note.** AG = students who attended classes in the afternoon; MG = students who attended classes in the morning.

*Data are expressed as mean (h:min) (SD—minutes). bData are expressed as mean (min) (SD—minutes).
*Two-way ANOVA.
A ESCOLA IDEAL

- Espaço e tempo para a sesta
Felipe Beijamini
Felipe Cini
Jefferson Souza Santos
Laura Simões
Lina Marins
Roberta Vicenzi
Sofia Pereira
Tâmile Anacleto
Thais Schaedler