2021 Bermuda 1-2 Sleep Survey Results

Phil Haydon

Rick Rohrer

Roy Guay

VIEWPOINT

Does Sleep Flush Wastes From the Brain?

Anthony L. Komaroff, MD
Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts.

Why do humans sleep? Most people spend one-third of their lives asleep. For most of human history, individuals have been much more vulnerable to enemies and predators when sleeping. But still, everyone sleeps and cannot help but do it. So, there must be a good reason for sleep, an evolutionary advantage.

Some Benefits of Sleep

One reason for sleeping may be to rest the brain and body. Nevertheless, most organs continue to work during sleep. In particular, the brain is highly active during sleep.[1] Sigmund Freud thought one purpose of sleep was to grapple with negative thoughts buried in the unconscious through dreams. Sleep definitely helps to consolidate memories and learning. Some have speculated that during sleep unused synapses are pruned, strengthening the rest of the synapses in the same way that pruning dead branches enhances the health of a rose bush. Together, these all might seem reason enough to sleep.

Glymphatic System

A bigger surprise was the discovery of the glymphatic system—first suggested in the 1980s[4] and identified definitively by Iliff and colleagues[2] in 2012. The glymphatic system is a drainage system that mingles "fresh" cerebrospinal fluid (CSF) with waste product–rich brain interstitial fluid (ISF) and flushes the fluid and waste products out of the brain and into the systemic circulation.

How the Glymphatic System Works to Flush Out the Brain

Fresh CSF, produced largely by the choroid plexus, travels to the subarachnoid space. Then the CSF enters the periarterial part of the glymphatic system (a tube that is wider than the artery, like a collar around the artery through which fresh CSF flows). Thus, the outer wall of the artery also is the inner wall of the periarterial glymphatic vessel.

The outer wall of a glymphatic vessel is a truly novel structure. It is composed of the flat end feet of

β-Amyloid accumulation in the human brain after one night of sleep deprivation

Ehsan Shokri-Kojori[a,1], Gene-Jack Wang[a,1], Corinde E. Wiers[a], Sukru B. Demiral[a], Min Guo[a], Sung Won Kim[a], Elsa Lindgren[a], Veronica Ramirez[a], Amna Zehra[a], Clara Freeman[a], Gregg Miller[a], Peter Manza[a], Tansha Srivastava[a], Susan De Santi[b], Dardo Tomasi[a], Helene Benveniste[c], and Nora D. Volkow[a,1]

[a]Laboratory of Neuroimaging, National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Bethesda, MD 20892; [b]Piramal Pharma Inc., Boston, MA 02108; and [c]Department of Anesthesiology, Yale School of Medicine, New Haven, CT 06510

Edited by Michael E. Phelps, University of California, Los Angeles, CA, and approved March 13, 2018 (received for review December 14, 2017)

The effects of acute sleep deprivation on β-amyloid (Aβ) clearance in the human brain have not been documented. Here we used PET and ^{18}F-florbetaben to measure brain Aβ burden (ABB) in 20 healthy controls tested after a night of rested sleep (baseline) and after a night of sleep deprivation. We show that one night of sleep deprivation, relative to baseline, resulted in a significant increase in Aβ burden in the right hippocampus and thalamus. These increases were associated with mood worsening following sleep deprivation, but were not related to the genetic risk (APOE genotype) for Alzheimer's disease. Additionally, baseline ABB in a range of subcortical regions and the precuneus was inversely associated with reported night sleep hours. APOE genotyping was also linked to subcortical ABB, suggesting that different Alzheimer's disease risk factors might independently affect ABB in nearby brain regions. In summary, our findings show adverse effects of one-night sleep deprivation on brain ABB and expand on prior findings of higher Aβ accumulation with chronic less sleep.

of sleep to Aβ clearance from the brain and the regional specificity of such effects.

Here we evaluated the effects of one-night SD on ABB in healthy controls to investigate whether sleep affects clearance of Aβ from the human brain. For this purpose, we used positron emission tomography (PET) with which it is now possible to measure ABB in the living human brain. There are several validated PET radiotracers for this purpose, including ^{18}F-florbetaben (FBB) (22, 23). It is believed that such radiotracers predominantly bind to insoluble $A\beta_{42}$ plaques (24–27), but there is recent evidence that they also bind to soluble $A\beta_{42}$ forms (28). Thus, we reasoned that PET and FBB could be used to detect increases in ABB because of acute SD, directly in the human brain (3). First, we aimed to assess the effect of one-night SD on brain ABB with PET-FBB in healthy controls ($n = 20$, 22–72 y old, 10 females) (Table S1), and compared the measures to baseline brain ABB captured at the same time of the day but

Sleep Movement

Genetic factors influence how often people move their arms and legs while they're sleeping.

Richard, based on your genetics, you're likely to move **about an average amount** during sleep.

Several studies have shown that a genetic variant is associated with how much people move their arms and legs in their sleep. One of these studies found that people with your genetic result tend to move about 12 times an hour during sleep. On average, people tend to move about 13 times an hour.

Number of sleep movements per hour

What you can do

Sleep movements aren't a problem for most people. But for some, frequent movements can make it hard to get restful sleep. If you think frequent movements may be disrupting your sleep, consider talking to a healthcare professional.

Response Rate

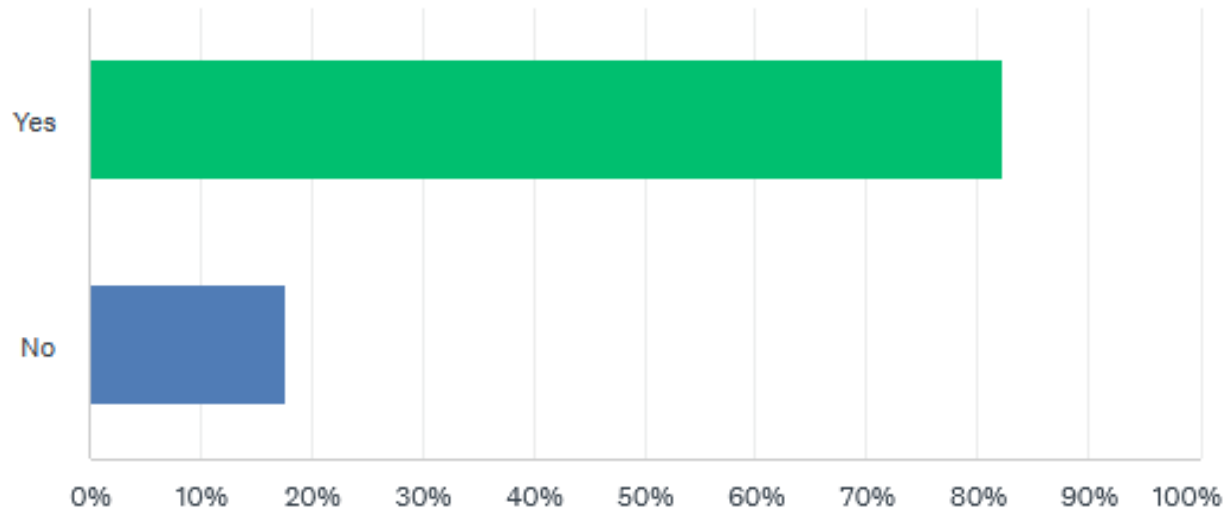
- 17 of 21 skippers arriving in Bermuda = 81%

Q1

Customize Save as

Did you prepare a sleep strategy before leaving for the race?

Answered: 17 Skipped: 0

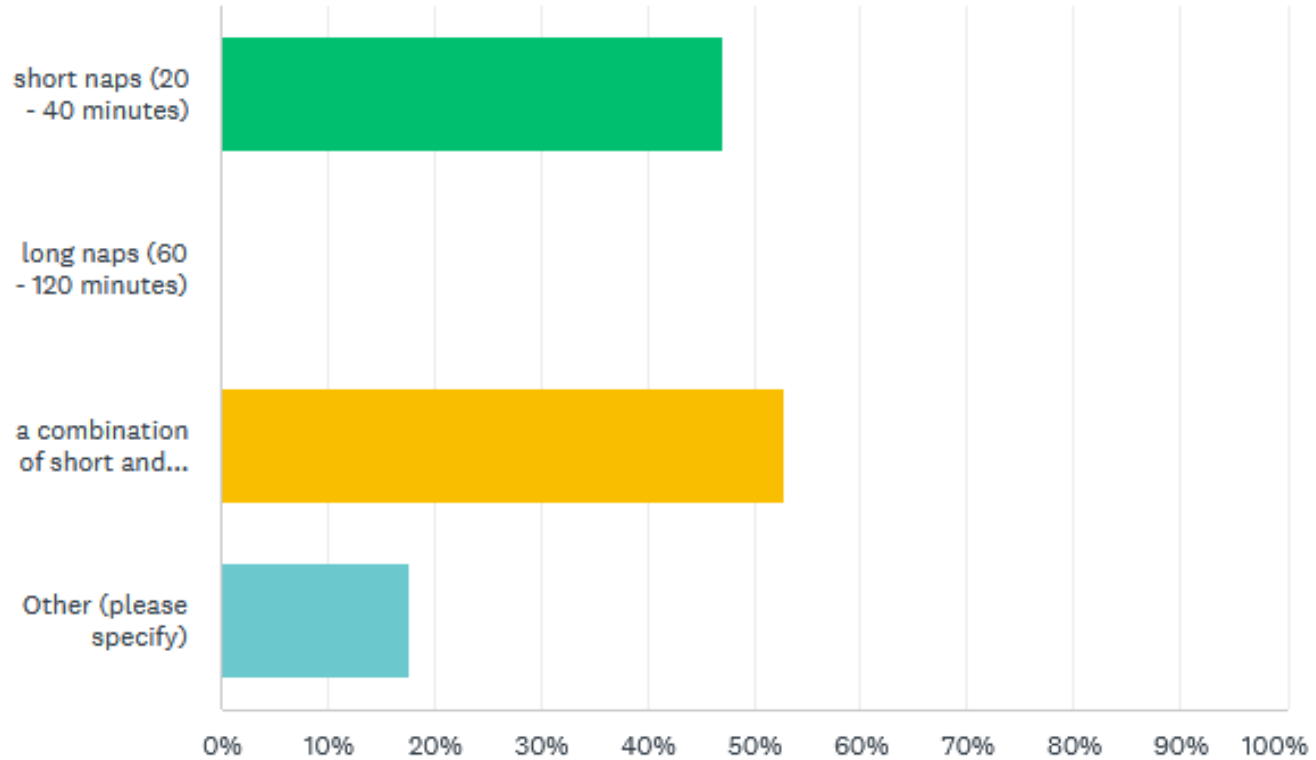


Q2

Customize Save as

Did you take predominantly:

Answered: 17 Skipped: 0



Comments Regarding Question 2

Showing **3** responses

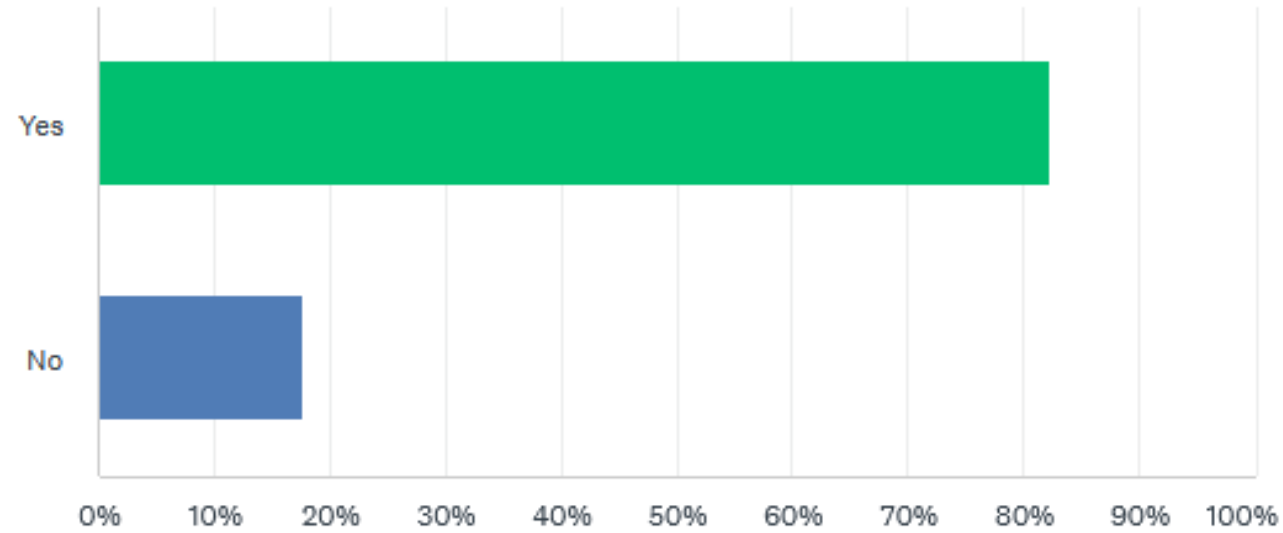
☐	Plus one 1 hour and 15 min continuous nap per day 7/27/2021 4:39 PM	View respondent's answers	Add tags
☐	Short naps north of the gulfstream. Longer south of GS 7/27/2021 1:39 PM	View respondent's answers	Add tags
☐	mostly short naps but also one solid sleep from 3 - 5 AM 7/27/2021 1:25 PM	View respondent's answers	Add tags

Q3

Customize | Save as

Did you use a timer or alarm to wake you from your naps?

Answered: 17 Skipped: 0

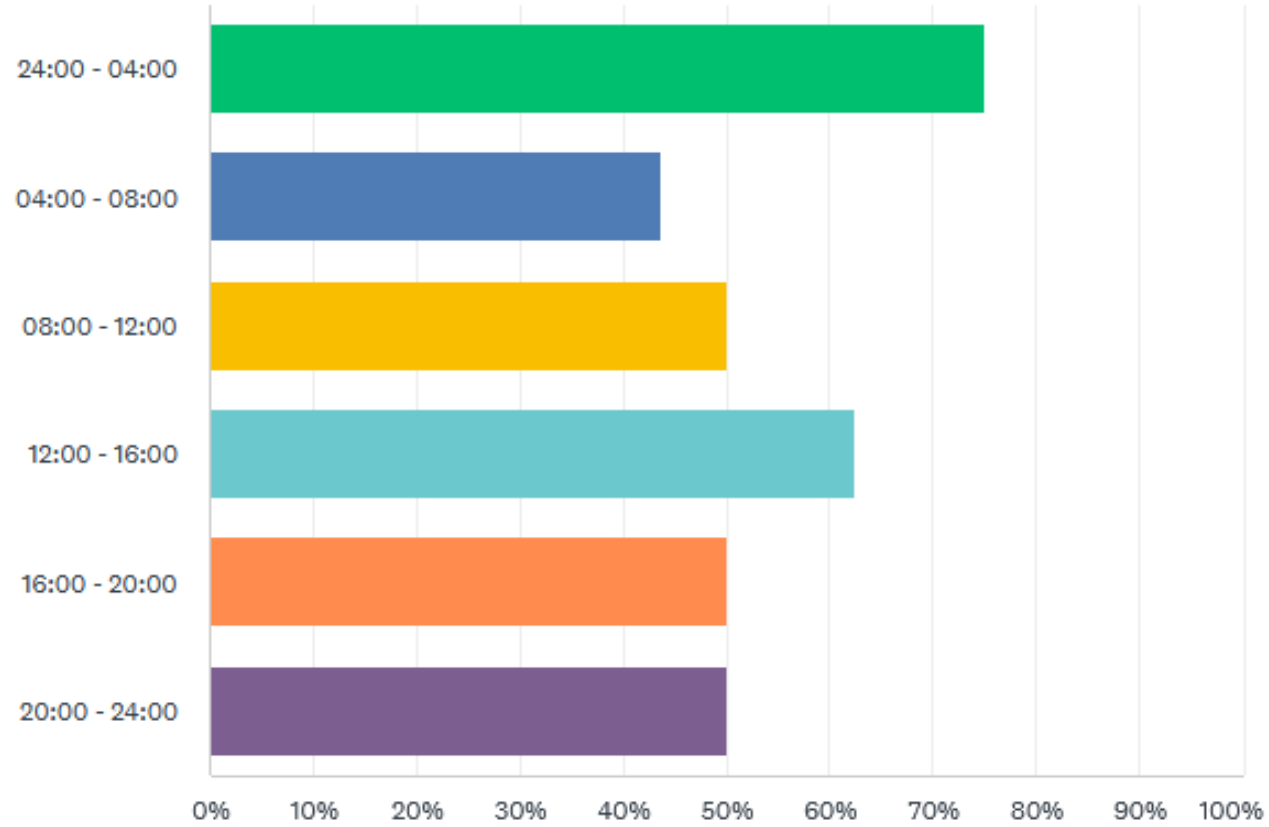


Q4

Customize Save as

What times of day did you generally nap?

Answered: 16 Skipped: 1

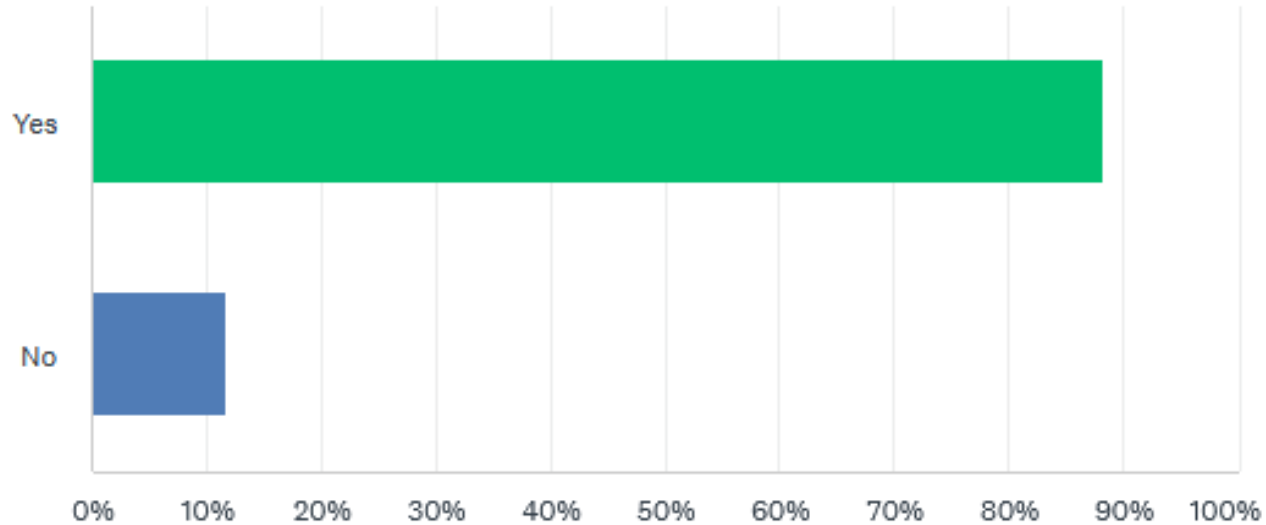


Q5

Customize Save as

At the start of the single-handed race, did you nap before crossing the continental shelf?

Answered: 17 Skipped: 0

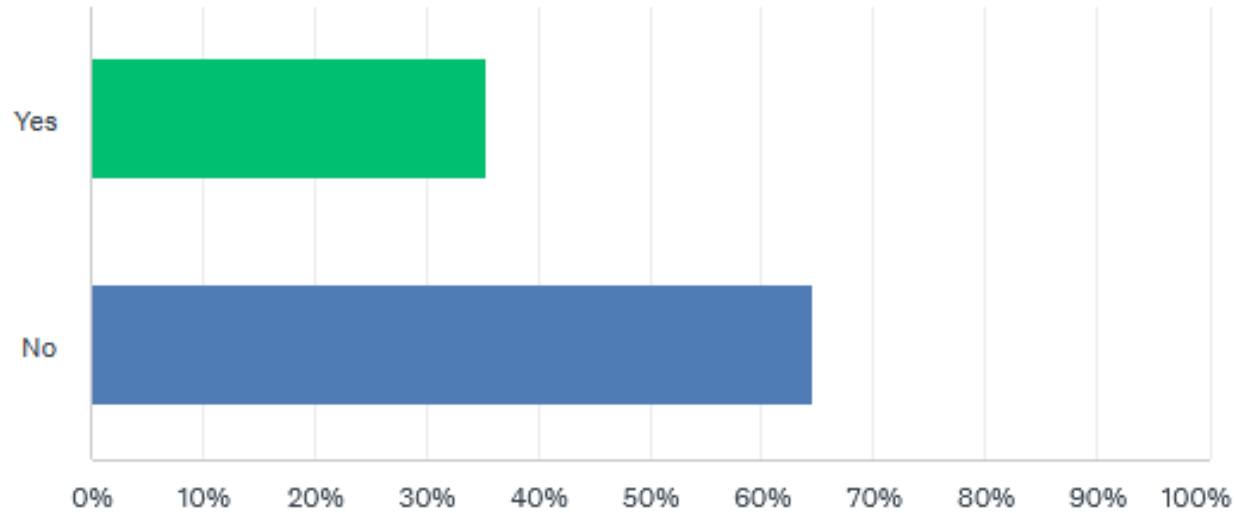


Q6

Customize Save as

Did you experience any effects of sleep deprivation in this race?

Answered: 17 Skipped: 0

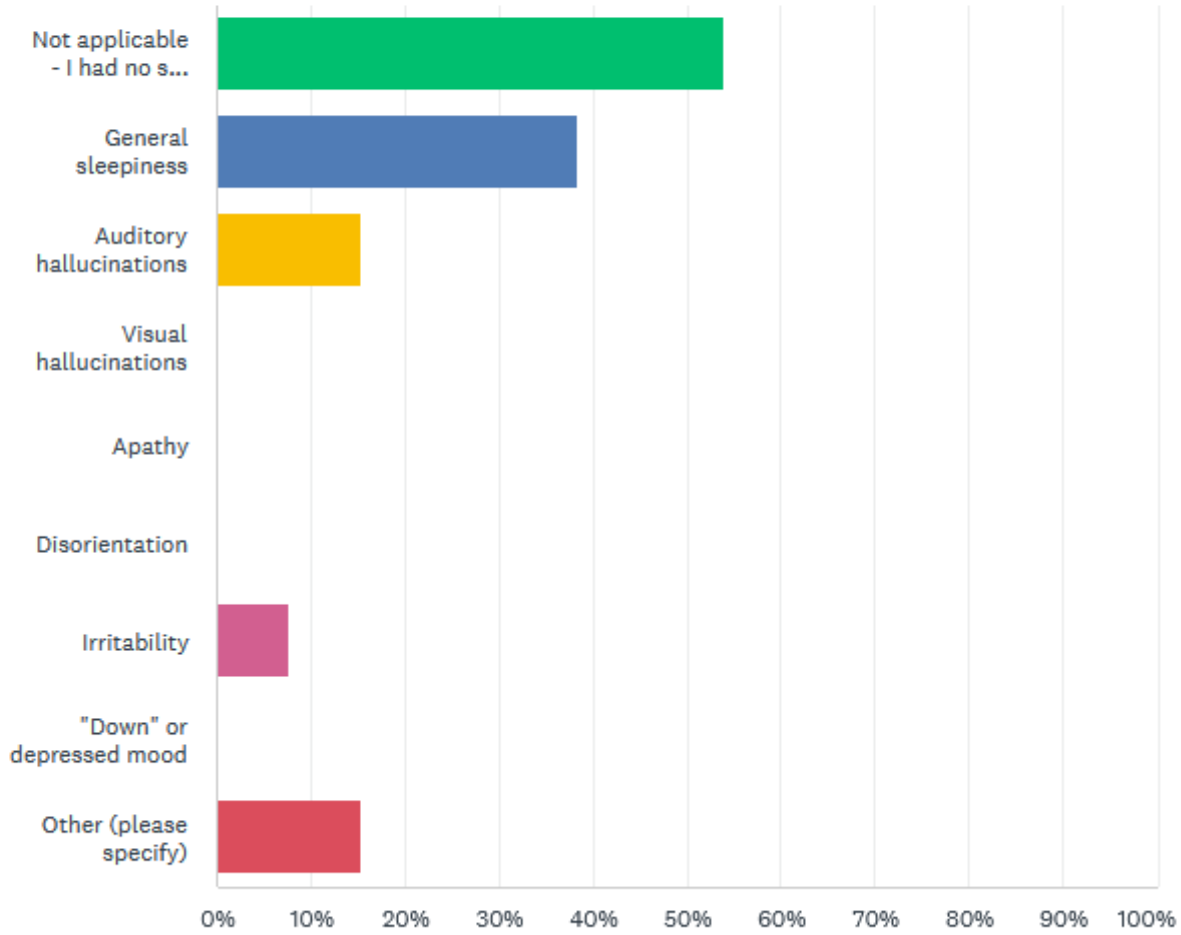


Q7

Customize Save as

If so, what effects did you experience (check all that apply)

Answered: 13 Skipped: 4



Comments Regarding Question 7

Showing **2** responses

anxious but confident

7/27/2021 2:46 PM View respondent's answers Add tags

one episode of sleep walking: from beanbag on the cabin sole to the nav station, where i woke up in front of the chartplotter

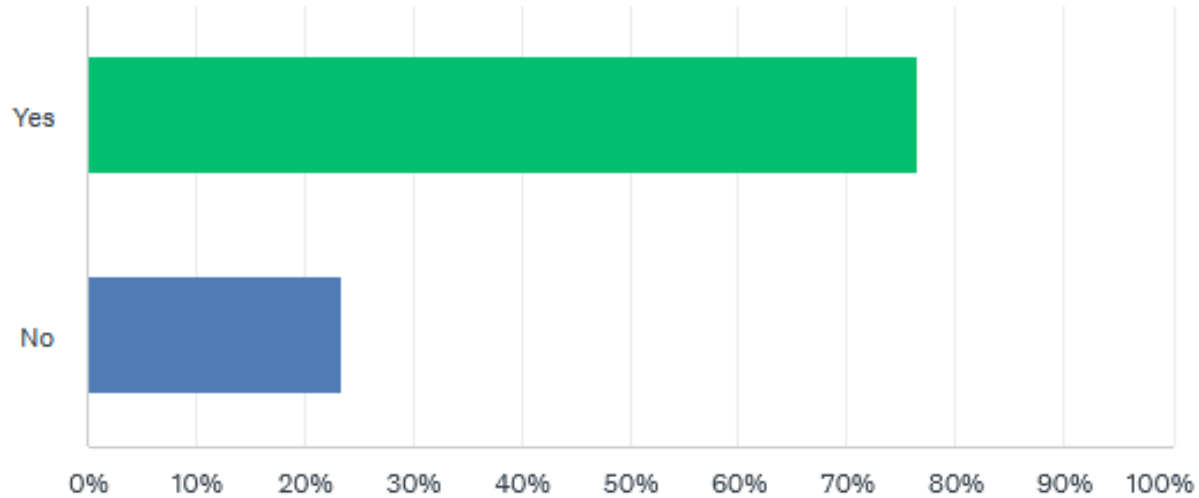
7/27/2021 1:25 PM View respondent's answers Add tags

Q8

Customize Save as

Aside from this race, have you ever experienced effects of sleep deprivation while sailing?

Answered: 17 Skipped: 0

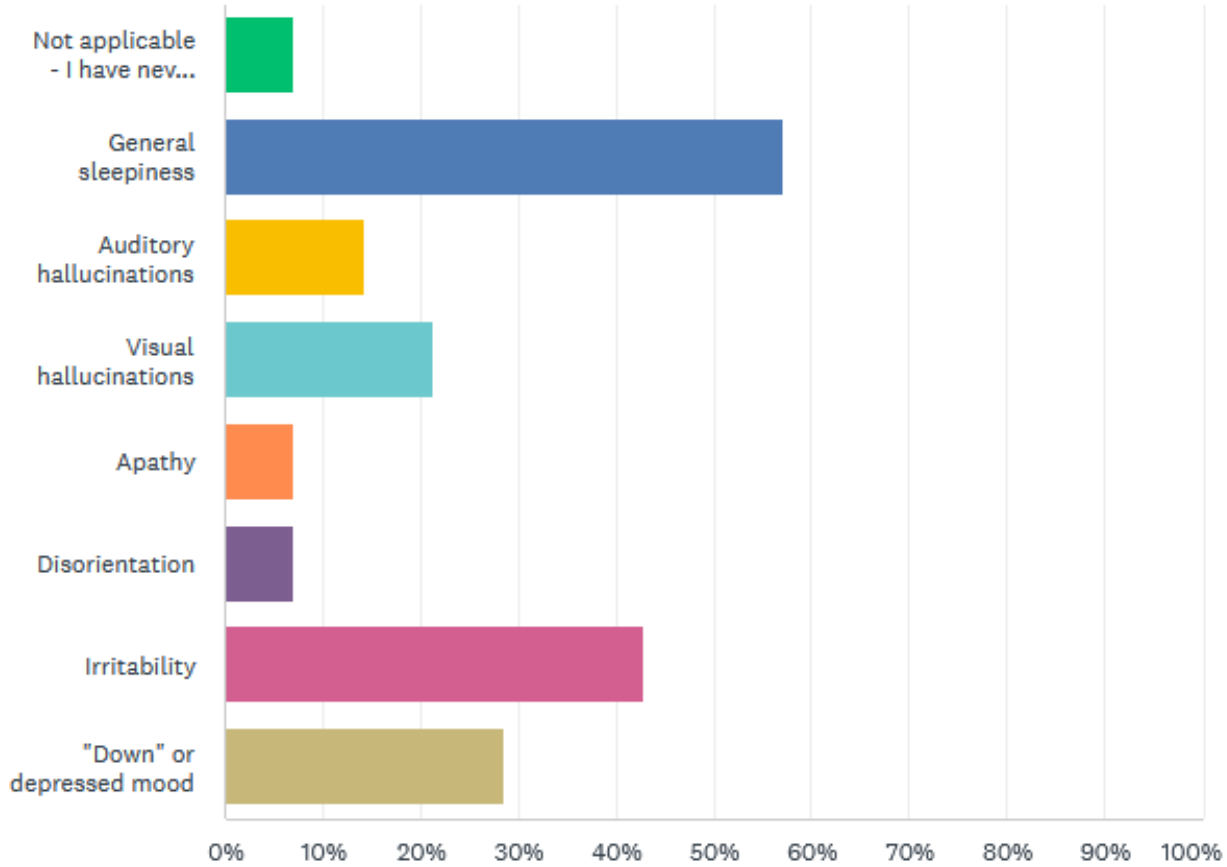


Q9

Customize Save as

If so, what effects have you experienced (check all that apply)?

Answered: 14 Skipped: 3



Comment Regarding Question 9

Showing **1** response

Did not trust instruments. 2001 was a slow race, nearly 9 days

8/7/2021 7:04 AM

View respondent's answers

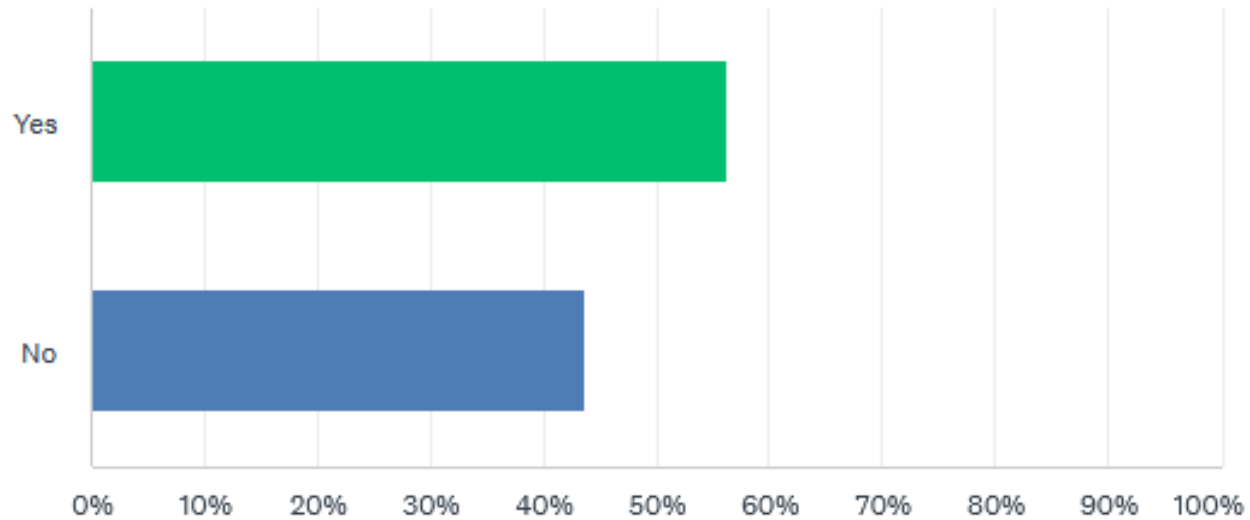
Add tags

Q10

Customize | Save as

Do you have any comments to share, or other sleep issues that you'd like to see addressed? Please note them here - and thanks for participating!

Answered: 16 Skipped: 1



Comments 1 - 5 Regarding Question 10

Showing **9** responses

From my reading and experience while short five snd ten minutes naps may refresh fir brain health it's necessary to have ninety minute naps snd at least one three hour nap a day.

7/28/2021 10:25 AM View respondent's answers Add tags

Sleep 20 minutes on the hour within 25 miles of shore. Use digital kitchen timer as alarm.

7/27/2021 8:03 PM View respondent's answers Add tags

In preparation for the race, a week before the start I brake my sleep pattern in two sessions by waking up during the night and taking a long nap in the afternoon

7/27/2021 4:39 PM View respondent's answers Add tags

Stay only in REM sleep, manage when it is safe to sleep, manage your sleep deprivation so you don't do an Alex Thomson, I arrived more rested that any other race to Bermuda, Food is important and helps with sleep. If you get 20-30 min nap and wake and it's OK to sleep another 20-30 min you should do so. I did not take drugs, interested if others did. Interested in the use of coffee, redbull etc. Happy to help more Peter B..

7/27/2021 2:55 PM View respondent's answers Add tags

Having on board good systems to monitor marine traffic as well as a robust and good functioning autopilot set up in wind vane mode and approprioate alarms on all systems such as AIS, Radar and wind shifts and confidently knowing how to use them is very important to give one confidence during nap times. Until the continental shelf passes naps would be only 15-20 min except when marine traffic and fishing gear is present, then no napping. Once past the shelf extended sleep times up to 90 min was ok, but it depends on the environmental conditions and marine traffic.

7/27/2021 2:46 PM View respondent's answers Add tags

Comments 6 – 9 Regarding Question 10

Sleep and managing sleep were probably the single most important factor for me. In both legs I was able to pass many of the boats in the last day which I in pet attribute to managing sleep better (and thus sailing faster/more focused) than my opponents

singlehanding on the way back, i underestimated how challenging the last 50 nm would be; doubt that this was such an issue for those w crew

7/27/2021 1:25 PM View respondent's answers Add tags

my experience is that i manage to take sufficient naps over a 24 hour period to make sleep a non issue . When things are going well i try to stay ahead on my sleep

7/27/2021 12:58 PM View respondent's answers Add tags

I made sure to give myself permission to nap. most of them were 2-3 hours, but I never slept more than 4. I felt it was important to be well rested heading to the shelf and for the last 50 miles of the race.

7/27/2021 12:34 PM View respondent's answers Add tags

Commentary from 11-6-21 skippers meeting

- This stuff is important!
- There are common themes but huge variability in personal needs – so hearing about a variety of experiences is helpful
- We need info on diet (hydration, caloric intake, caffeine, etc)
- There is enthusiasm for extending info-gathering in the 2023 event:

  sleep diaries?

  wearable sleep trackers (apple, fitbit, polar, etc)?