The Sleep Aid Potential and Mineral Content of Pistachio Nuts

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ABSTRACT

The world is facing a sleep-loss epidemic [1]. As impaired sleep increases the risk of disease and early mortality, and synthetic sleep medications are often linked to negative health consequences, there is a need for safe sleep aid alternatives [2,3]. Although pistachios contain minerals and other compounds linked to sleep improvements [4,5,6,7], no studies have investigated how pistachio intake affects sleep. In this study, pistachios of Iranian origin were evaluated for their mineral content and for their effects on sleep, as Iran is one of the largest producers of pistachios in the world [8]. Pistachios (25 g x 7) were given to participants (n=21; ages 22-62 years) to determine whether consumption before bedtime improved sleep quality, onset, duration and duration of nightly disturbances. Subjects were assessed for 1 week with and without pistachio intake using objective and subjective measures based on a sleep diary and a phone app (sleepcycle.com). The magnesium, iron, zinc and copper content of the Iranian pistachios were assessed using atomic absorption spectroscopy (AAS) and compared to the mineral content of pistachios of California and UK origin to assess variation between sources. Differences were found in participants sleep before and after pistachio consumption for all parameters measured, with sleep onset and duration improving significantly ($P<0.01$; $P<0.05$). When considering the sex of the participants, only females had significant improvements for sleep onset and duration of nightly awakenings ($P<0.01$; $P<0.05$), and no age effect was found. Mineral analysis indicated Iranian pistachios to be reasonably high in copper (0.25±0.01mg/25g) and zinc (0.33±0.05mg/25g). However, significantly higher levels of zinc were observed in Californian pistachios ($P<0.01$). These results indicate that intake of pistachios of Iranian origin may improve certain sleep parameters significantly and mineral content may contribute to these effects. However, future studies should investigate other chemical constituents, sources and efficacy further to confirm the sleep aid value of pistachios.

MATERIAL & METHODS

AAS Pistachio Sample Preparation:

Pistachios from Iran were ground in a pestle and mortar ready for AAS analysis (figure 1) (left). Pistachios from California and the UK were analysed for comparison. Samples were placed in a 100ºC Gallenhamp Hotbox over to remove moisture and were then ashed in a 600ºC PYRO high-temp micro-wave muffle furnace.

14-dat Study Pistachio Sample Preparation:

Iranian pistachios were measured out into 25g portions (figure 1) (right). Seven portions were given to each participant.

Figure 1. Ground pistachios ready for AAS analysis (left) and 25g pistachio portions for 14-day sleep study (right)

AAS:.

Standard concentrations for magnesium, iron, zinc and copper were made. Spectra AAS machine set with a lamp current of 4.0mA for all samples and wavelengths 202.6nm (magnesium), 248.3nm (iron), 213.9nm (zinc) and 324.8nm (copper). The machine measured each standard and then each mineral solution and calculated the amount of each mineral (mg/L) for each sample.

14-day Sleep Study

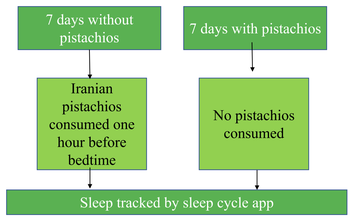

Figure 2. 14-day sleep study involving 21 male/female participants

Figure 3. Example screenshots of sleep cycle app data

RESULTS

Mineral quality of pistachios from different regions

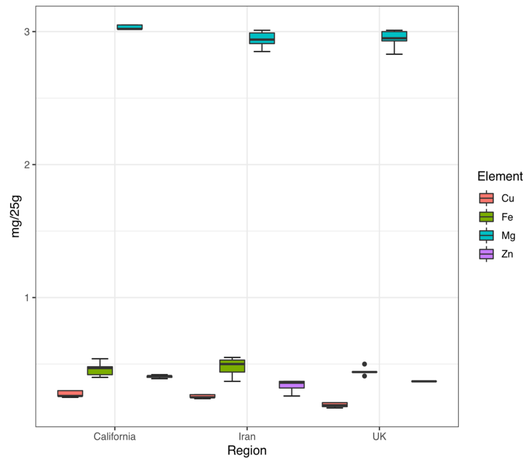

Figure 4. Copper, iron, magnesium and zinc content of pistachios from three different regions

Sleep onset before and after pistachio consumption

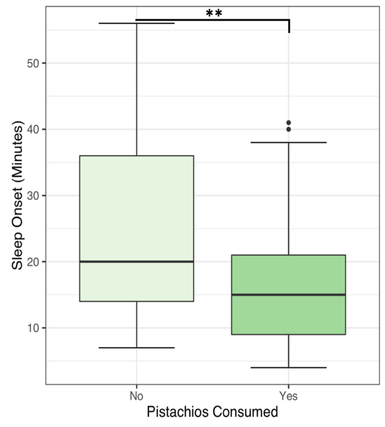

Figure 5. Participants sleep onset before and after pistachio consumption. No pistachios M=27±13.4 minutes; pistachios M=19±11.1 minutes. Asterix indicate pairwise significance (paired t-test) $^{**}P$ <0.01.

Sleep duration before and after pistachio consumption

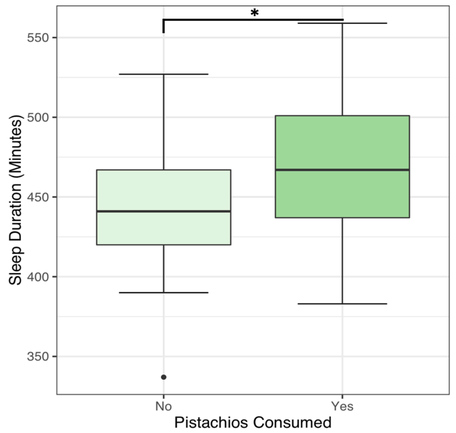

Figure 6. Participants sleep duration before and after pistachio consumption. No pistachios M=441±42.8 minutes; pistachios M=471±44.8 minutes. Asterix indicate pairwise significance (paired t-test) $^{*}P$ <0.05.

Gender comparisons of sleep parameters

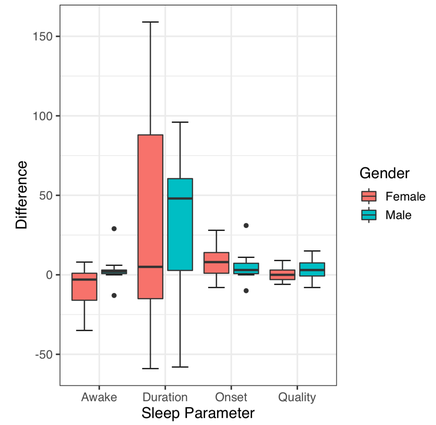

Figure7. Differences between genders in participants sleep parameters measured before and after pistachio consumption.

CONCLUSIONS

- **Iranian pistachios were reasonably high in zinc and copper, but Californian pistachios had the highest overall mineral quality.**
- **Consumption of Iranian pistachios improved sleep onset and duration with significant effect.**
- **When analyzing differences between participant genders, pistachio consumption had the greatest effect on females sleep, with sleep onset and duration of nightly awakenings improving significantly**
- **Future work should focus on testing various other pistachio substances which may have contributed to their sleep improving effects.**

ACKNOWLEDGEMENTS

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