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File: ■ Lavender (*Lavandula angustifolia*, Lamiaceae)

■ Sleep Quality

■ Aromatherapy

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RE: Lavender Aromatherapy Improves Sleep Quality in College Students

Lillehei AS, Halcón LL, Savik K, Reis R. Effect of inhaled lavender and sleep hygiene on self-reported sleep issues: A randomized controlled trial. *J Altern Complement Med.* 2015;21(7):430-438.

Sleep problems are associated with numerous health concerns such as anxiety, depression, cardiovascular disease, hypertension, inflammation, obesity, impaired glucose tolerance, and diabetes. Essential oils, such as lavender (*Lavandula angustifolia*, Lamiaceae) flower, which have sedative or hypnotic properties, have been evaluated for sleep therapy. The purpose of this randomized, double-blind, placebo-controlled study was to evaluate the effect of inhaled lavender essential oil on sleep quality and quantity in college students.

Students (n = 79, aged 18-36 years) with self-reported sleep issues (difficulty falling asleep, frequent awakenings during the night, or daytime sleepiness) were recruited from the University of Minnesota, Minneapolis, Minnesota, campus. Students were excluded if they were pregnant, working a night shift, or used prescription sleep medication. All subjects received sleep hygiene information based on the National Institutes of Health (NIH) recommendations—specifically, (1) maintain a regular sleep schedule; (2) avoid fluid intake before bed and food, caffeine, alcohol, and nicotine late in the day; (3) create a good sleeping environment (e.g., wear ear plugs and a sleep mask, and avoid screens and texting); (4) create a relaxing bedtime routine; (5) keep up with school work; and (6) exercise regularly.

Each 3-cm adhesive patch contained a 1-cm disc of absorbent material impregnated with 55 µL lavender oil (supplied by Wyndmere Naturals, Inc.; Minnetonka, Minnesota) or left blank (placebo). Based on the gas chromatography-mass spectrometry (GC-MS) analysis provided to the principal investigator, "the essential oil used was chemically consistent with the International Organization for Standardization (ISO) for *L. angustifolia*." The patch (supplied by Bioesse Technologies, LLC; Minnetonka, Minnesota) had a skin-barrier backing to prevent skin absorption of the essential oil and a time-release function to last 6-8 hours. For 5 consecutive nights, subjects applied a patch on their mid-upper chest at bedtime and removed it in the morning.

Sleep quantity was measured via a Fitbit® tracker (to measure movement during sleep) and sleep diary, and sleep quality was measured with the Pittsburgh Sleep Quality Index (PSQI) and the NIH Patient-Reported Outcomes Measurement Information System (PROMIS) sleep

disturbance short form. Subjects also completed a sleep hygiene survey (SHS). Assessments were made at baseline, at day 5, and 2 weeks after the completion of treatment.

The majority of the subjects were white (67%) and female (69%); both treatment groups had similar demographics. There were technical issues with the Fitbit, resulting in unacceptable levels of missing data (only 14% of the data were recovered). The patches were reported to have fallen off during sleep in 37% of the person nights ($n = 146$); however, the data analysis indicated that the patch falling off was not a significant covariate. Based on SHS scores, sleep hygiene was better during the 5-day treatment phase compared to baseline and post-treatment in both groups; there were no significant differences in SHS scores between groups at any time point. Based on the PSQI, both groups had poor sleep before the intervention, and there was no difference between groups at baseline.

Post-treatment, sleep quantity did not significantly differ between groups; both groups had a significant decrease in awakenings ($P = 0.02$) and increase in being able to fall asleep easily ($P = 0.001$).

The PSQI and PROMIS assessments indicated that sleep quality was significantly better for the lavender group compared with the sleep hygiene-only group at day 5 ($P = 0.01$ and $P = 0.04$, respectively) and at follow-up ($P \leq 0.001$ and $P = 0.007$, respectively). Better sleep hygiene was also associated with better sleep quality but to a much lesser degree at day 5 ($P = 0.02$ and $P = 0.03$, respectively) and at follow-up ($P = 0.03$, PROMIS only). The lavender group had a clinically significant improvement in sleep quality, while there was no clinically significant change in sleep quality in the sleep hygiene-only group. The lavender group had less daytime fatigue at day 5 and follow-up ($P = 0.02$ and $P = 0.009$, respectively) and was more likely to wake refreshed at day 5 ($P = 0.01$). The 4 adverse event reports (minor skin irritation, each lasting 1 night) were attributed to the patch adhesive.

The authors conclude that, in college students with self-reported sleep issues, lavender essential oil inhalation improved sleep quality, and the effect persisted for 2 weeks after lavender aromatherapy was suspended. "The persistent effect of lavender on sleep quality at two-week follow-up suggests a re-balancing or long-acting effect on the sleep cycle, although the exact mechanism of action is unknown." The limitations of the study were the lack of statistical power to evaluate potential differences due to race or ethnicity, the loss of objective Fitbit data regarding sleep quantity, the subjective self-reporting nature of the data, the lack of standardized dosages due to the poor patch adherence, and the potential failure of subject blinding due to the lavender scent. The authors conclude that this trial "supports the use of lavender and sleep hygiene as safe, accessible, and effective interventions for self-reported sleep issues in college students. Further research to study their effect on other populations and additional studies exploring the duration of intervention effects are needed."

—*Heather S. Oliff, PhD*

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