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Original Paper

Mastic-revised1.pdf

52/100

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The effect of chewing regular and mastic gum on brainwave activity, heart rate, mental and mood state. A pilot study by Stella Magkou investigates short-term effects of chewing regular sugar-free gum versus natural mastic gum in 30 healthy 15-year-old students. Using a smartphone camera-based heart rate app, a consumer EEG headband (BrainBit), and a Visual Analogue Scale for vigor and affect, the study reports no heart-rate change, an increase in alertness (global vigor) overall and within the mastic group, and multiple EEG rhythm changes, with indications (but limited between-group confirmation) that mastic gum may yield stronger effects. The work is exploratory, with notable limitations in device validity, blinding, controls, and multiple-comparison handling.

| Category | Score | Reason |
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| Abstract | 6 | The abstract is largely self-contained and states objectives, methods, and main findings; however, it cites paired t-tests and t-tests whereas the methods section reports non-parametric tests, and some claims (e.g., greater benefits for mastic) overreach the statistical support. |
| Recency | 6 | The bibliography blends classic studies with some recent sources (2021–2023) but also relies on older work and non-peer-reviewed websites; additional recent peer-reviewed literature on EEG during mastication and adolescent psychophysiology would strengthen currency. |
| Scope | 8 | The study covers outcomes named in the title and keywords (heart rate, brainwaves, mental and mood states) and compares regular versus mastic gum within a pilot framework. |
| Relevance | 6 | The question is relevant and practical, with modest novelty in focusing on mastic gum; however, the contribution is constrained by small sample size, consumer-grade tools, and limited control conditions. |
| Factual Errors | 5 | There is a concrete inconsistency between the abstract (claims of t-tests) and the methods/results (non-parametric Wilcoxon/Mann–Whitney), and several statistical reporting details (one-tailed hypotheses |

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| Factual Errors | 5 | parametric Wilcoxon/Mann-Whitney), and several statistical reporting details (one-tailed hypotheses and Z signs) are confusing or insufficiently justified. |
| Language | 5 | Readable but with grammatical/typographical issues (e.g., tense inconsistency, minor typos such as 'tosignificant' and 'stuff' vs 'staff') and occasional ambiguous phrasing that is atypical for formal scientific style. |
| Formatting | 6 | Overall structure is present, but formatting is inconsistent (stray symbols, inconsistent notation for Greek letters, and section labeling irregularities) relative to standard manuscript conventions. |
| Suggestions | 7 | Potentially novel angle (mastic gum) is promising; to advance, implement a randomized double-blind crossover with a sham-chew and no-chew control, standardize pre-assessment rest, control chewing rate/force (e.g., metronome and force sensor), use validated HR/HRV devices and artifact-robust EEG (or add EMG channels and artifact rejection), include objective cognitive tasks, assay salivary cortisol, and correct for multiple comparisons; characterizing mastic gum hardness and chemical constituents would also add mechanistic insight. |
| Problems | 6 | The study addresses a gap regarding mastic gum but leaves key limitations unresolved (device validity, artifacts, blinding, control conditions); practical significance of several statistically significant EEG changes is unclear relative to measurement variability. |
| Assumptions | 4 | Assumptions that a smartphone heart-rate app and consumer headband accurately capture physiological changes and 'mental state' are insufficiently justified; time-of-day and prior activity effects are acknowledged but not controlled. |
| Consistency | 5 | Within-paper statements are partly aligned (e.g., null heart-rate effect), but claims of stronger mastic effects are not consistently supported by between-group analyses; statistical methodology descriptions are inconsistent across sections. |
| Robustness | 4 | Results appear sensitive to measurement setup (chewing artifacts, non-uniform EEG durations, small n) and contextual factors (time-of-day, baseline arousal); limited sensitivity analyses and no replication cohort. |
| Logic | 6 | Conclusions about increased alertness are cautiously framed and largely follow the data, but inferences about mastic's superiority exceed the strength of between-group statistics and are vulnerable to multiple-testing inflation. |
| Statistical Analysis | 6 | Appropriate non-parametric tests were chosen after normality checks, and some effect sizes and CIs are reported; however, one-tailed tests lack clear a priori justification, multiplicity across many outcomes/timepoints is not adjusted (e.g., Holm/Benjamini-Hochberg), and repeated-measures structure would be better handled with Friedman tests (plus Dunn-Holm post hocs) or mixed-effects |

models. Reporting of test statistics could be more complete and standardized.

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| Controls | 3 | No sham-chew or no-chew condition, partial blinding only, and unequal EEG window lengths reduce causal inference; limited device calibration or validation controls for HR and EEG metrics. |
| Corrections | 3 | No adjustment for confounders such as baseline arousal, time-of-day, prior activity, or chewing rate/force; ANCOVA or mixed models with covariate control would be more appropriate even in a pilot. |
| Range | 3 | Only one short chewing duration (3 minutes), a single session, and adolescent participants limit the range; response curves versus duration/intensity and broader populations are not explored. |
| Collinearity | N/A | No multivariable regression or feature modeling was conducted; collinearity assessment is not applicable. |
| Dimensional Analysis | N/A | No equations are presented; dimensional analysis does not apply. |
| Ethical Standards | informational | Guardian consent was obtained, but there is no mention of institutional ethics/IRB approval for research with minors, data privacy procedures, or device safety assessments; these should be explicitly addressed. |
| Conflict Of Interest | informational | No conflicts are declared; given named commercial products (gum brands, devices, apps), the authors should disclose funding, material support, or relationships and affirm the absence of sponsorship influence. |
| Normalization | informational | Consider within-subject normalization (e.g., percent change or z-scores relative to baseline), standardized EEG artifact handling, and pre-specification of primary outcomes to reduce analytical flexibility. |
| Experimental Design | 4 | Randomization is stated, but design lacks double-blinding, sham/no-chew controls, standardized pre-test rest, and validated instrumentation; EEG window durations differ across timepoints, and chewing intensity/rate are uncontrolled. A crossover design with power analysis, pre-registration, artifact mitigation (EMG channels, ICA), validated HR/HRV sensors, and correction for multiple comparisons would substantially improve rigor and replicability. |