

The Effects of Caffeine on Premenopausal and Postmenopausal Women's Cepstral Measures of Voice

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Background Information

- Voice is a process by which air is pushed through the vocal folds, causing the vocal folds to vibrate, which results in voiced consonants and vowels.
- Alternations in the physiologic structures required for voice will lead to changes in voice production (Colton, Casper, & Leonard, 2006).
- Vocal fold hydration may aid in vocal fold vibratory action, while dehydration may have the adverse reaction (Verdolini & Titze, 1994).

Background Information

- Li, Zhang, Maytag, & Jiang (2015) note that one agent that contributes to vocal fold dehydration is caffeine. Caffeine is a mild diuretic (Insel, Ross, & McMahon, 2014) which has been suggested to affect voice production.
- Another factor associated with a change in voice production is the process of menopause. After menopause women have a lowering of fundamental frequency linked to an increase of mass of the vocal folds (Raj, Gupta, Chowdhury, & Chadha, 2010).
- Determining if caffeine has an adverse effect on the voice production of premenopausal and postmenopausal women is important to the continuing research on voice.

Purpose

- The purpose of this study was to determine if caffeine affected the cepstral measures of voice in premenopausal and postmenopausal women differently.

Research Question & Hypothesis

- Research Question:
 - Does caffeine affect the cepstral measures of voice in premenopausal and postmenopausal women differently?
- Hypothesis:
 - There will be no measurable difference in the cepstral measures of voice between the premenopausal and postmenopausal groups after caffeine has been ingested.

Participants

- Four premenopausal women aged 20-30 years old
 - Not on oral contraceptives
 - Normal menstrual cycle
- Four postmenopausal women aged 50-80 years old
 - Not on hormone replacement therapy
 - High BMI

Methods

- Procedures
 - Participants were instructed to not ingest caffeine for 24 hours prior to the study. No food or drink for 8 hours before the study.
 - The Rainbow Passage was the selected reading passage. The participants read the first two lines of the Rainbow Passage three times in a sound booth, and the researcher recorded each participant’s trials.
 - The participants drank 8 oz. of black coffee, waited 30 minutes, then re-read the Rainbow Passage in the manner previously noted.

Methods Continued

- Measures
 - The following measures were utilized to analyze the cepstral aspects of each participant’s voice:
 - Cepstral Peak Prominence (CPP)
 - Cepstral Peak Prominence fundamental frequency (CPP F₀)
 - Low/ High Spectral Ratio (L/H Ratio)
- Analysis
 - A series of Wilcoxon signed ranks tests were used to determine the statistical relevance of the cepstral measures.

Results

- For both the premenopausal and postmenopausal groups, there was no significant statistical difference in any of the cepstral measures analyzed.

Results

| Cepstral measure | Premenopausal women pre-caffeine (n=4) | | Premenopausal women post-caffeine (n=4) | | P Value |
|--------------------|---|---------|--|---------|---------|
| | Median | SD | Median | SD | |
| CPP | 6.4287 | .5792 | 6.0343 | .48195 | .465 |
| CPP F ₀ | 190.9445 | 32.6942 | 193.6723 | 29.2319 | .273 |
| L/H Ratio | 29.1093 | 1.8230 | 29.5345 | 1.8230 | .465 |

| Cepstral measure | Postmenopausal women pre-caffeine (n=4) | | Postmenopausal women post-caffeine (n=4) | | P value |
|--------------------|--|--------|---|--------|---------|
| | Median | SD | Median | SD | |
| CPP | 6.5288 | .7216 | 6.7640 | .9820 | .068 |
| CPP F ₀ | 192.5072 | 3.9278 | 194.4947 | 9.9232 | .465 |
| L/H Ratio | 27.5578 | 4.2539 | 28.3543 | 4.3605 | .715 |

Discussion

- Relation of data to the hypothesis
 - The null hypothesis stated that there would be no measurable difference in the cepstral measures of voice between the premenopausal group and the postmenopausal group after caffeine was ingested. The results of the current study support this hypothesis.
- Interpretation
 - Caffeine did not affect the cepstral measures in either group of participants. Caffeine not having a dehydrating effect on the vocal folds is one possible reason for these results.

Implications

- This study showed that ingesting caffeine 30 minutes prior to testing has no significant impact on vocal production in the tested populations.
- This study showed that ingesting caffeine 30 minutes prior to testing does not affect the vocal productions of premenopausal and postmenopausal women differently.
- This research is important for speech-language pathologists because it is still common practice to suggest lessening caffeine intake to assist with vocal health and vocal production (Erikson-Levendoski & Sivasankar, 2011).

Limitations

- This study had a limited sample size.
- This study lacked longitudinal data.
- This study consisted of testing at different phases of participants' menstrual cycles.
- This study consisted of testing at different times with different brews of coffee.
- A detailed medical history was not taken; therefore, participants with medical conditions that could impact voice were not excluded from this study.

Recommendations

- Future research into this topic should be completed. Suggestions for future research are as follows:
 - A larger sample size would provide for more normative data.
 - Testing on multiple occasions may provide a more representative sample of each participant.
 - Testing for the premenopausal women should occur at the same stage in each individual's menstrual cycle.
 - Participants with medical conditions that could affect voice should be excluded.

Selected References

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