A RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED TRIAL EXAMINING
THE ACUTE EFFECTS OF NICOTINE ON PHYSIOLOGICAL AND SUBJECTIVE
SEXUAL AROUSAL IN NONSMOKERS

Christopher B. Harte & Cindy M. Meston

THE UNIVERSITY OF TEXAS AT AUSTIN
Erectile Dysfunction (ED) is significantly higher in current smokers versus those who had never smoked (Dorey, 2001; Mannino et al., 1994)

- Odds ratio ≈ 1.5 – 2.0
SMOKING AND FEMALE SEXUAL DYSFUNCTION

- One study found positive relationship
  - Oksuz & Malhan, 2006
  - Smoking most important risk factor for FSD (Odds ratio=2.41)

- Others found no relationship
  - Cayan et al., 2004; Safarinejad, 2006

ACUTE EFFECTS OF SMOKING ON SEXUAL AROUSAL

- Only one study investigated acute effects of smoking on human sexual response (Gilbert et al., 1986)
  - Decrease in erection after smoking 3 cigarettes within 30 min compared to placebo
- Acute effects of smoking on female sexual arousal in humans or animals unknown

LIMITATIONS OF PRIOR RESEARCH

- Correlational
- Method of nicotine administration
- Smoking status
GOALS OF CURRENT STUDY

- Examine acute effects of isolated nicotine on:
  1. Physiological sexual arousal
  2. Subjective sexual arousal
  3. Concordance between physiological and subjective sexual responses
PARTICIPANTS

- 53 heterosexual participants (28 men, 25 women)
  - M = 21 years; Range: 18-27 years

- Screening criteria
  - <100 direct exposures nicotine
  - International Index of Erectile Function (IIEF) (Rosen et al., 1997)
    - IIEF erectile subscale > 25
  - Female Sexual Function Index (FSFI) (Rosen et al., 2000)
    - FSFI full scale > 26.5
    - FSFI arousal subscale > 4.0
  - Medications, medical conditions

DRUG ADMINISTRATION

- **Nicotine**: 6 mg total
  - One 4-mg and one 2-mg nicotine Nicorette® mint gum piece

- **Placebo**:
  - Two mint gum pieces

- All pieces individually wrapped with one peppermint gum stick
NICOTINE PHARMACOKINETICS

PROCEDURE – 2 COUNTER-BALANCED SESSIONS

20 min – Study Explanation

Gum Administration

20 min - Questionnaires

13 min - Film

Remove Gum

10 min – Questionnaires

30 min
MEASURES – SEXUAL AROUSAL

- Physiological sexual arousal
  - Women:
    - Vaginal Photoplethysmography
    - Vaginal Pulse Amplitude (VPA) in mv
  - Men:
    - Mercury in rubber strain gauge
    - Circumferential change in mm

- Subjective sexual arousal
  - Hand controlled device, recorded in 5 sec intervals

- Z-transformed within-subjects
MEASURES –
NICOTINE ADVERSE EFFECTS

- 10-item measure
  - Potential adverse effects:
    - Nausea
    - Light headedness
    - Throat irritation
  - Bogus adverse effects:
    - Fatigue
    - Dry eyes
    - Runny nose
QUESTION 1:

- Does nicotine acutely affect physiological sexual arousal in men and/or women?
RESULTS –
MALE PHYSIOLOGICAL AROUSAL

Nicotine
Placebo

NEUTRAL
PETTING
ORAL SEX
INTERCOURSE
ENTIRE EROTIC
RESULTS –
MALE PHYSIOLOGICAL AROUSAL

Condition X Film interaction, $F(1, 19) = 5.77, p = .03$

$p < .001$

![Graph showing physiological sexual arousal](image-url)
RESULTS – MALE PHYSIOLOGICAL AROUSAL

23% reduction

\[ p = .02 \]
RESULTS –
FEMALE PHYSIOLOGICAL AROUSAL

Physiological Sexual Arousal (z-score)

Time

Entire Erotic
RESULTS – FEMALE PHYSIOLOGICAL AROUSAL

Condition x Film interaction, $F(1, 17) = 5.61, p = .03$

$p < .001$  
$p = .01$
RESULTS – FEMALE PHYSIOLOGICAL AROUSAL

30% reduction

$p = .05$
CONCLUSION – PHYSIOLOGICAL AROUSAL

Nicotine significantly reduced sexual arousal in men and women.
QUESTION 2:

- Does nicotine acutely affect subjective sexual arousal in men and/or women?
RESULTS –
MALE SUBJECTIVE AROUSAL

Subjective sexual arousal (z-score)

Nicotine
Placebo

NEUTRAL PETTING ORAL SEX INTERCOURSE
ENTIRE EROTIC

Time
Subjective sexual arousal (z-score)

0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600 625 650 675 700 725 750

0 0.5 1.0 1.5 2.0
RESULTS –
MALE SUBJECTIVE AROUSAL

$p < .001$

$p = .15$

Subjective Sexual Arousal (z-score)

Placebo Condition

Nicotine Condition
RESULTS – FEMALE SUBJECTIVE AROUSAL

Subjective sexual arousal (z-score)
RESULTS –
FEMALE SUBJECTIVE AROUSAL

$p = .21$

$p < .001$

Subjective Sexual Arousal (z-score)

Neutral  Erotic  Neutral  Erotic

Placebo Condition  Nicotine Condition
CONCLUSION – SUBJECTIVE AROUSAL

- Nicotine did not significantly impact subjective sexual arousal in men or in women.
 QUESTION 3:

- Does nicotine affect the concordance between physiological and subjective sexual responses in men and/or women?
RESULTS – MALE CONCORDANCE

PHYSIOLOGICAL AND SUBJECTIVE AROUSAL CONCORDANCE - NICOTINE CONDITION

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PHYSIOLOGICAL AND SUBJECTIVE AROUSAL CONCORDANCE - PLACEBO CONDITION

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NEUTRAL                PETTING               ORAL SEX                           INTERCOURSE

ENTIRE EROTIC
RESULTS – FEMALE CONCORDANCE

PHYSIOLOGICAL AND SUBJECTIVE AROUSAL CONCORDANCE - NICOTINE CONDITION

PHYSIOLOGICAL AND SUBJECTIVE AROUSAL CONCORDANCE - PLACEBO CONDITION
CONCLUSION – CONCORDANCE OF SEXUAL RESPONSES

- In response to nicotine, men and women exhibited a reduced initial physiological response, and reduced ability to maintain physiological arousal.
- However, this pattern only reached statistical significance in men.
GENERAL CONCLUSIONS

- Nicotine significantly reduces physiological sexual arousal in healthy, sexually functional, nonsmoking men and women.
- No effect on subjective arousal in men and women.
- Not epiphenomena of nicotine-induced adverse effects.
GENERAL CONCLUSIONS

- Nicotine may disrupt activity of 2\textsuperscript{nd} messenger system responsible for vasocongestion (eNOS, NO) \textsuperscript{(McVary et al., 2001)}
- Result in a decrease in genital arterial inflow and disruptions in outflow

CLINICAL IMPLICATIONS

- First empirical evidence that isolated nicotine reduces physiological sexual arousal in healthy, young, nonsmoking men and women.
- Used as public health claim to assist in the prevention and cessation of cigarette smoking in adolescents and adults.
ACKNOWLEDGEMENTS

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