



Sex and Sleep

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- Menstrual phase effects on sleep
- Sleep in menopause
- Sleep in pregnancy
- Effects of estrogen and progesterone on sleep

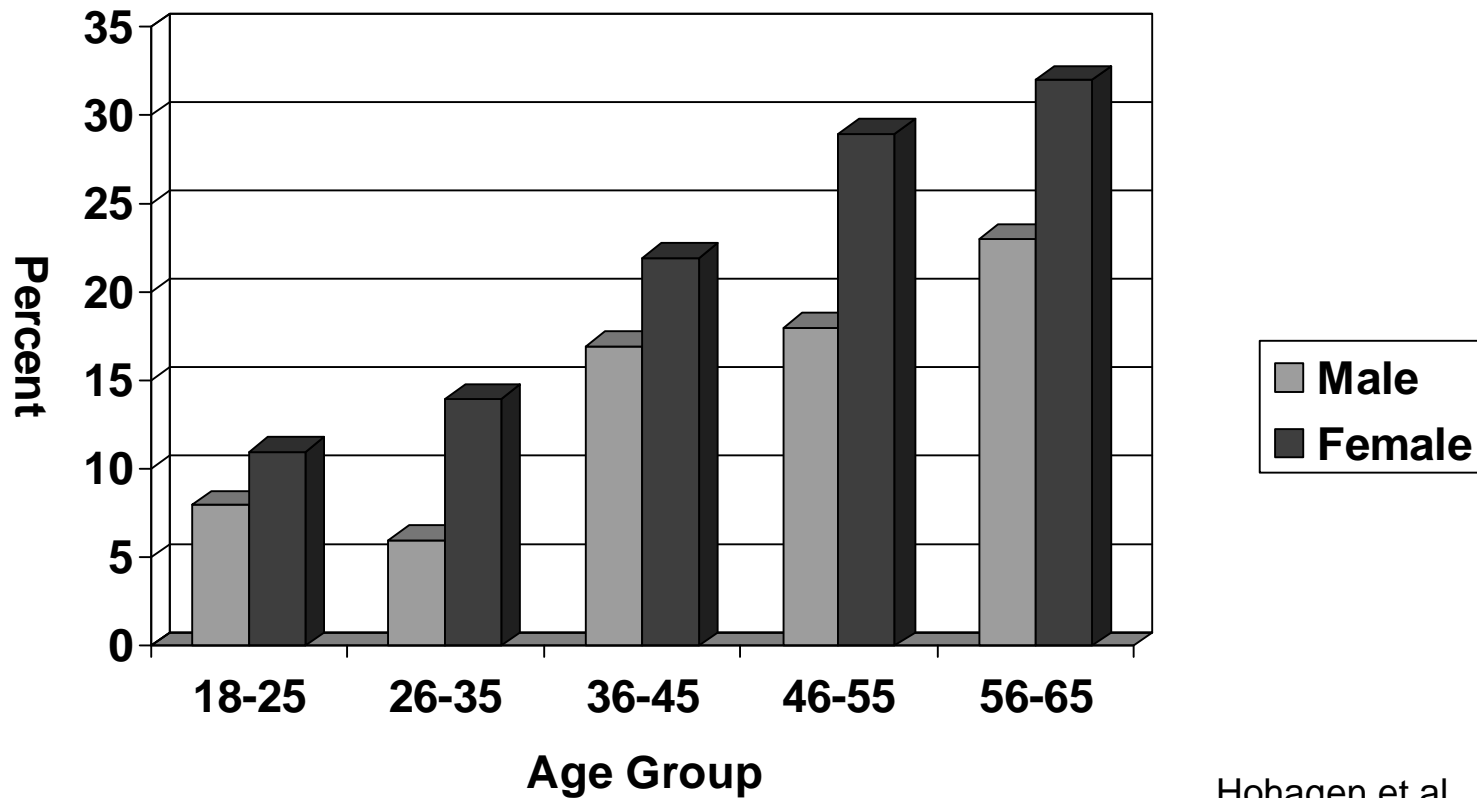
Sex Differences in Objective – Subjective Discrepancy in Sleep

- 1) Objective Sleep Differences
- 2) Subjective Sleep Differences
- 3) Difference in Daytime Consequences

Objective Sleep

- Compared to men women have
 - Shorter sleep onset latencies
 - Less time awake in bed
 - More total sleep time
 - Higher sleep efficiencies (Goel et al, 2005)
 - Fewer awakenings (Bixler et al., 1984)
 - Less SWS during the second half of the night

Sex Differences in Self Reported Disturbed Sleep



Hohagen et al., 1993

Subjective Sleep

- Compared with men, women report
 - needing more sleep (insufficient sleep)
 - more disturbed sleep

(Bixler et al. 2002; Zhang et al., 2006)

- These differences persist after controlling for psychiatric conditions

(National Sleep Foundation. 2005 sleep in America poll)

Sex Differences In Consequences Of Poor Sleep

- Men are more likely than women to report better functioning during the day with less than seven hours of sleep (NSF 2005)

Subjective/Objective Sleep Differences in Females

- Subjective but little objective
 - Menstrual phase
 - Menopause transition
- Large individual differences in menstrual phase effects (Manber et al., 1996, 1997)
- About 15% experience clinically significant decrement in sleep efficiency (below 85% during the luteal but not follicular phase) (Manber et al., 1996, 1997)

Need to better understand
subjective-objective sleep
discrepancies

Subjective sleep is clinically relevant
&
Easier to study

Sleep Disorders Are Not The Same In Men And Women

- 1) Difference in prevalence
- 2) Difference in presentation

Sex Differences in Sleep Disorders

- Insomnia is more prevalent in women (2:1)
- Restless legs syndrome (RLS) is more prevalent in women (2:1)
- No known sex differences in periodic limb movement disorder (PLMD)
- Narcolepsy is more prevalent in men (1.72 versus 1.05 cases in 100,000)
- REM sleep behavior disorder and Kleine–Levin syndrome are much more common in men
- Obstructive sleep apnea (OSA) is more prevalent in men (2:1 to 4:1)

(Krishnan & Collop, 2006)

Sex Differences in OSA Symptoms

Women with OSA are more likely to

- Be obese
- Report low energy / fatigue
- Have IBS
- Have sleep onset difficulties
- Use sleep medications
- Hypothyroidism
- Restless legs
- Depression
- Nightmares
- Palpitations at night
- Hallucinations

Women with OSA are less likely to

- Have supine position-dependent OSA
- Report witnessed apnea
- Report heavy snoring
- Less likely to respond to weight loss

(Wahner-Roedler, 2007; Valipour, 2007; Millman, 1995; Zhou, 2000)

Need to study disease-specific sex differences

Sex Differences in Sleep in Psychiatric Disorders

Sleep ↔ Emotion Regulation

Sex Difference in Sleep in Psychiatry

- Men are more likely to experience slow wave sleep deficiency when depressed
 - May indicate impaired homeostatic regulation of sleep
(Armitage et al., Sleep , 2001)
- Depressed women are more accurate in estimating sleep characteristics than depressed men
(Armitage, et al. Dep & Anx., 2000)
- Studies with men only find greater sleep disturbances in PTSD than control
 - TST; SOL; S1; SWS; REMD (Kobayashi 2007)

Current Work

- Treatment of Insomnia And Depression (TRIAD; MH78924; N=255)
- Moderators of treatment response (HL096492)
 - Opportunity to study
 - sex differences in sleep in patients with depression and insomnia
 - Sex by moderators interaction

Endogenous/Exogenous Effects on Sleep Might Differ

A Research Challenge

Neuro-steroids & Sleep

- Progesterone
 - Nongenomic effects
 - Progesterone and metabolites (allopregnanolone and pregnalolone) are GABA_A agonists and impact NREM
 - decrease in slow frequency (0.4-4.3 Hz)
 - increase in high frequency (>15 Hz)(Schulz, et al., 1996)
 - Pregnenolone - a GABA_A receptor antagonist

Summary

- Need a better understanding of sex differences in the discrepancy between objective and subjective sleep
- Need to understand sex differences in the presentation and course of specific sleep disorders
- Need large samples to allow examination of interaction between moderators and sex in outcome research