

# Comparison of Speaking Fundamental Frequency between premenopausal woman and postmenopausal women with and without hormone therapy.

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## Background

The voices of middle-aged women are subject to a combination of aging and menopausal transition. The **menopause** ends the reproductive period and is characterized by a **decrease** of the **female sex hormones** estrogen and progesterone. The hormone balance and the ratio of estrogen and progesterone to androgens changes and the influence of **androgens** becomes more important in the female body. In the postmenopause, ovarian contribution of estrogen is negligible, and **adipose tissue** becomes the main source of estrogen production. **Hormone therapy** (HT) has a long-standing tradition for the treatment of menopausal complaints. It compensates for the drop in endogenous estrogen and or progesterone levels in the postmenopause. It is known that sex hormones influences the **female voice**. When studying voice in middle-aged women a distinction should be made between premenopausal women, postmenopausal with HT and postmenopausal women without HT, with low and high BMI.

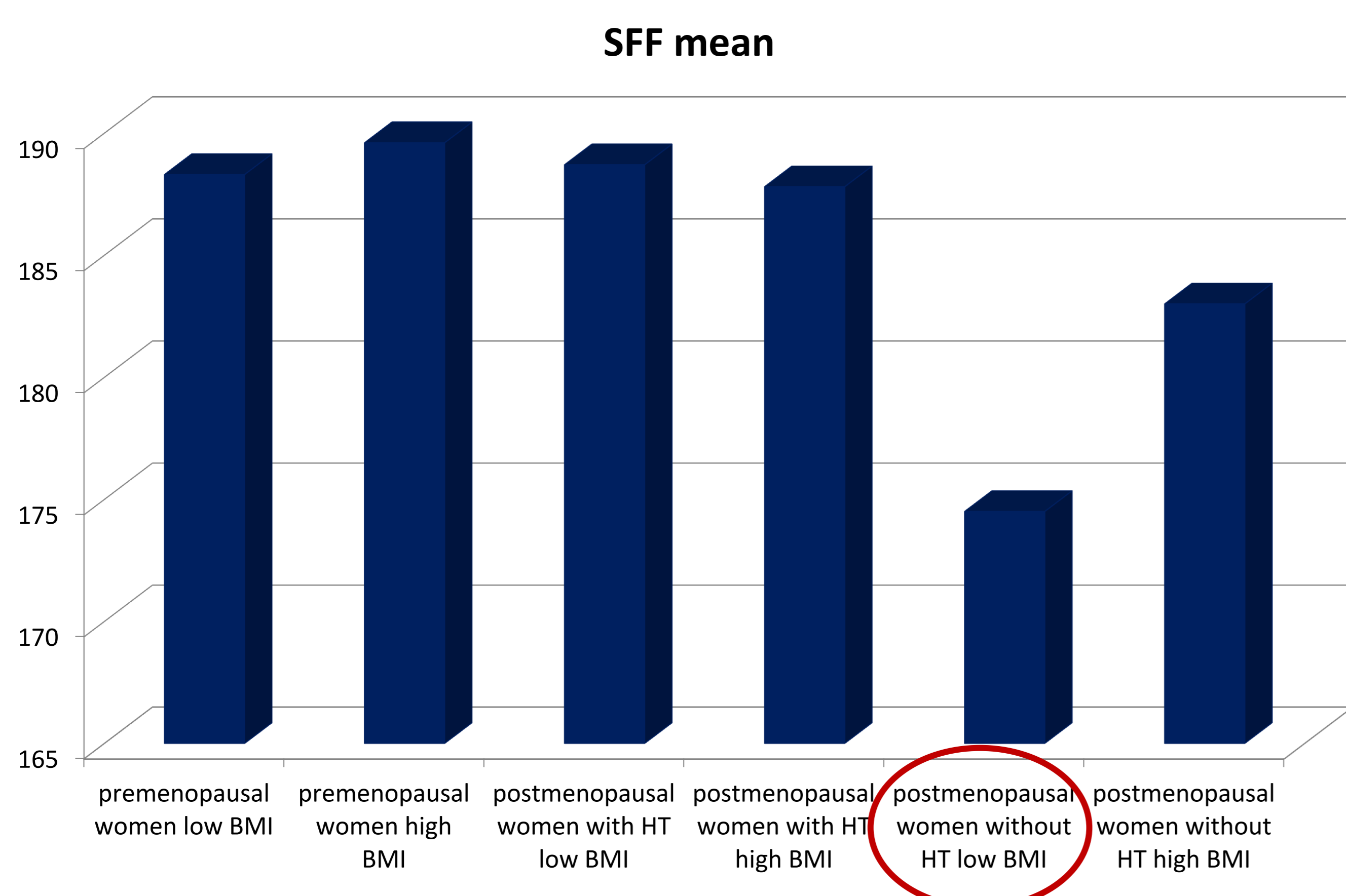
## Purpose

The purpose of this study was to investigate the speaking fundamental frequency (SFF) in pre- and postmenopausal women with and without hormone therapy (HT) and with low and high BMI.

## Voice Assessment

The mean SFF of connected speech was measured using Real-Time Pitch (Model 5121 V3.1.6) program from Computerized Speech Lab from Kay.

Subjects	n	Age (years)		BMI		time of menopause (years)	
		mean	SD	mean	SD	mean	SD
premenopausal women low BMI (<25)	22	48.5	2.3	21.6	1.9		
premenopausal women high BMI (> 25)	13	48.1	2.3	29.0	4.4		
postmenopausal women with HT low BMI (<25)	35	57.5	5.0	22.4	1.9	7.6	4.5
postmenopausal women with HT high BMI (> 25)	19	56.7	4.1	27.3	1.8	7.1	3.5
postmenopausal women without HT low BMI (< 25)	28	58.5	5.5	22.5	1.7	8.2	6.6
postmenopausal women without HT high BMI (> 25)	12	59.4	5.4	28.0	2.2	11.2	5.4



	n	SFF		ANCOVA
		mean	SD	p-value
premenopausal women low BMI	22	188.3	17.6	
premenopausal women high BMI	13	189.6	15.1	
postmenopausal women with HT low BMI	35	188.7	18.2	
postmenopausal women with HT high BMI	19	187.8	22.6	
postmenopausal women without HT low BMI	28	174.5	17.8	
postmenopausal women without HT high BMI	12	183.0	11.3	<b>0.016</b>

		LSD
		p-value
premenopausal women low BMI	premenopausal women high BMI	0.837
	postmenopausal women with HT low BMI	0.934
	postmenopausal women with HT high BMI	0.937
	<b>postmenopausal women without HT low BMI</b>	<b>0.010</b>
	postmenopausal women without HT high BMI	0.428

## Discussion

The SFF of premenopausal women with low BMI was compared with the SFF of premenopausal women with high BMI, postmenopausal women with HT and low BMI, postmenopausal women with HT and high BMI, postmenopausal women without HT and with low BMI and postmenopausal women without HT and with high BMI. The results of this study show that the SFF of premenopausal women with low BMI (mean: 188.3Hz) only differed from the SFF of postmenopausal women without HT and with low BMI. (mean: 174.5Hz). The mean difference in SFF between these two groups was 14 Hz. This difference of 14Hz corresponds with 1.32 semitones or with 7.6% [(188.8Hz-174.5Hz)/188.8Hz].

The results of this study suggest that the menopause lowers the voice with approximately 14Hz and that HT and adipose tissue (high BMI) might counteracts the menopausal drop in SFF.