

Changes in circadian blood pressure and heart rate rhythms with gender and age – effect of anti-hypertensive medication

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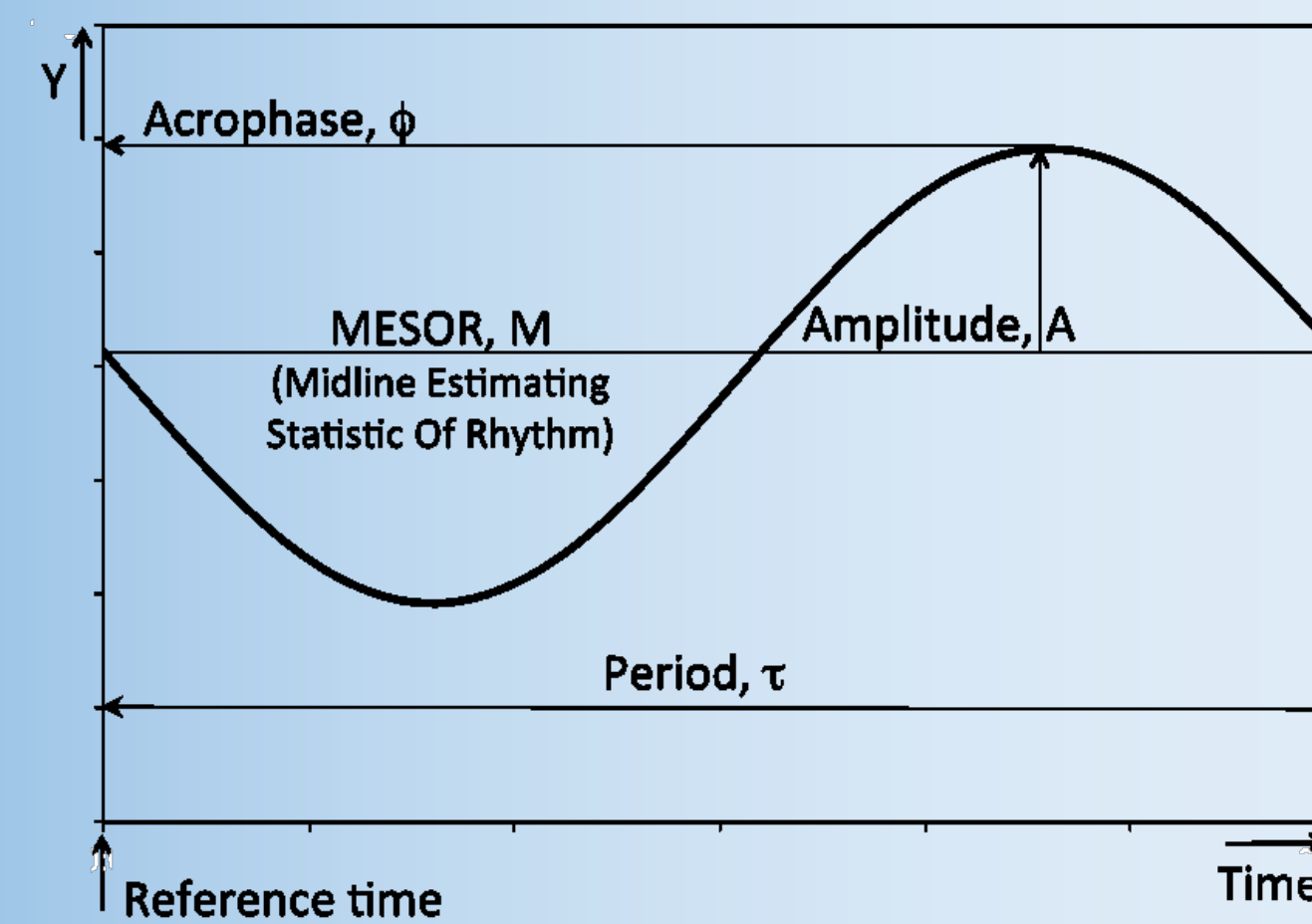
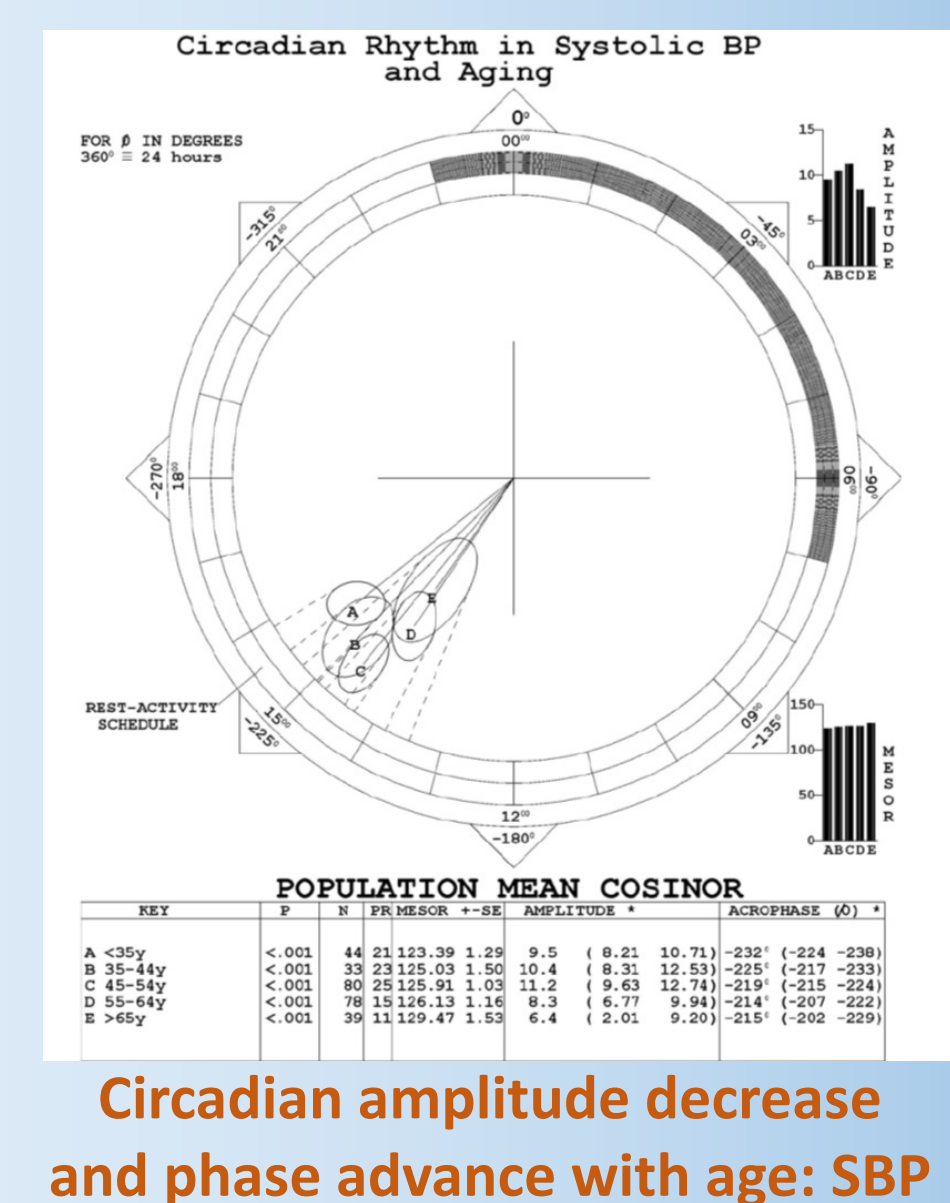
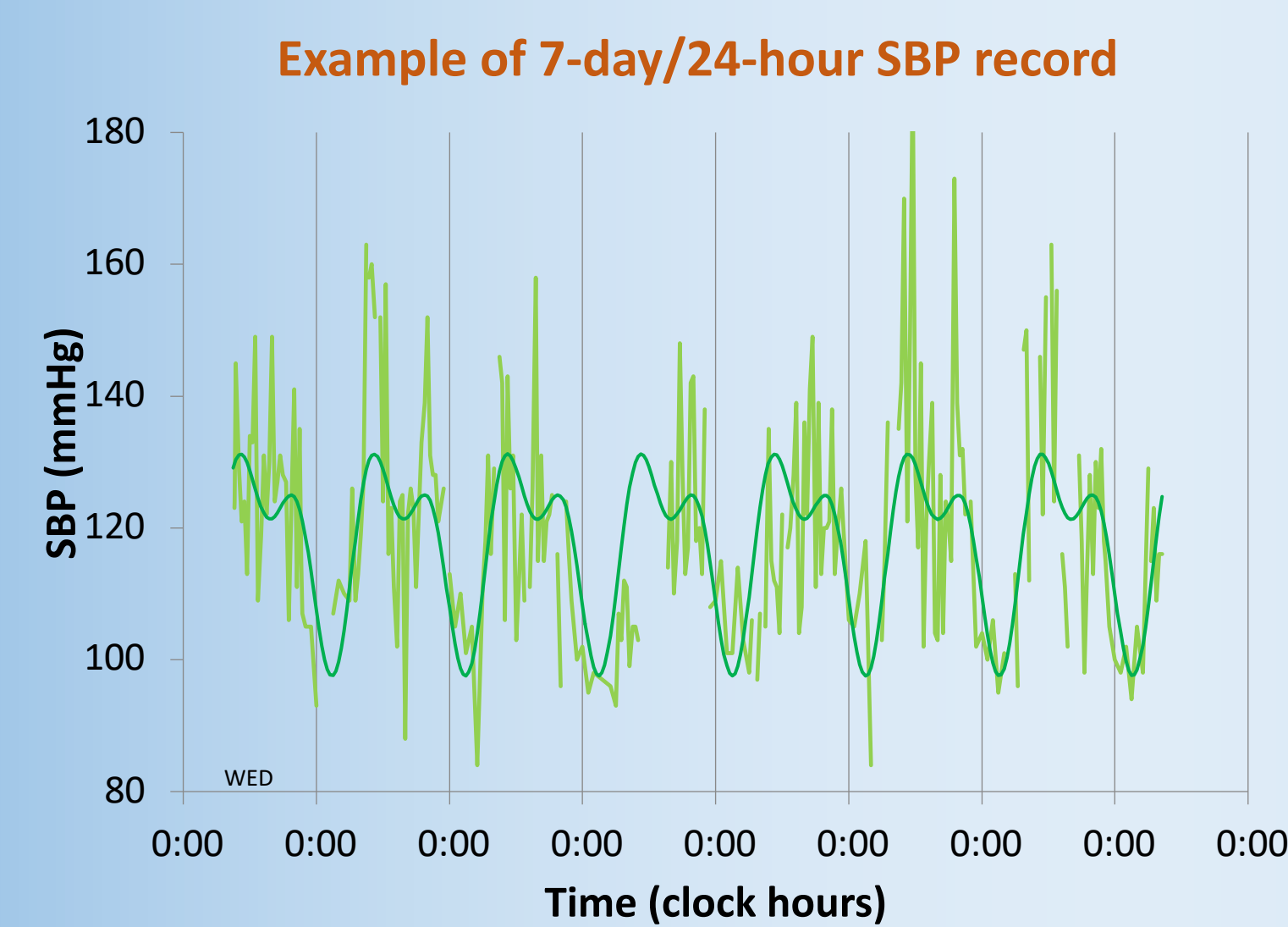
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Aim

This study aimed at comparing **gender** differences and **age** trends in **circadian** rhythm characteristics between clinically healthy individuals who **were** or **were not** taking **anti-hypertensive medication**.

Background

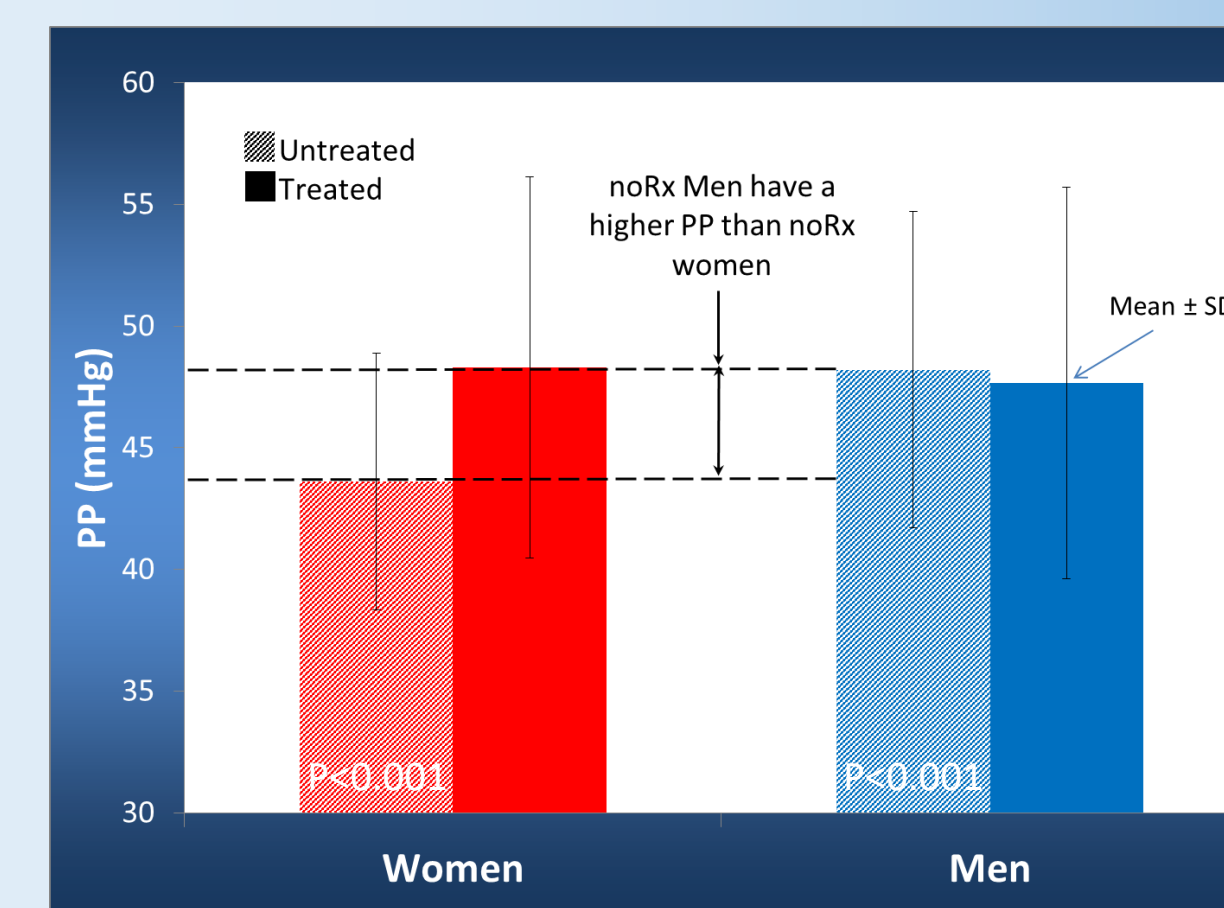
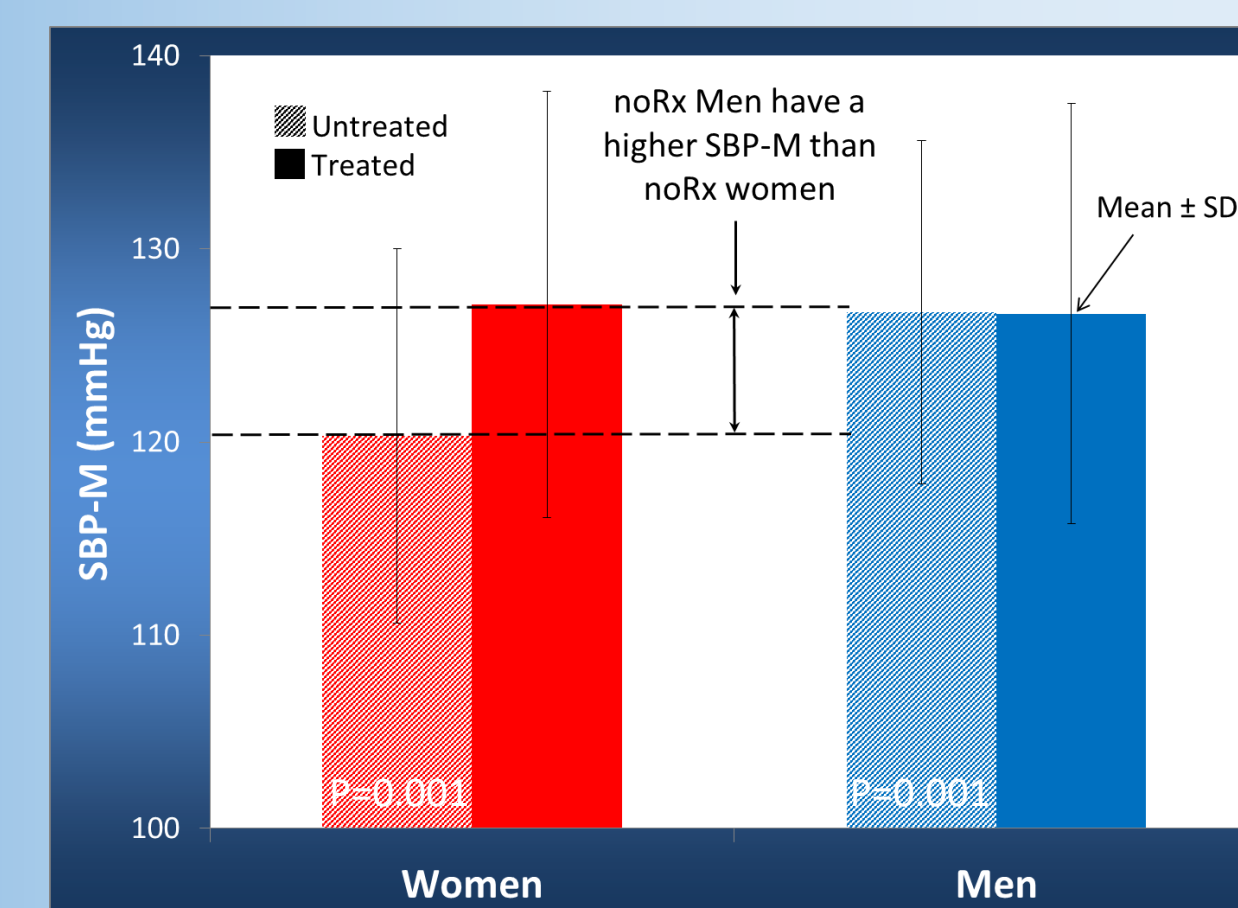
Systolic (S) and diastolic (D) blood pressure (BP) and heart rate (HR) are circadian periodic; women have a lower systolic BP and a higher HR than men; BP increases with age, reaching a maximum around 80 (SBP) or 50 (DBP) years of age; HR decreases with age. The circadian amplitude also decreases and the circadian phase advances with increasing age. **Currently, these differences are not taken into account when prescribing anti-hypertensive medication to reach target BP values.**



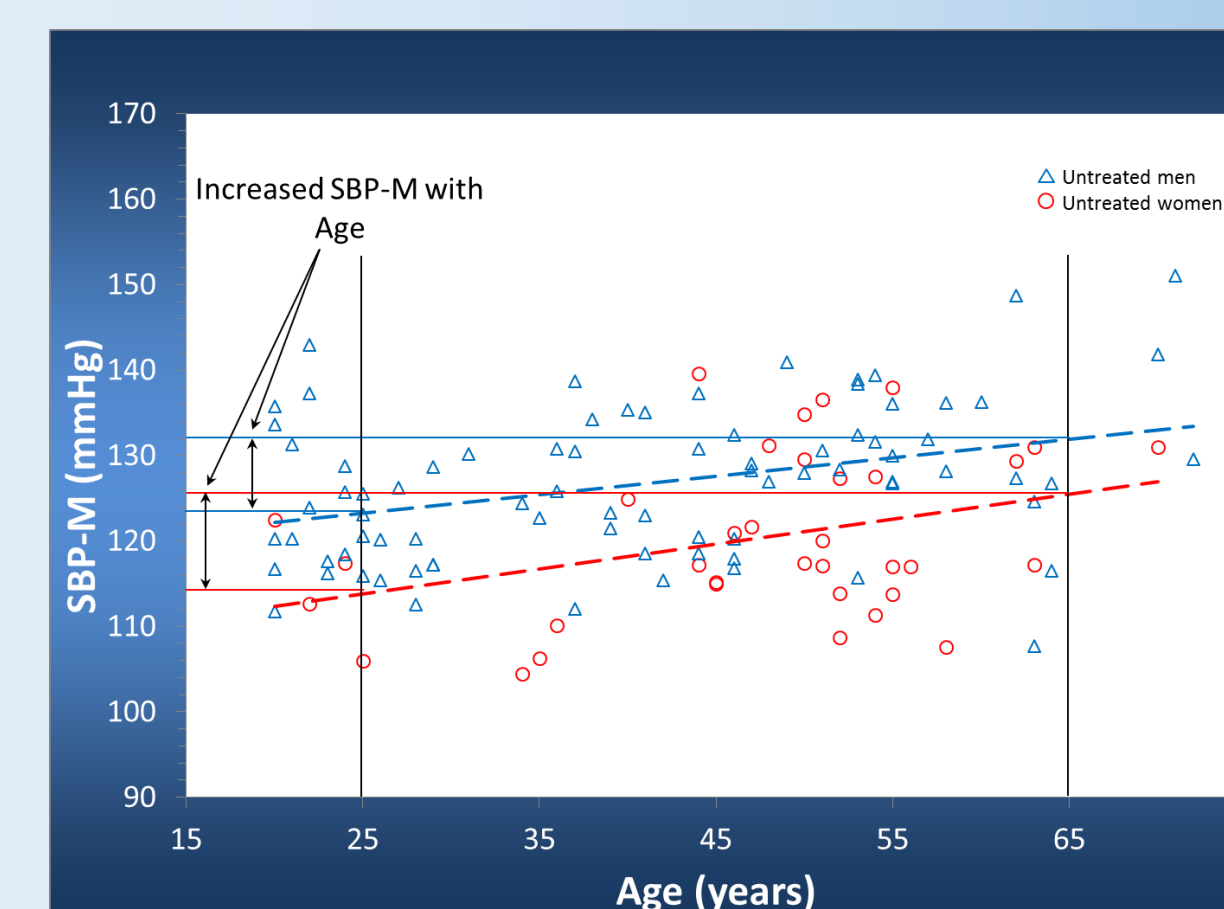
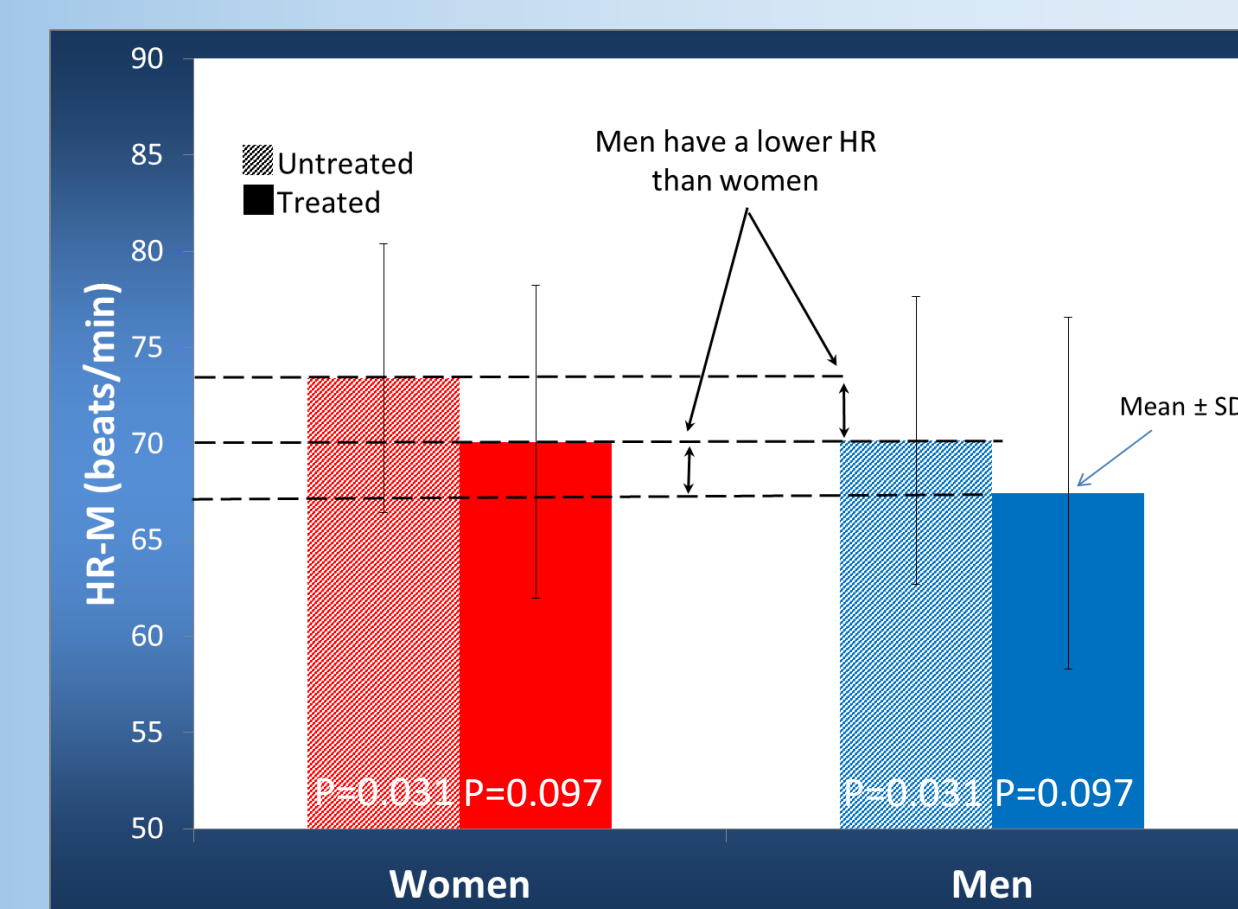
Circadian rhythm characteristics were estimated by **cosinor**

Period (τ): Estimated (Brno); Fixed 24-h (Tokyo)
Gender comparison: Student t test (2-tailed, assuming equal variance)
Age trends: Linear regression

Results: Brno



Treated women have a higher SBP-M and PP than untreated women



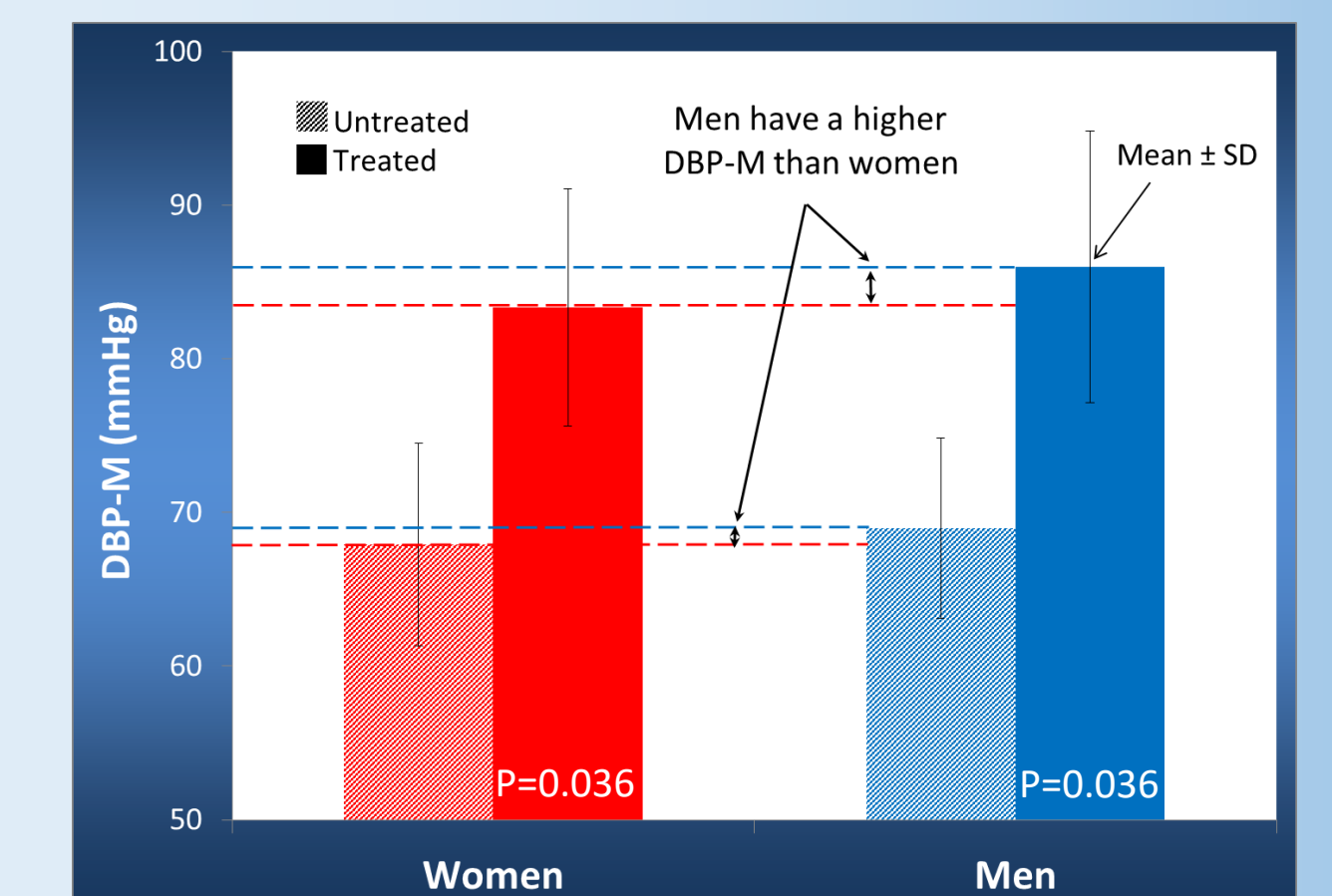
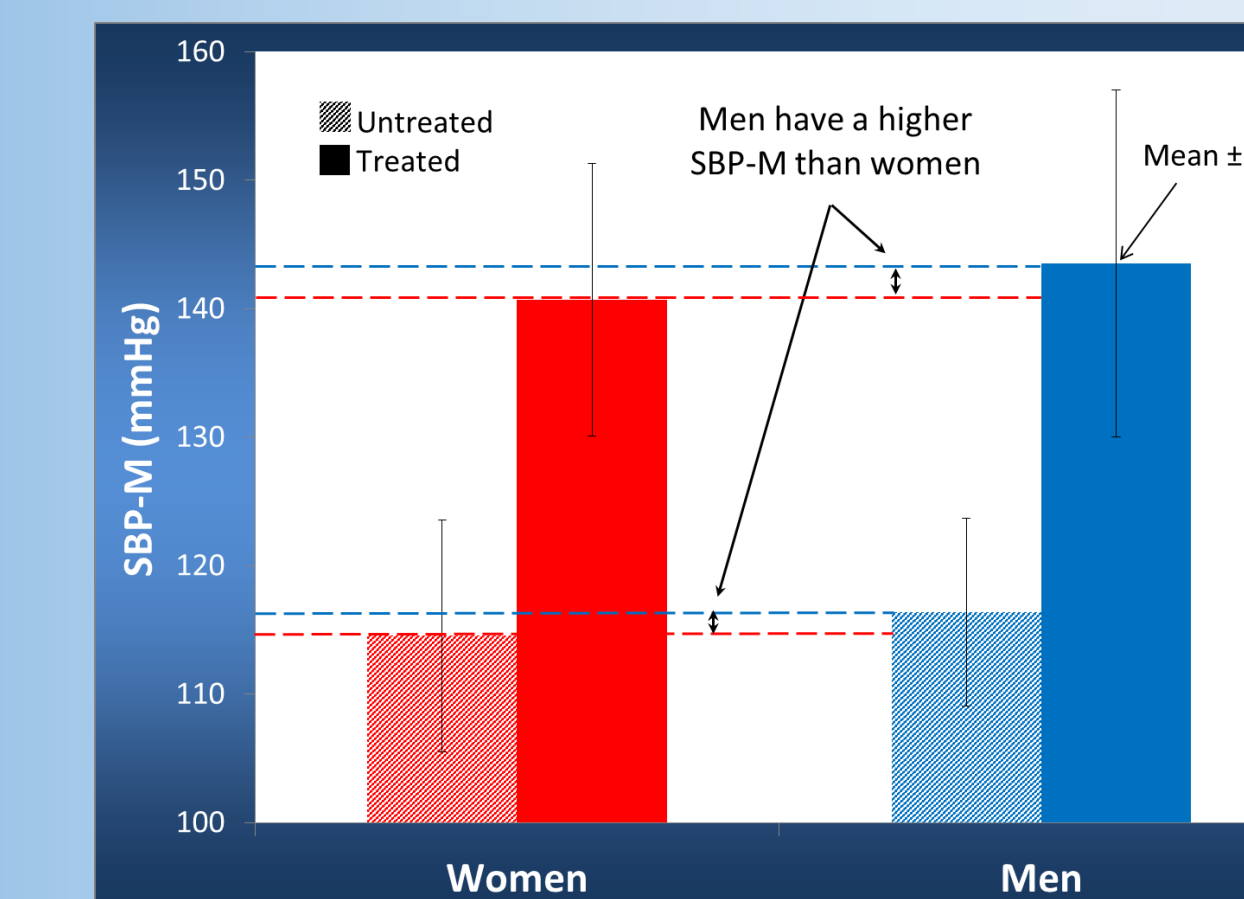
Treated Subjects have a Lower HR-M than Untreated Subjects

Untreated subjects' SBP-M increases with Age

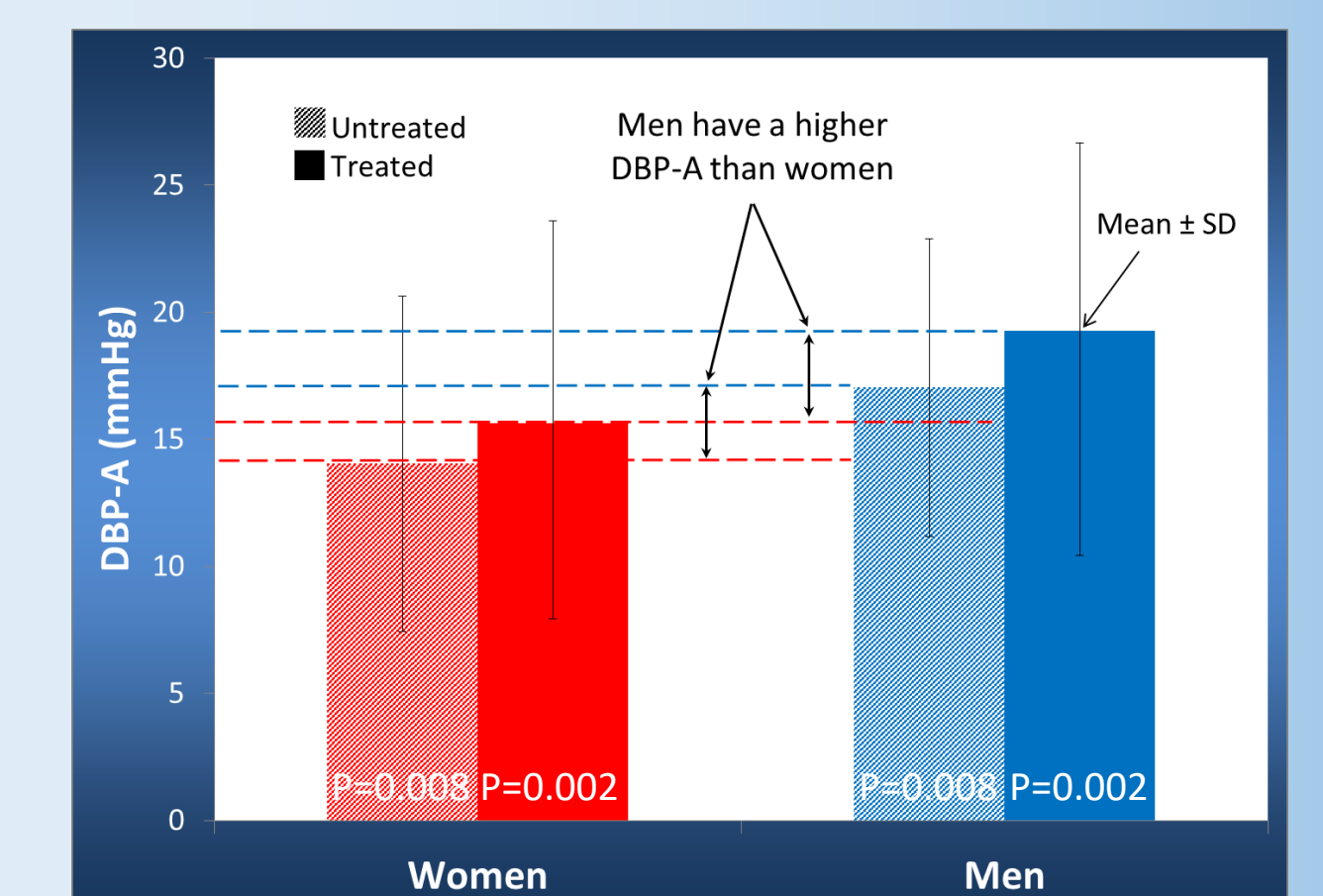
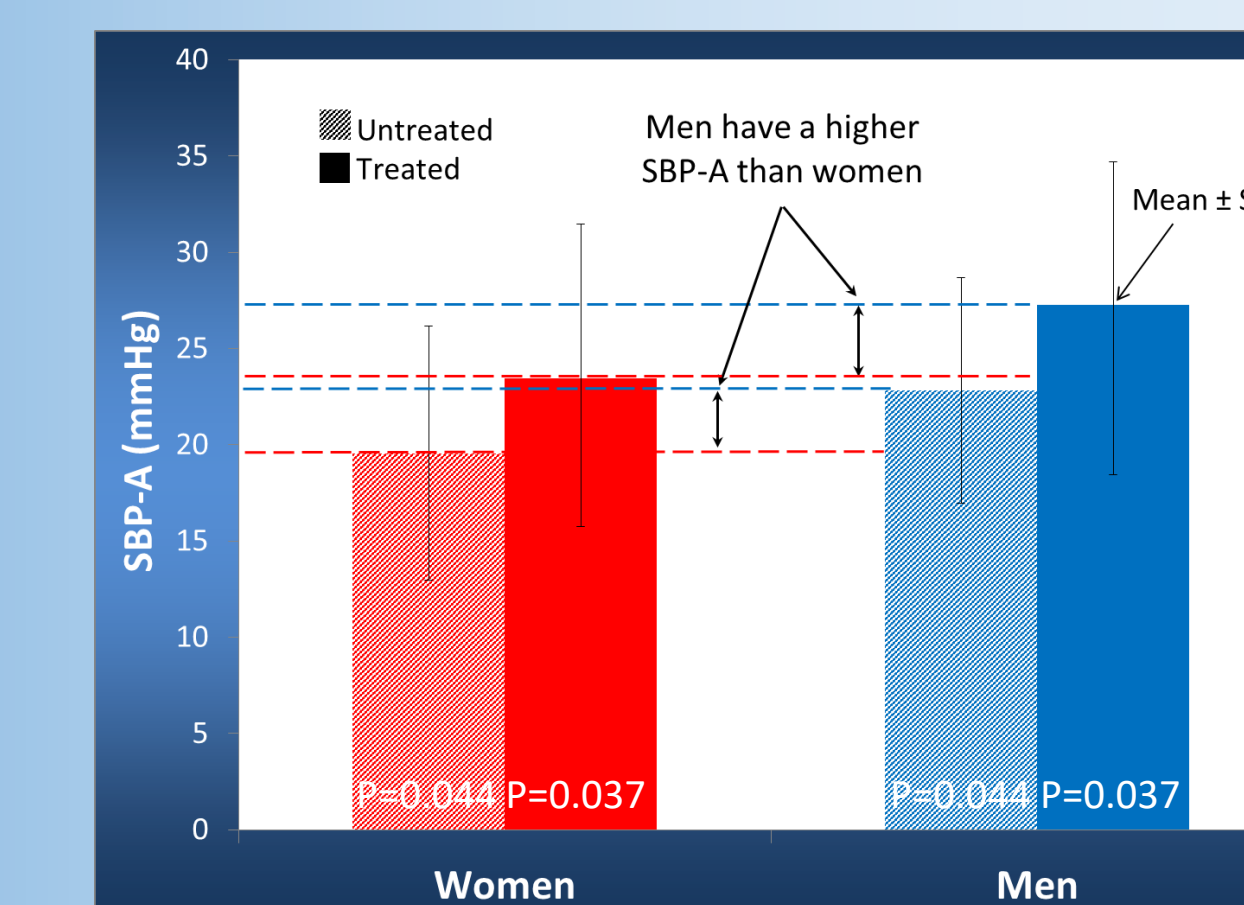
Gender:	Untreated		Treated	
	Women	Men	Women	Men
SBP-M	\uparrow (P=0.036)	\uparrow (P=0.001)	-	-
SBP- τ	-	\downarrow (P=0.002)	-	-
SBP-A	-	-	\downarrow (P=0.010)	\downarrow (P=0.006)
DBP-M	-	\uparrow (P<0.001)	-	-
DBP- τ	-	\downarrow (P=0.001)	-	\downarrow (P=0.037)
DBP-A	-	-	\downarrow (P=0.005)	\downarrow (P<0.001)
HR-M	-	-	-	-
HR- τ	-	\downarrow (P=0.040)	-	-
HR-A	-	\downarrow (P=0.004)	-	\downarrow (P<0.014)
PP	-	-	-	\uparrow (P<0.001)

Circadian characteristics, including period, change with increasing age (\uparrow / \downarrow)

Results: Tokyo



Women have a lower SBP-M and DBP-M than Men



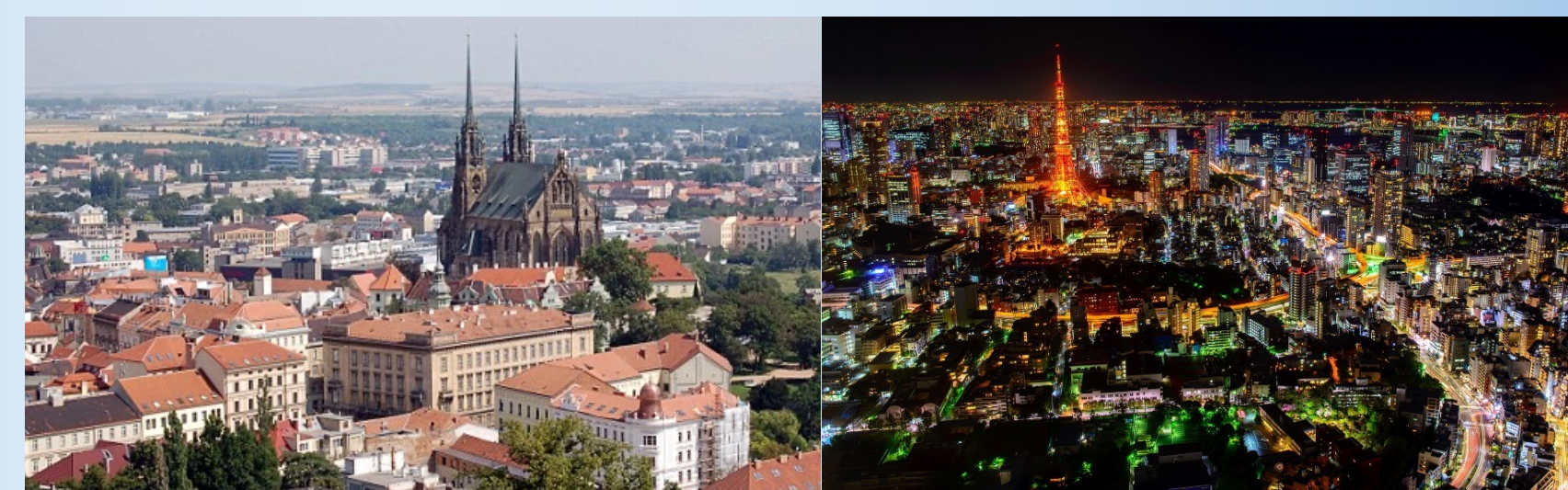
Women invariably have a smaller 24h-A of BP than men (P<0.05)

Gender:	Untreated		Treated	
	Women	Men	Women	Men
SBP-M	\uparrow (P<0.001)	-	-	-
SBP-A	-	-	-	-
DBP-M	\uparrow (P<0.001)	-	-	-
DBP-A	-	-	-	-
HR-M	-	\downarrow (P<0.001)	-	-
HR-A	-	-	-	-
PP	\uparrow (P=0.001)	-	\uparrow (P=0.007)	\uparrow (P=0.019)

Circadian characteristics change with increasing age (\uparrow / \downarrow)

Methods

Data were taken from Brno, Czech Republic and Tokyo, Japan



Study location:	Brno (Czech Republic)	Tokyo (Japan)
N (F/M)	287 (76F & 211M)	297 (145F & 152M)
Age range (years)	20 - 84	30 - 72
Record length	~7 days	48 hours
Sampling interval (min)	30 (day) or 60 (night)	15

Conclusions

- There was very little age difference between men and women.
 - Treated vs. untreated subjects were ~10 years older in both studies.
 - Age difference may account for differences observed in HR-M in Brno.
- Brno:** Subjects seem to have been medicated with the same target to treat value, thus not accounting for gender differences.
- Tokyo:** SBP-M did not differ significantly between men and women, irrespective of treatment. Possibly due to higher target to treat values.
- This geographic difference may stem from differences in medical practice and/or ethnicity.*

Results from both studies point to the important need to account for the circadian variation in BP and HR and for its changes as a function of gender and age in prescribing anti-hypertensive medication.