POSTER #206

Identifying sleep associations in women across five countries: a global smartwatch-based study

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INTRODUCTION

- Sleep disturbance is common among women, particularly in midlife,[1,2] and can be influenced by age, body mass index (BMI), and physical activity, often worsening during the menopausal transition due to hormonal and other related changes.[3,4]
- Large-scale, cross-cultural, objective data on sleep disturbance in different populations have traditionally been limited.[5]
- Wearable technology, such as the Samsung Galaxy Watch, validated against polysomnography for sleep stage classification,[5,6] provides an opportunity for real-world, large-scale, objective sleep data analysis.[7]
- This study examined associations between sleep parameters and variables including age, country, BMI, and physical activity in a large, international cohort of women.

METHODS

This study used anonymized data from the global **Samsung Health consumer database**, focusing on **sleep metrics** captured via broadly available consumer **smartwatches** (Samsung Galaxy).

- **Participants: 192,500** women (n=38,500 per country) aged **20–65** years with **≥7 nightly sleep records**
- Study timeframe: March 1–28, 2024

- Total sleep period duration (**TSPD**): duration of time from initial sleep onset to final awakening (sleep offset – sleep onset)
- Total sleep time (**TST**): sum of number of minutes spent asleep within the sleep period (onset time to offset time)
- Wakefulness after sleep onset (**WASO**): total number of minutes an individual is awake after having initially fallen asleep

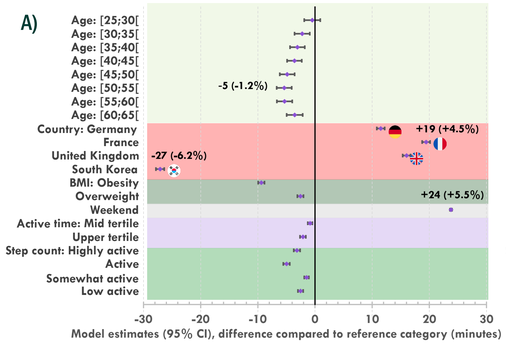
- **Age** (20–65)
- **Country** (France, Germany, South Korea, UK, USA)
- **BMI** (normal weight: 18.5–24.9 kg/m²; overweight: 25.0–29.9 kg/m²; obese: ≥30 kg/m²)
- **Physical activity**
  - **Average daily steps:** sedentary <5,000; low active 5,000–7,499; somewhat active 7,500–9,999; active 10,000–12,499; highly active ≥12,500
  - **Average daily active time:** lower tertile, middle tertile, upper tertile

- Linear regression mixed models assessed associations of sleep parameters (TSPD, TST, WASO) with age, BMI, weekday/weekend patterns, physical activity, and country relative to a reference category (age: ≥20–<25; country: USA; BMI: normal weight; weekday/weekend: weekday; physical activity: step counts, and active time tertiles). An extended exploratory linear regression model assessed age-by-country interactions.

RESULTS

- Overall, 30.7% (n=59,016) of women were aged ≥50 years. The average **BMI** was **27.6 kg/m²**, with **28%** of women classified as having **obesity**. More than **65%** of the population was classified as **sedentary** or **low active**.
- Women experienced a mean (standard deviation [SD]) **TSPD** of **439.4 (92.0) minutes**, a mean (SD) **TST** of **391.2 (81.9) minutes**, and a mean (SD) **WASO** of **48.3 (33.5) minutes**.
- **TSPD** varied by **weekend/weekday** and **country** (**Figure 1A**), whereas **TST** varied by **age, weekend/weekday**, and **country** (**Figure 1B**). For **WASO**, age effects outweighed country and weekend effects in age groups ≥50 years (**Figure 1C**). The effects of physical activity on sleep measures were relatively small (**Figures 1A–C**).

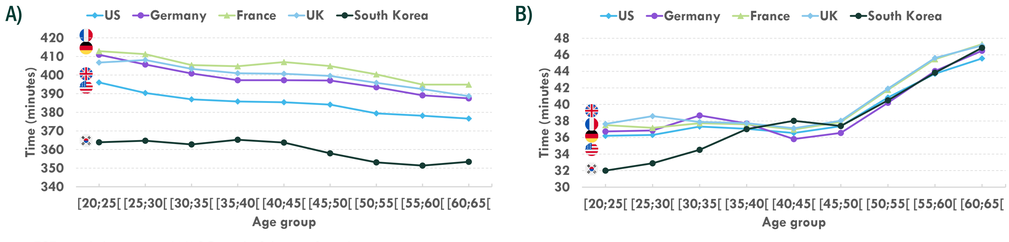
Figure 1. TSPD (A), TST (B), and WASO (C) by age, country, BMI, weekend/weekdays, and physical activity



BMI, body mass index; CI, confidence interval; TSPD, total sleep period duration; TST, total sleep time; WASO, wakefulness after sleep onset.

- Exploratory regression analyses highlighted a country effect on TST potentially owing to cultural factors; South Korea had the shortest TST and significant interaction effects with age in TST across all age groups (**Figure 2A**).
- Age effects on WASO were observed across countries, even in those with high TST, particularly in women aged ≥45. In South Korea, significant interaction effects with age were observed in WASO in women aged >30 years (**Figure 2B**).

Figure 2. Exploratory regression analysis: model-derived expected mean TST (A) and WASO (B) by age group and country (age-by-country interaction)



TST, total sleep time; WASO, wakefulness after sleep onset.

CONCLUSIONS

Age-related changes in sleep patterns started between 45–50 years and were most evident between 50–60 years, regardless of country. These age ranges overlap with the menopausal transition and postmenopause, reinforcing the need for early identification and intervention to improve sleep during this stage.

TST and TSPD appeared to be influenced by cultural factors, whereas the effects of aging dominated WASO consistently across countries, particularly in women >45 years.

The effects of age on TST and WASO were generally similar across countries, except for South Korea, where age effects on WASO were more pronounced.

Smartwatch-based data provide a powerful tool to **assess factors influencing sleep** in women, underscoring the potential for **large-scale sleep research.**

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DISCLOSURES

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