



# Gender difference in patients with chronic phase cerebral hemorrhage during level walking

Eun-Hye Chung<sup>1\*</sup>, Se-Young Bak<sup>1</sup>, Heegoo Kim<sup>1,2</sup>, Seyoung Shin<sup>1,2</sup>, Hongseok Baek<sup>1</sup>, Doyoung Lee<sup>1</sup>, HyeongMin Jeon<sup>1,2†</sup>, MinYoung Kim<sup>1,2‡</sup>

<sup>1</sup>Department of Rehabilitation Medicine, CHA Bundang Medical Center

<sup>2</sup>Digital Therapeutics Research Team, CHA Future Medicine Research Institute, CHA Bundang Medical Center, CHA University School of Medicine, Seongnam, Republic of Korea



## [Introduction & Objective]

- Walking is essential for maintaining activities of daily living (ADLs) and enhancing quality of life, particularly in stroke patients. While biomechanical variations in walking exist across genders and ages in healthy individuals, limited research investigates gender disparities in gait among stroke patients.
- This study aims to investigate whether there are gender differences in chronic cerebral hemorrhage patients.

## [Method]

### Participants

- Eight patients with chronic phase cerebral hemorrhage were included in this study.

Table 1. Clinical characteristics of the intracerebral hemorrhage patients

Variables	Men (n=4)	Women (n=4)
Age (years)	58.50 ± 7.43	55.50 ± 12.66
Height (cm)	171.65 ± 5.68	158.33 ± 4.74
Weight (kg)	68.10 ± 11.06	60.88 ± 4.20
Affected side Right/Left	0/4	3/1

### Experimental Protocol



- Functional assessments
  - Functional Ambulatory Category (FAC)
  - Berg Balance Scale (BBS)
  - Trunk Impairment Scale (TIS)
- Gait characteristics
  - Kinematic variable - range of motion (degree)
  - Kinetic variable – Joint power (W/kg)

### Equipment

- Three-dimensional motion capture system (Qualysis, Sweden)
- Three force plate (Kistler, Swiss)



Figure 1. Experimental Equipment

### Statistical analysis

- SPSS 25, USA, NY
- mann-whitney test

## [Result]

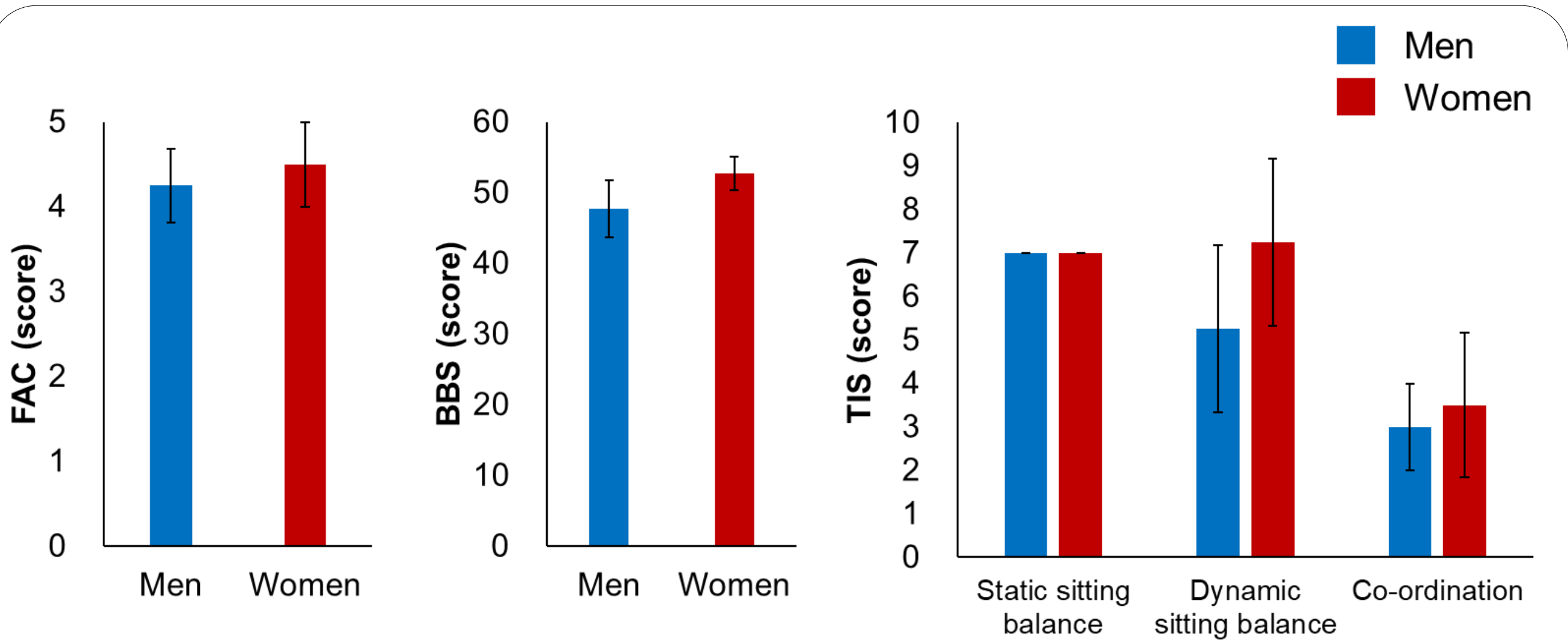


Figure 2. Functional Assessments

- There were no significantly differ by gender in the functional assessments.

Table 2. Factors related to the gait of the intracerebral hemorrhage patients

Variables		Men (n=4)	Women (n=4)	p-value
ROM (deg)				
Affected site	Hip	21.15 ± 8.98	36.14 ± 4.63	<b>0.043*</b>
	Knee	29.43 ± 9.34	35.38 ± 4.02	0.386
	Ankle	18.33 ± 7.42	21.77 ± 4.21	1.000
Unaffected site	Hip	33.93 ± 7.48	37.61 ± 2.41	0.248
	Knee	41.52 ± 7.18	33.09 ± 4.89	0.083 <sup>†</sup>
	Ankle	20.11 ± 6.36	19.89 ± 4.65	1.000

Values are presented as mean ± standard deviation  
Abbreviations: ROM Range of motion, 2nd Hip joint second peak power  
Significant difference between men and women using Mann-Whitney U test.  
<sup>†</sup>p< 0.01,\*p < 0.05

- Women showed higher hip joint range of motion on the affected side compared to men in ROM (p < 0.05).

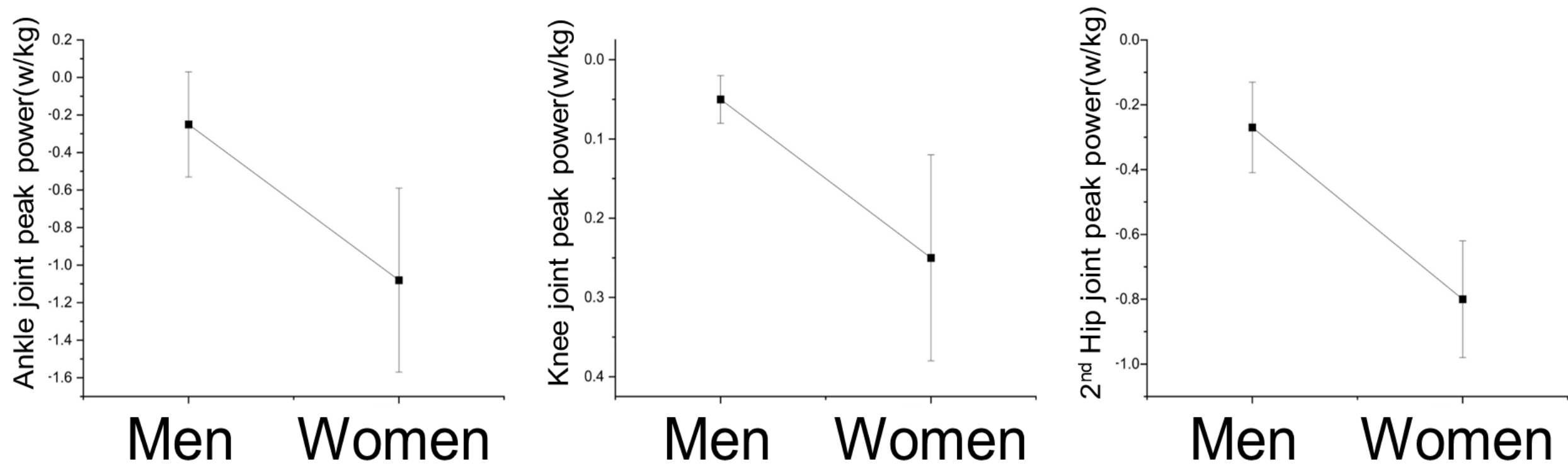


Figure 3. Compare lower limb joint peak generation power by gender

- Women demonstrated higher generation peak power in several joints compared to men (p < 0.05).

## [Conclusion & Discussion]

- In general, in normal adults, men have greater forward momentum in walking than women. This difference in momentum is believed to be due to the difference in moment at the ankle joint.
- In this study, we found that men did less work than women in every lower limb joints on the affected side.
- Although there were no gender differences in either the BBS assessment of balance or the FAC assessment of gait through functional assessment, the kinetic index through kinematic analysis suggests that men are less rehabilitated than women.
- Further research is needed on muscles such as the gastrocnemius that influence forward propulsion during walking, and the number of subjects should be increased.

## [Acknowledgement]

This research was supported by the Basic Science Research Program through the National Research Foundation (NRF) of Korea funded by the Ministry of Education and Science (2022R1F1A1064485), and a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health and Welfare, Republic of Korea (grant number: RS2023-00262005, HR22C1605).