IMPLICATIONS OF LOW PHASE ANGLES FOR STRENGTH AND FUNCTIONAL PERFORMANCE IN OLDER ADULTS: A CROSS-SECTIONAL ANALYSIS

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Background

- Adults over 65 y often experience significant declines in muscle quality, quantity, and function[2]. Obesity, low relative skeletal muscle mass, and reduced muscle strength have been linked to an increased fear of falling, functional impairment, and disability among older adults[4].

- Phase angle (PhA) measures the delay in current flow, which is caused by a reduction in the capacitance of the cell membrane and can be obtained through bioelectrical impedance analysis (BIA). PhA is the ratio of resistance to reactance, with higher PhA values indicating better skeletal muscle and cell membrane integrity. Conversely, lower PhA values are often associated with disease, dehydration, inflammation, malnutrition, and functional disabilities[1].

- Lower PhA is associated with increased risks of disability, falls, sarcopenia, frailty, and mortality among older populations[3]. Hence, this study aims to compare the values of handgrip strength (HGS), sit-to-stand (STS), and balance performance (BP) in older adult women who are classified as having low versus high PhA.
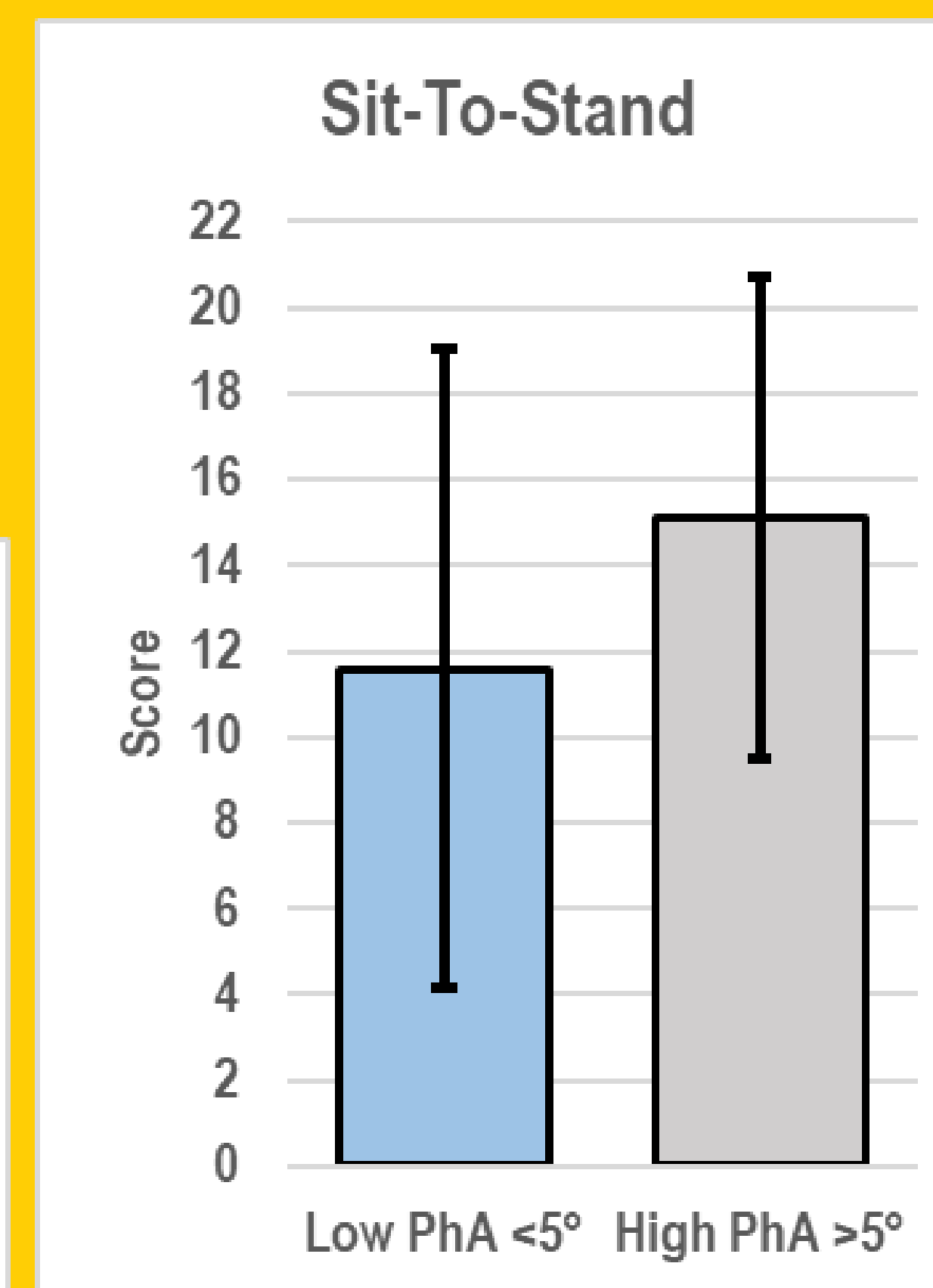
Methods

- Participants were recruited from community partners and clinical sites. Each participant underwent an initial screening to determine eligibility. We conducted a cross-sectional analysis involving 87 older adult women, with an average age of 74.7 ± 7.1 years and an average BMI of 26.9 ± 5.2 kg·m-2.

- *Handgrip strength (HGS)* was measured with the participants seated, their feet flat on the floor, and their elbows bent at 90 degrees. They were instructed to squeeze a handgrip dynamometer as hard as possible for three to five seconds, with a thirty-second rest period between three trials.

- *Sit-to-stand (STS)* was done by having the participants stand up from a chair as many times as possible in thirty seconds.

- For the **balance performance (BP)** assessment, participants were asked to remove their shoes and stand as still as possible on a balance plate for two to three minutes. They maintained this position with their hands on their hips and eyes closed.

- *Phase Angle (PhA)* was recorded at a frequency of 50 kHz using the InBodys10 BIA device. Based on previous research, a limit of 5 degrees was set as the midpoint between low and high PhA, derived from the lower PhA limit of 3 degrees and the upper PhA limit of 7 degrees. Participants were divided into two groups based on their PhA levels: low-PhA (<5°; n=26) and high-PhA (>5°; n=61).

- Age, BMI, HGS, STS, and BP were then compared between these groups using independent samples t-tests.

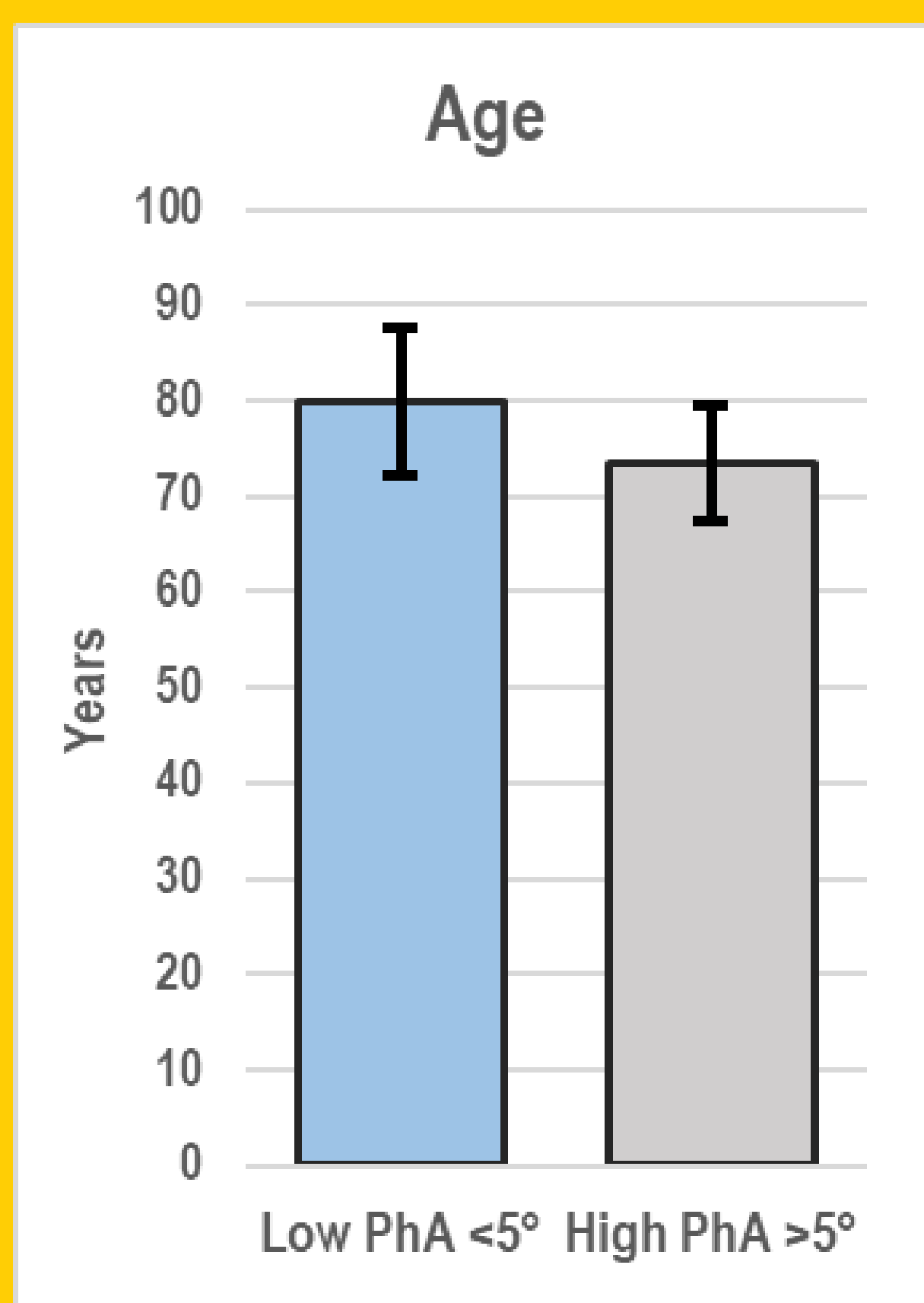## Older adult women with PhA <5° exhibited 23% lower body functional strength than those with PhA >5°
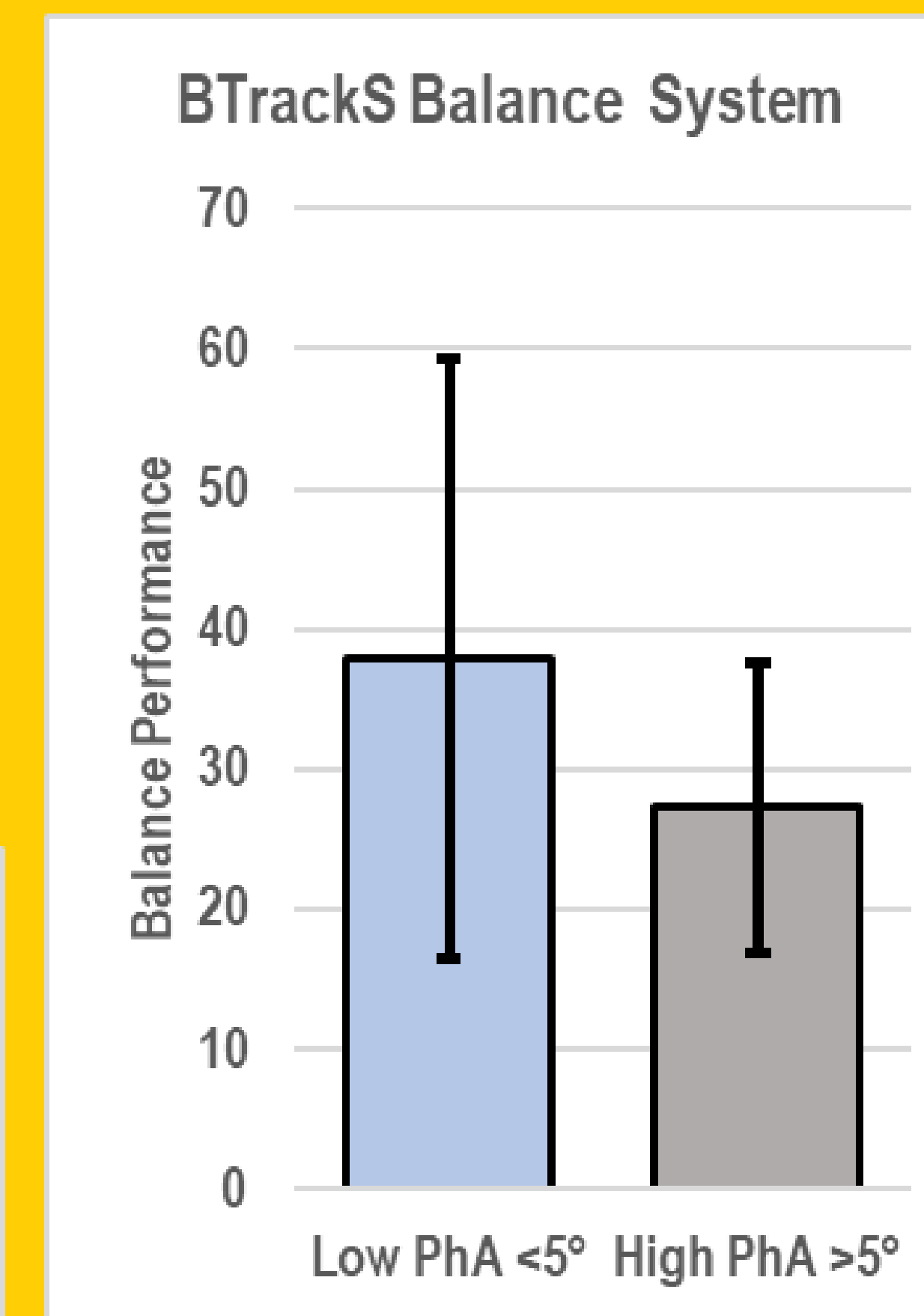
Graph 3: Comparing Low and High PhA with BP

Graph 2: Comparing Low and High PhA with STS scores

Graph 1: Comparing Low and High PhA with age

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Results

- There were no significant differences between groups for HGS or BMI.
- Significant differences in age (t(85) = -4.09, p < .001) were observed between groups, with the low-PhA group (M = 79.81, SD = 7.75) being older than the high-PhA group (M = 73.49, SD = 6.03).
- Significant differences were observed for STS scores (t(85) = 2.40, p = .018) between the groups, with the low-PhA group (M = 11.58, SD = 7.45) having lower scores than the high-PhA group (M = 15.08, SD = 5.62).
- Significant differences were also observed for the BP scores (t(85) = -3.13, p = .002) between the groups, where the low-PhA group (M = 37.92, SD = 21.48) had higher scores than the high-PhA group (M = 27.26, SD = 10.36).

Conclusion

- This study aimed to investigate the relationships between PhA and measures of physical performance such HGS, STS, and BP among older adult women. While there were no significant differences in HGS or BMI between the two groups, the study did find significant differences in age, STS scores, and BP scores based on PhA levels. Older adult women with lower PhA levels were older and had lower STS scores and higher BP scores compared to those with higher PhA levels.

- These findings suggest impaired physical performance depending on PhA in older adult women, reinforcing the notion that PhA may serve as an important clinical indicator for age-related functional decline. Therefore, monitoring and managing PhA levels could potentially contribute to preventing functional disabilities, frailty, and mortality among older populations.

References

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