

# B-MOBILE



## A Smartphone-Based Intervention to Reduce Time Spent in Sedentary Behavior (SB) in Adults with Obesity

Dale S. Bond, PhD  
Associate Professor (Research)  
Dept of Psychiatry and Human Behavior  
E-mail: [dbond@lifespan.org](mailto:dbond@lifespan.org)



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# **Outline**

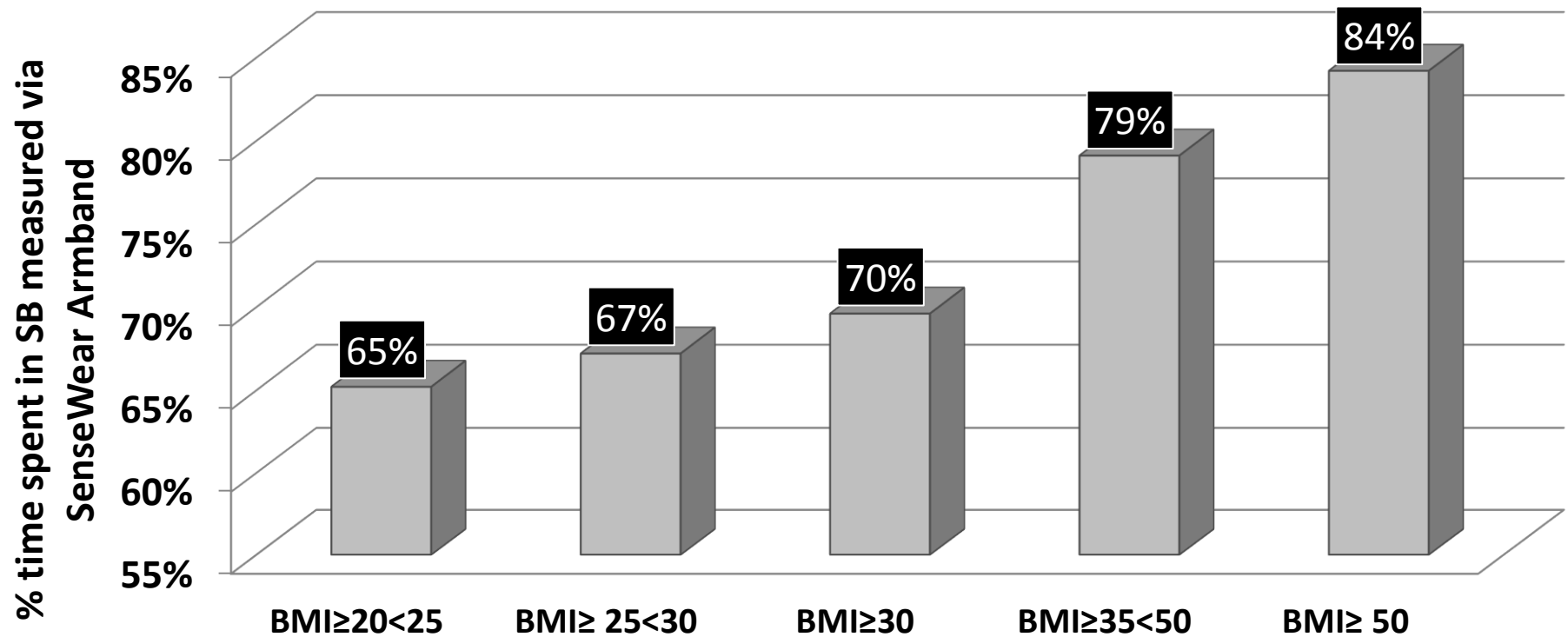
- 1. Rationale for *B-MOBILE* intervention approach**
- 2. Description of *B-MOBILE* intervention approach**
- 3. Evidence for preliminary efficacy of *B-MOBILE* intervention approach for reducing SB**
- 4. Beyond primary outcomes—examination of behavioral response to *B-MOBILE* intervention approach**
- 5. Conclusions and Future Directions**

# **RATIONALE FOR B-MOBILE INTERVENTION APPROACH**



# SB is Ubiquitous in Adults' Daily Lives

- American adults spend ~60% of daily waking hours in SB (\* more than time spent sleeping)
- Adults with obesity are at risk for even higher levels of SB



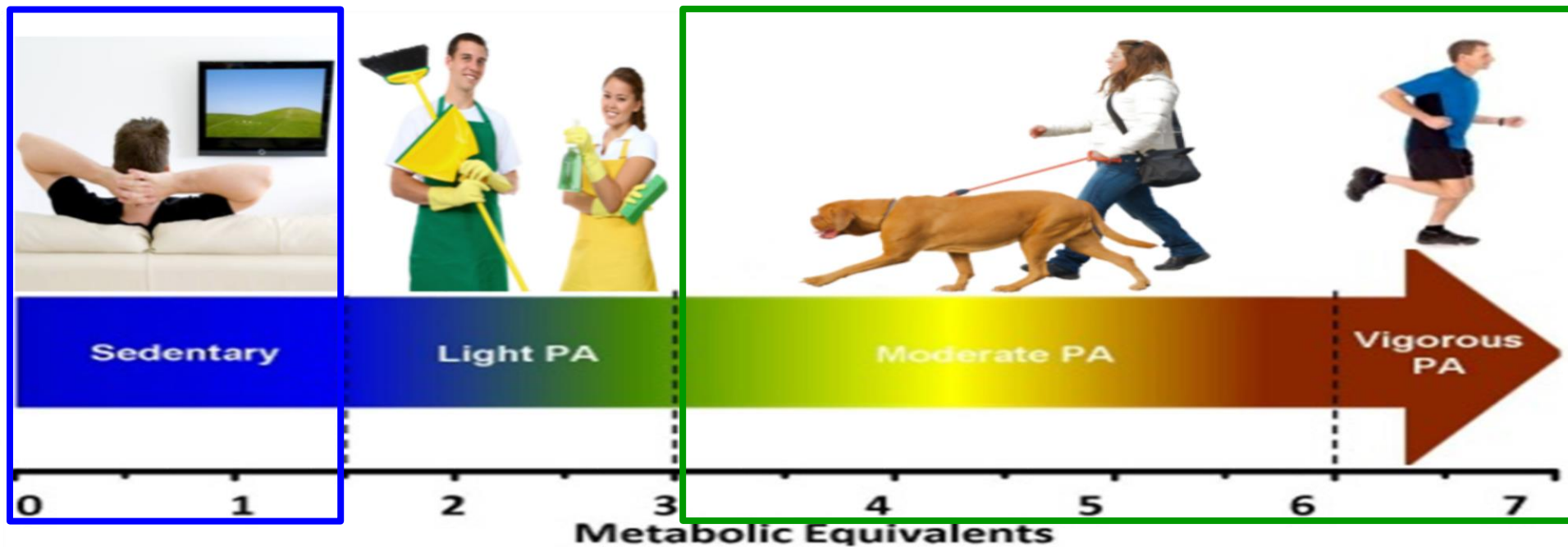
# SB vs. Inactivity: Distinct Health Behavior Change Challenges

## EXCESSIVE SB

Too much time spent in waking activities involving very low energy expenditure & sitting or reclining posture

## INACTIVITY

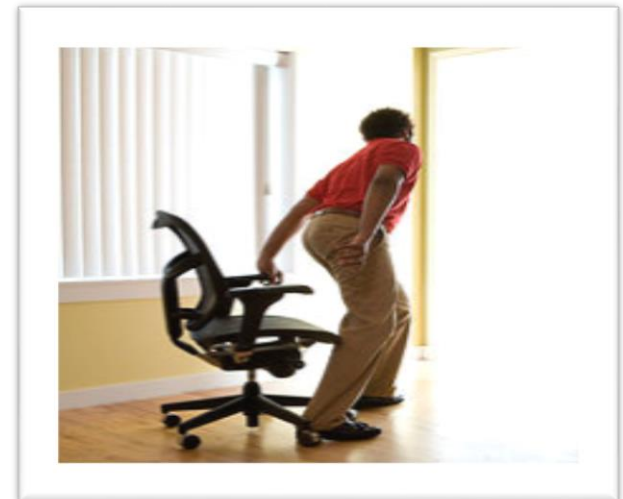
Too little time in activities requiring moderate to high effort and cause noticeable to substantial increases in heart rate—i.e. not meeting public health guidelines <150 MVPA min/wk in bouts  $\geq 10$  min



# SB vs. Inactivity:

## Important Health Risk Implications

- Both total SB and fewer SB interruptions are linked, independent of MVPA, with higher levels of adiposity, cardiometabolic and inflammatory risk biomarkers, and type 2 diabetes, CVD, and cancer incidence and mortality
- Conversely, less overall time spent in SB and more frequent SB interruptions are associated with lower adiposity and decreased levels of cardiometabolic risk biomarkers in individuals with overweight/obesity



# **SB vs. Inactivity:**

## **Important Intervention Considerations**

- Given that SB, unlike bout-related MVPA, is highly habitual, accounts for most waking hours, and involves minimal conscious processing, interventions to interrupt and decrease SB may be particularly effective when they:
  - Are [simple](#)
  - Are [usable across settings](#)
  - [Require little planning](#)
  - [Automatically monitor SB and prompt movement](#) upon meeting a clinically relevant threshold

# **Benefits of Mobile Health Technology for SB Intervention**



**Real-time  
Measurement and  
Intervention**



**Used During Daily  
Activities in the  
Natural Environment**



**Treatment  
Tailoring**



**Automation of  
Routine and/or  
Tedious Tasks**



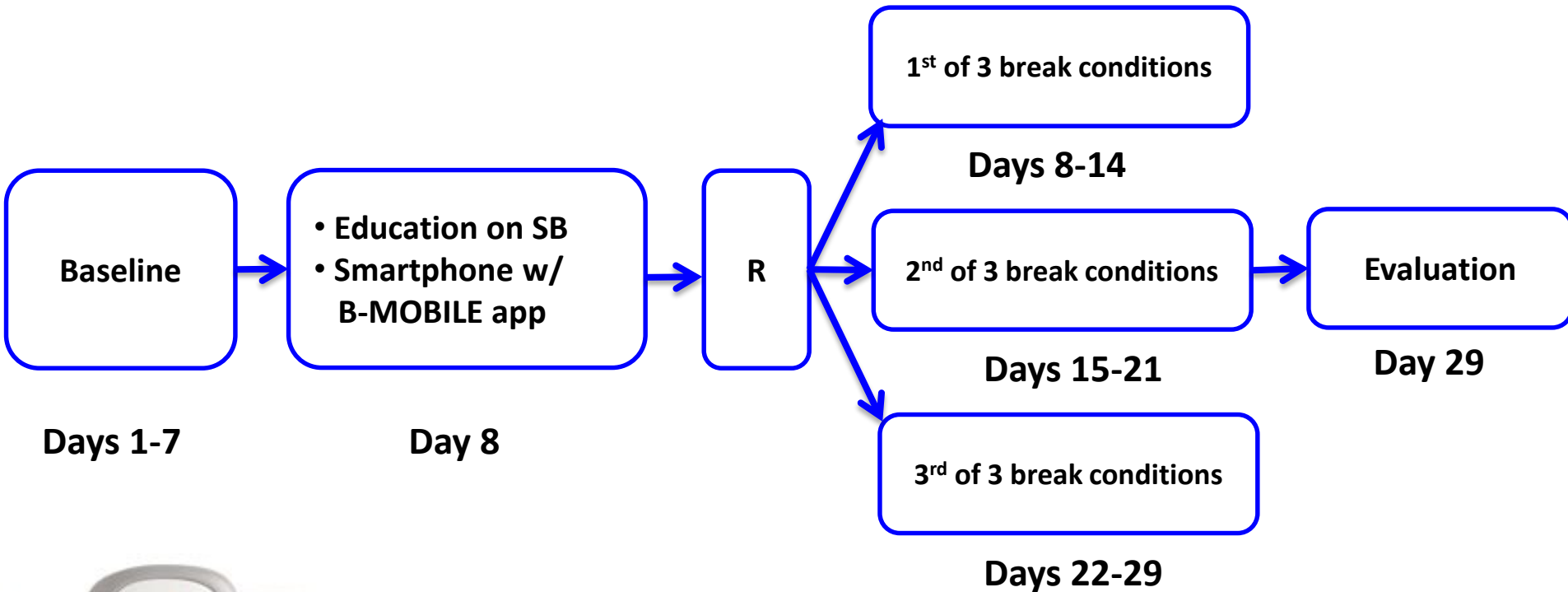
**Intervention  
Engagement**

# DESCRIPTION OF B-M BILE INTERVENTION APPROACH

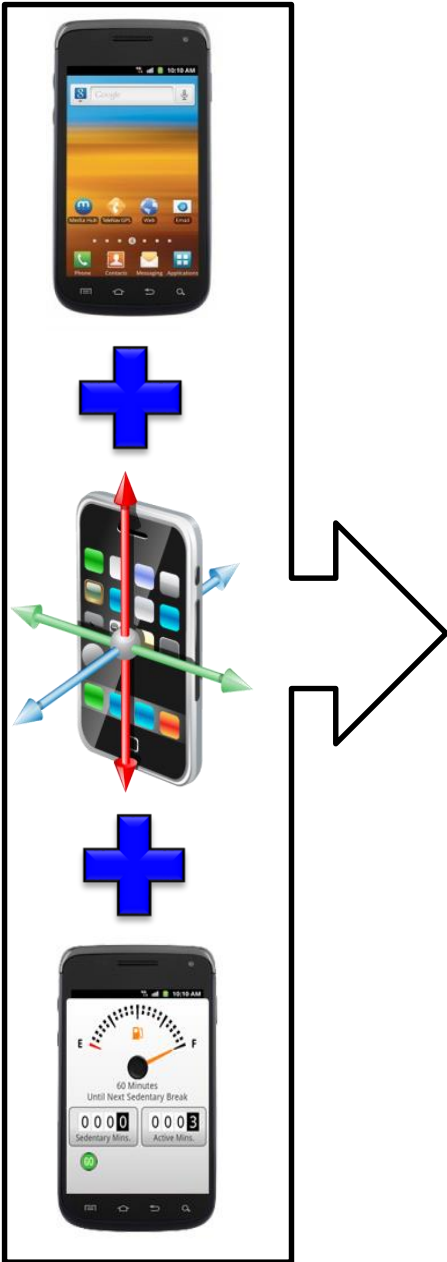
## **B-MOBILE Study Objectives**

- **Pilot-test *B-MOBILE* intervention in adults with obesity**
- **Compare 3 approaches to interrupting SB with PA breaks and delivering feedback on time spent in SB and PA.**
  1. **Prompt to walk  $\geq 3$  min after 30 continuous SB min**
  2. **Prompt to walk  $\geq 6$  min after 60 continuous SB min**
  3. **Prompt to walk  $\geq 12$  min after 120 continuous SB min**

# ***B-MOBILE* Methods and Procedures**

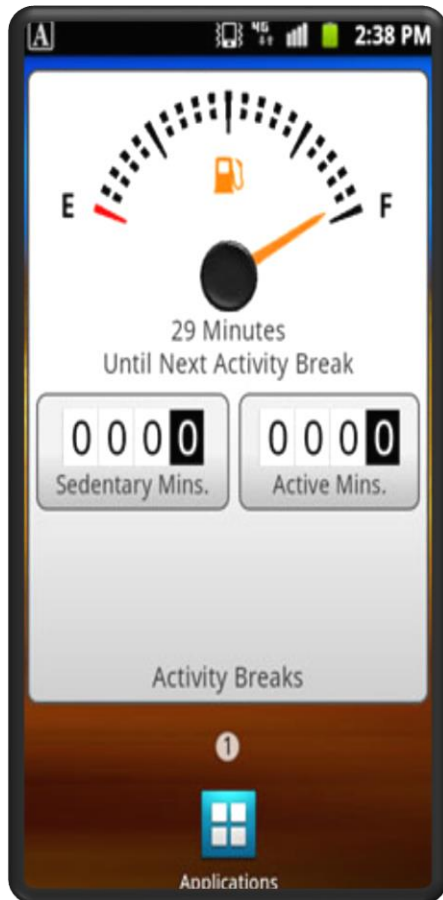


# **B-MOBILE Intervention Approach**

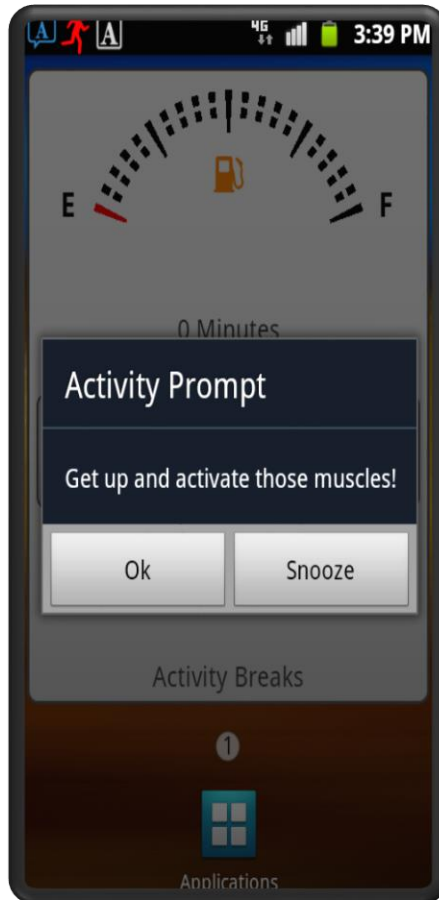


- Target SB performed across all settings
- Automatically monitor SB
- Issue automatic prompts to interrupt prolonged SB with brief PA breaks
- Provide continuous real-time feedback on SB and PA throughout day and amount of time until next PA break
- Deliver immediate reinforcement for adherence to prompts and performing PA breaks

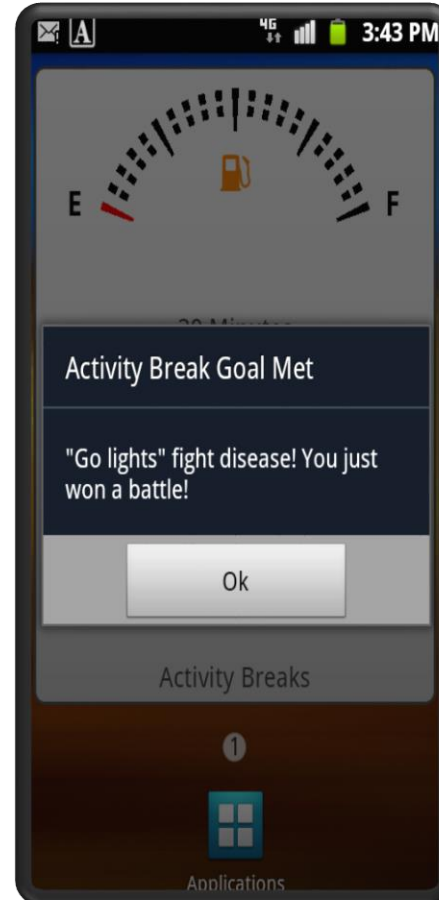
# **B-MOBILE Methods: Intervention Approach (cont.)**



**Smartphone  
activated & idle**



**Activity prompt is  
presented**



**Onboard  
accelerometer  
detects that break  
goal accomplished**



**"Go lights" have  
been earned by  
accomplishing break  
goals**

# PRELIMINARY EVIDENCE FOR EFFICACY OF

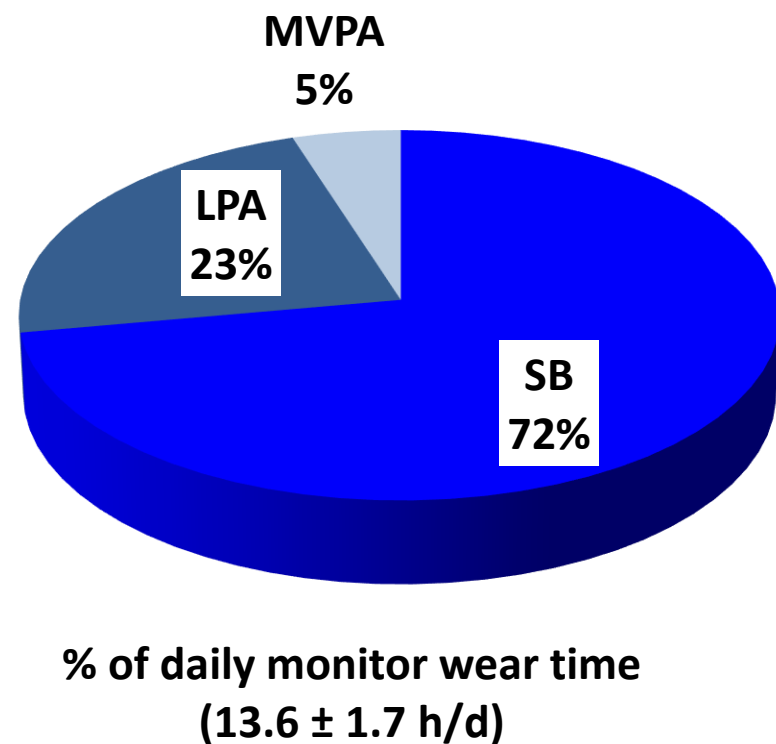
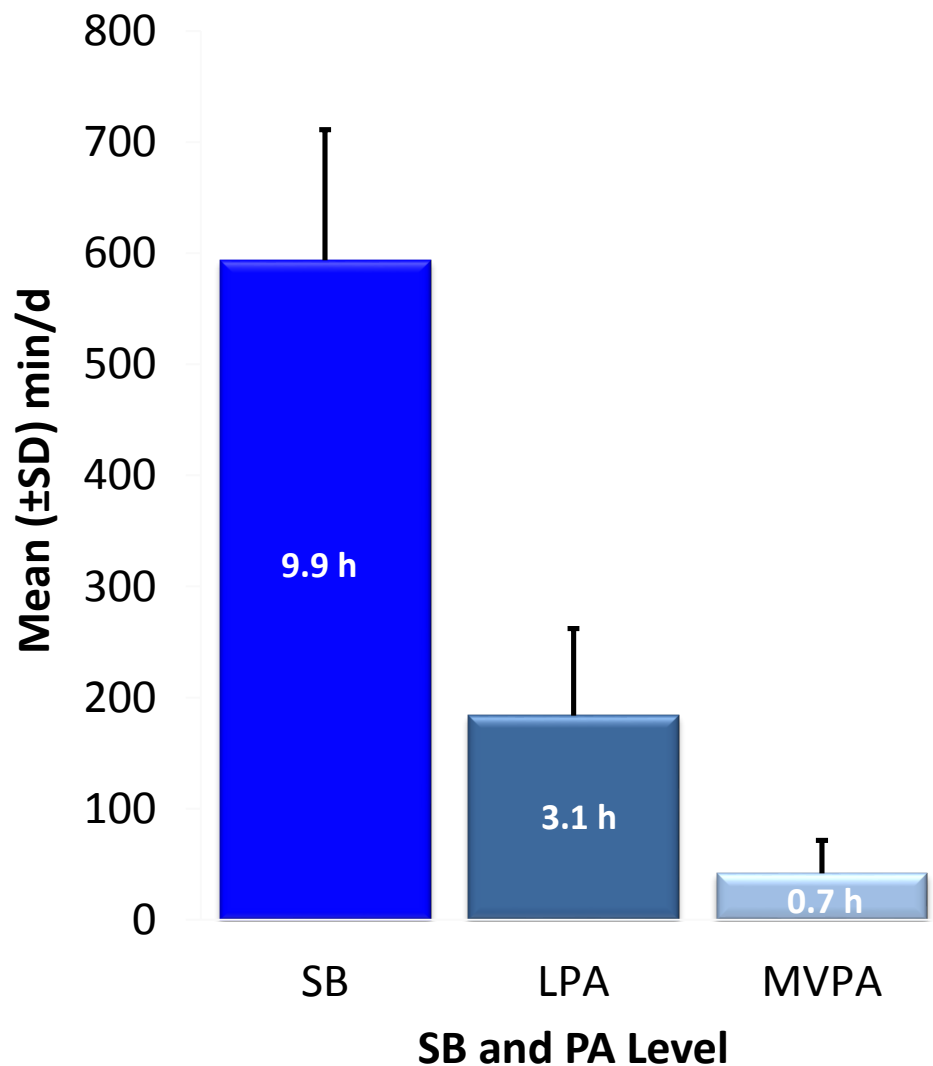
B-M  BILE

# INTERVENTION APPROACH

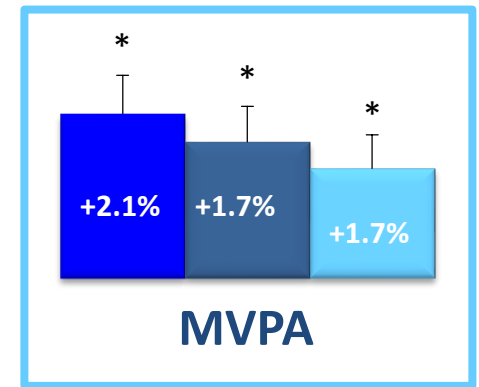
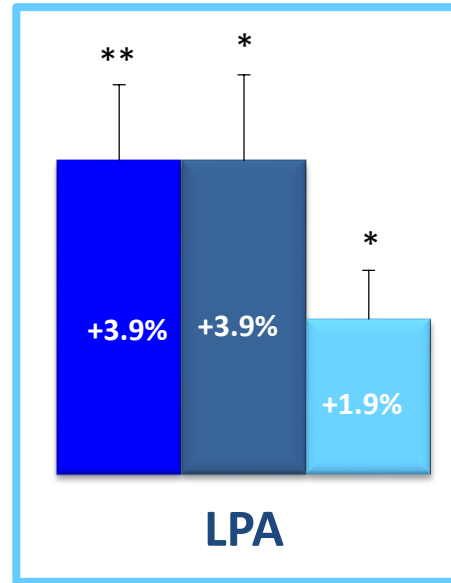
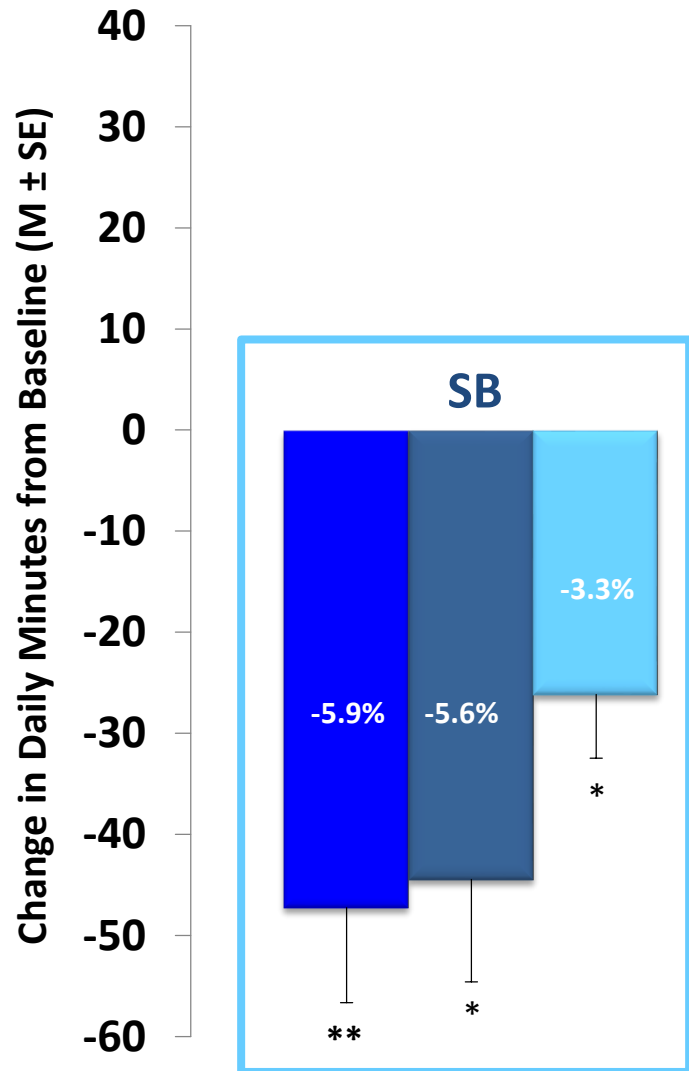
## **B-MOBILE Results: Participant Characteristics at Baseline (N=30)**

Age (Mean $\pm$ SD yrs)	47.5 $\pm$ 13.5
Female (%)	83.3
Non-White Race (%)	66.7
Hispanic Ethnicity (%)	10.0
$\geq 4$ year college degree (%)	40.0
BMI (Mean $\pm$ SD kg/m <sup>2</sup> )	36.2 $\pm$ 7.5
Weight (Mean $\pm$ SD kg)	98.1 $\pm$ 21.6

## **B-MOBILE Results: SB at Baseline**



# **B-MOBILE Results: Changes from Baseline in Total Daily Minutes Spent in SB, LPA, and MVPA**

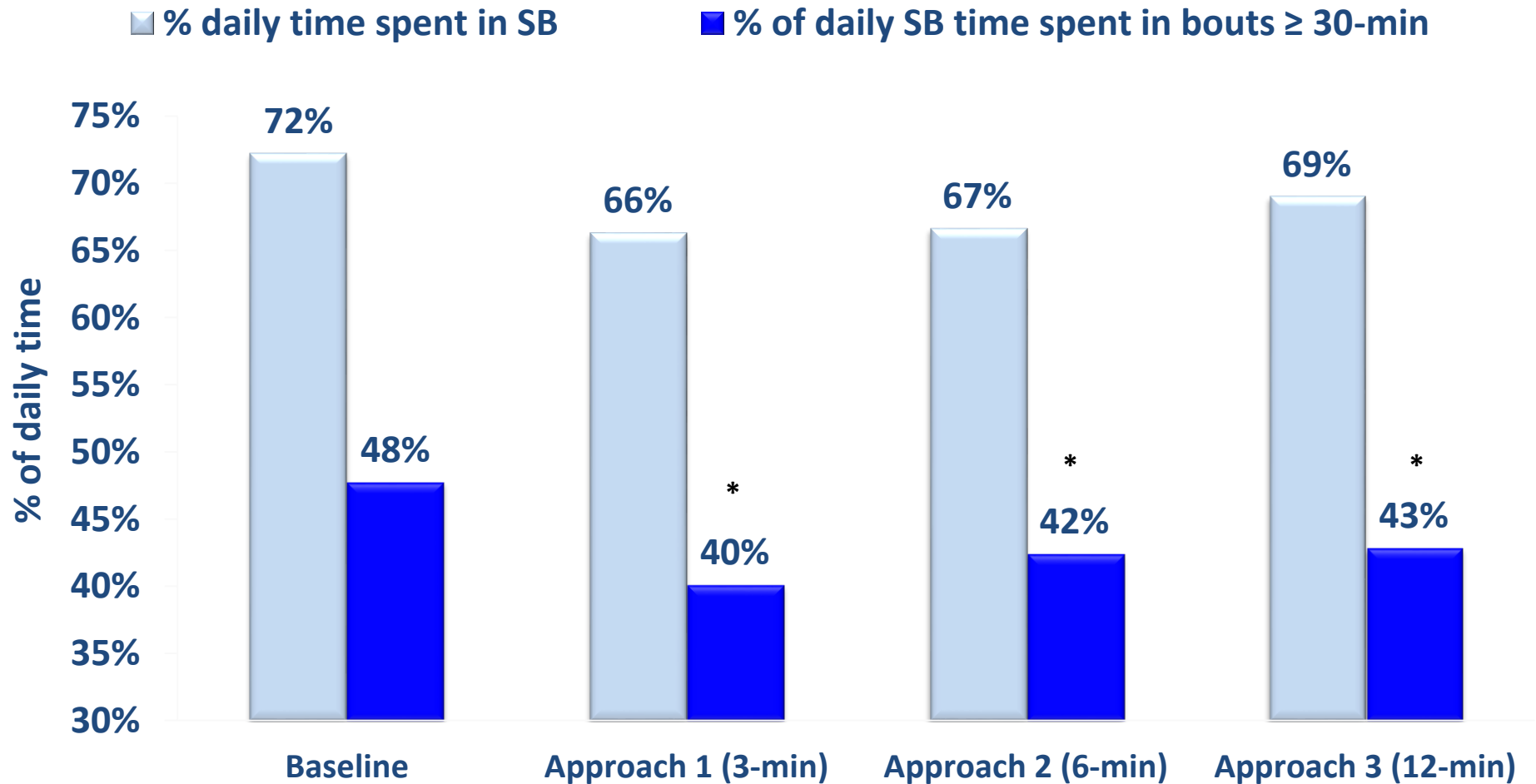


- Approach 1 (3-min break after 30 SB min)
- Approach 2 (6-min break after 60 SB min)
- Approach 3 (12-min break after 120 SB min)

\* $p < 0.05$  (vs. baseline)

\*\* $p < 0.05$  (vs. baseline and approach 3)

# **B-MOBILE Results: Changes from Baseline in Time Spent in Prolonged SB Bouts ( $\geq 30$ min)**



\* $p < 0.05$  (compared to baseline)

# **BEYOND PRIMARY OUTCOMES— EXAMINATION OF BEHAVIORAL RESPONSE TO THE**



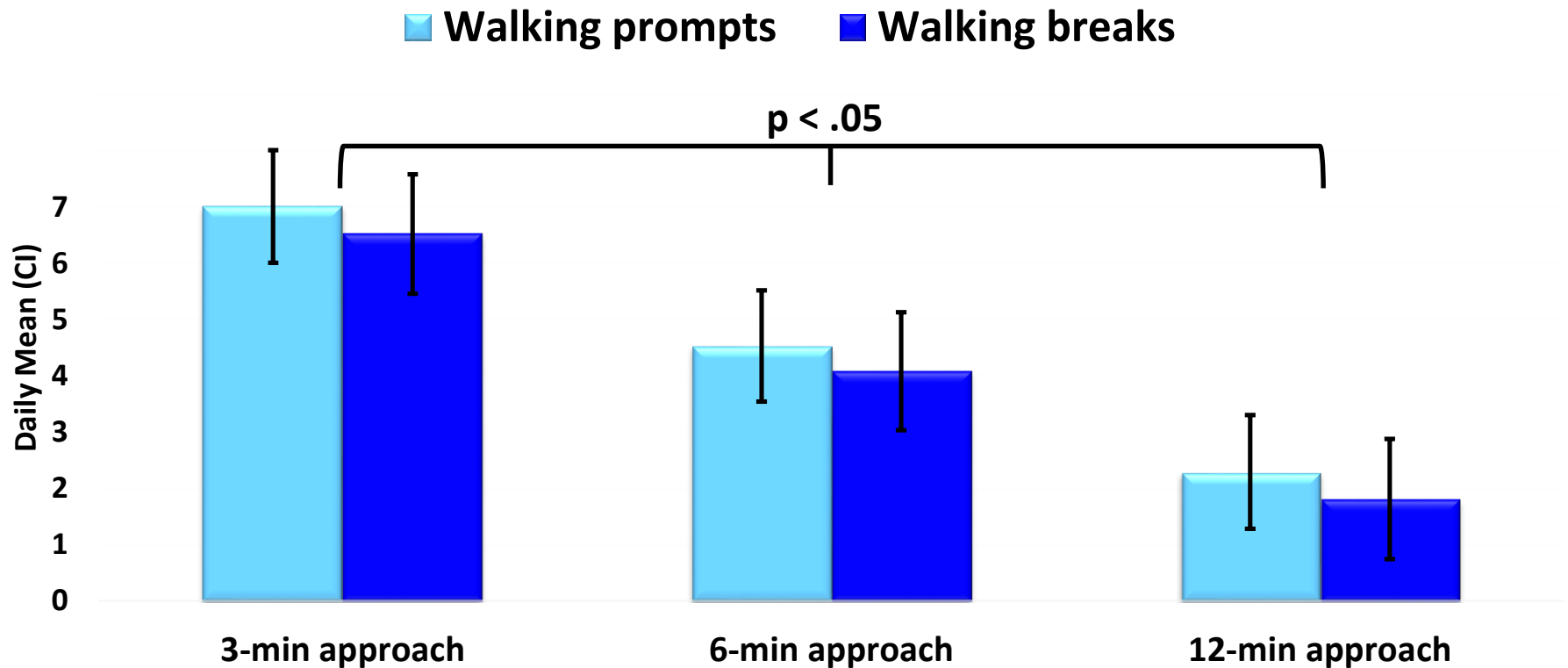
# **INTERVENTION APPROACH**

# **B-MOBILE Behavioral Response Results**

## ■ **Intervention Engagement**

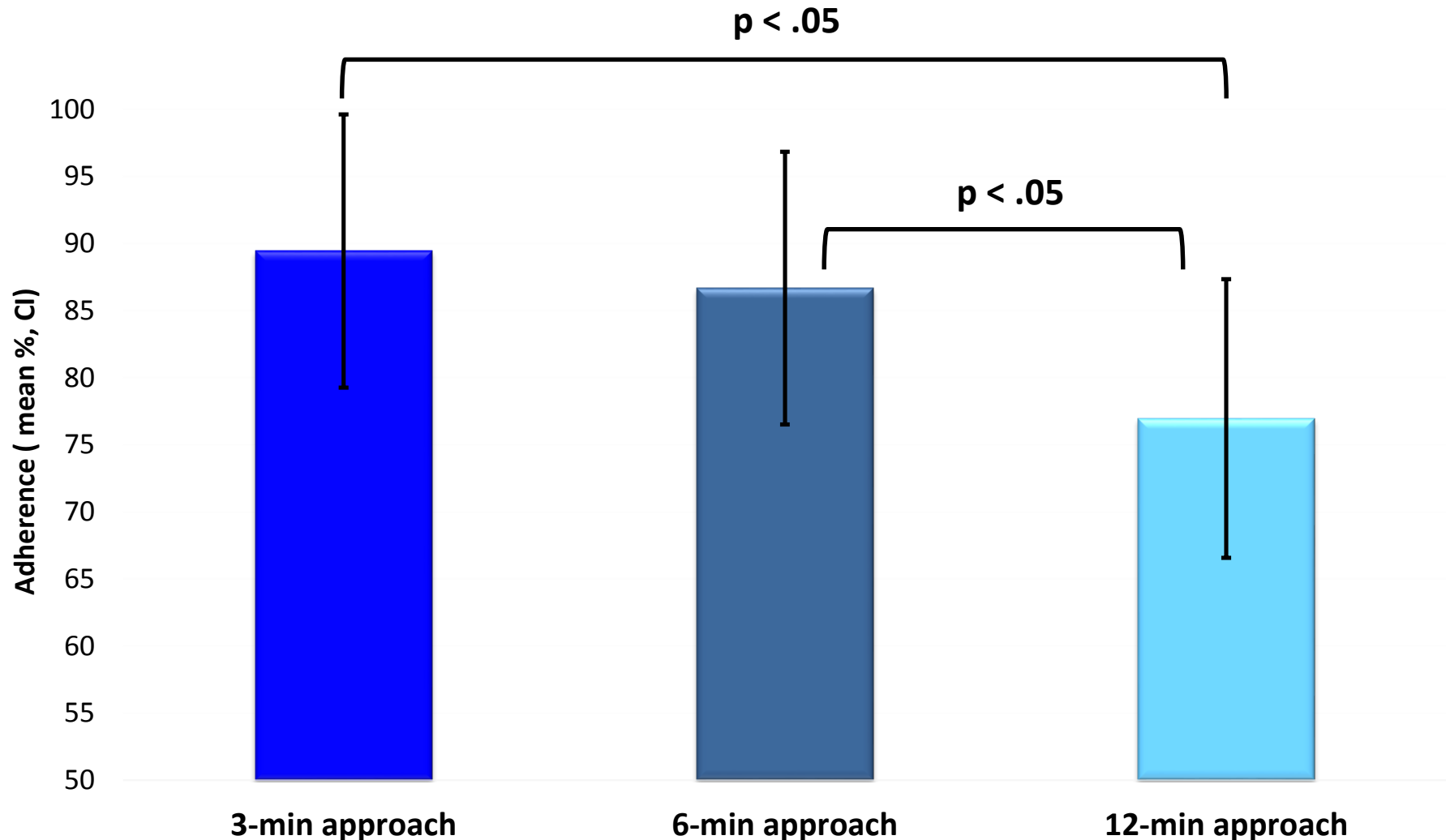
- On average, participants carried the smartphone for 6.9 d per each 7-day condition for 14.9 h/d (\* no differences between men and women)

## ■ **Number of Walking Prompts and Walking Breaks Per Day**



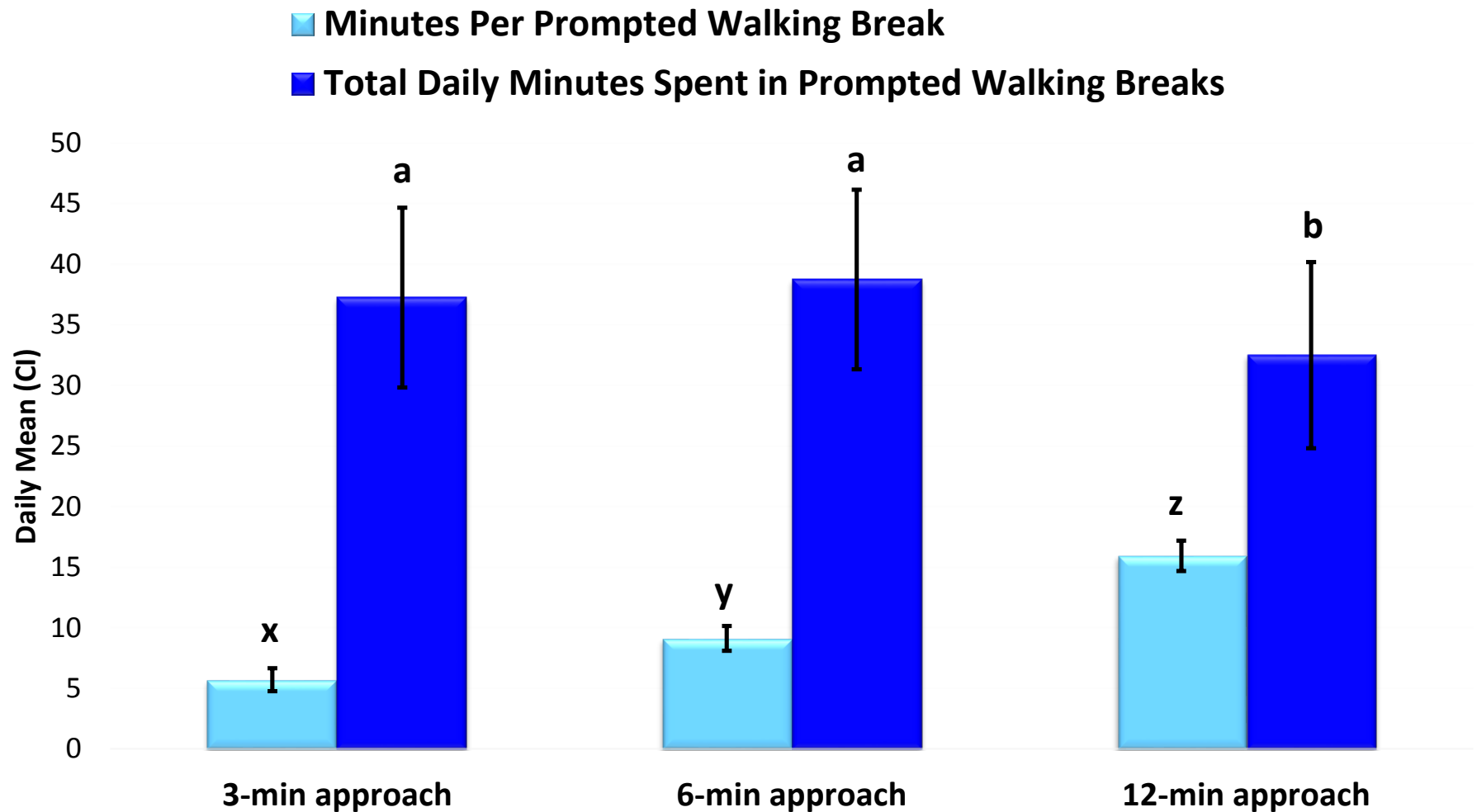
# **B-MOBILE Behavioral Response Results (cont.)**

- **Adherence to Walking Prompts (% of walking prompts that resulted in a walking break of the prescribed duration)**



# **B-MOBILE Behavioral Response Results (cont.)**

## ■ **Duration of Prompted Walking Breaks**



# CONCLUSIONS

- ***B-MOBILE*** produced significant SB reductions in adults with obesity
  - All 3 approaches reduced total % time spent in SB, which was replaced with increases in both LPA and MVPA
  - All 3 approaches reduced % time spent in prolonged bouts  $\geq 30$  min
  - 3-min approach superior to 12-min approach for reducing SB and increasing LPA
  
- ***B-MOBILE*** produced a high level of engagement and behavioral adherence
  - More frequent SB prompts resulted in the highest levels of adherence
  - Approaches that required shortest walking breaks per prompt resulted in the greatest number of total daily minutes spent in walking breaks
  - ***Frequent prompts for small change may be an optimal strategy for reducing SB***

# FUTURE DIRECTIONS

- Enhancing ***B-MOBILE*** approach with functionality to support long-term use
  - Long-term goal setting and feedback
  - Tailoring of prompts based on *chosen prompting scheme, context (location) and source(s) of motivation*
  - Progressive goals with gamification and friendly competition
  - “Push notifications” for SB education and intervention engagement
- Test whether enhanced ***B-MOBILE*** can produce longer-term reductions in SB and related improvements in cardiometabolic and inflammatory risk biomarkers among adults with obesity

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