

Impact of Device Type on Visual Cognition

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Background

- mHealth tools, like remotely administered digital cognitive assessments, are emerging methods for evaluating cognitive health [1, 2].
- mHealth tools offer clinical advantages, such as: (1) long-term insights, (2) increased patient comfort, (3) enhanced compliance [2,3].
- Despite documented benefits, the role of technology familiarity in mobile assessment performance remains underexplored.
- Interface expertise may confound cognitive mHealth markers [1].

Purpose

The present study aims to investigate whether technological familiarity, technology ownership, and assessment device influence performance on a single point ambulatory cognitive assessment.

Design

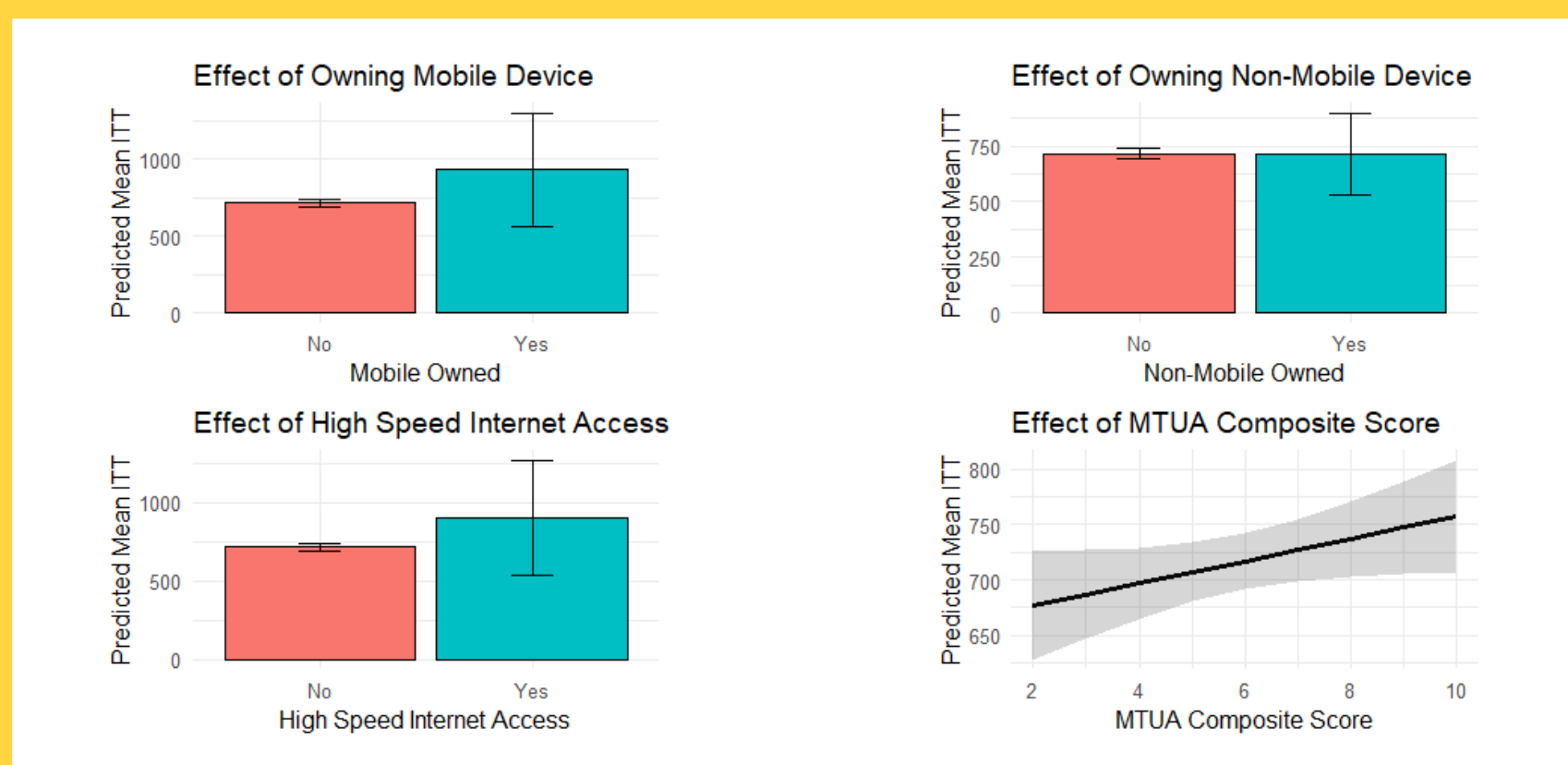
- The present study used a 2 x 2 x 2 x 2 x 2 between subjects factorial design with a continuous covariate, with ITT as the dependent variable.

Design	Variable	Levels
Between - Subjects	Assessment device	Mobile Phone / Non-Mobile Phone
Between - Subjects	Ownership (Mobile)	Yes / No
Between - Subjects	Ownership (Non-Mobile)	Yes / No
Between - Subjects	Ownership (Wearables)	Yes / No
Between - Subjects	Ownership (High speed internet)	Yes / No
Between - Subjects	Technological Familiarity	Continuous composite score across MTUA subscales.

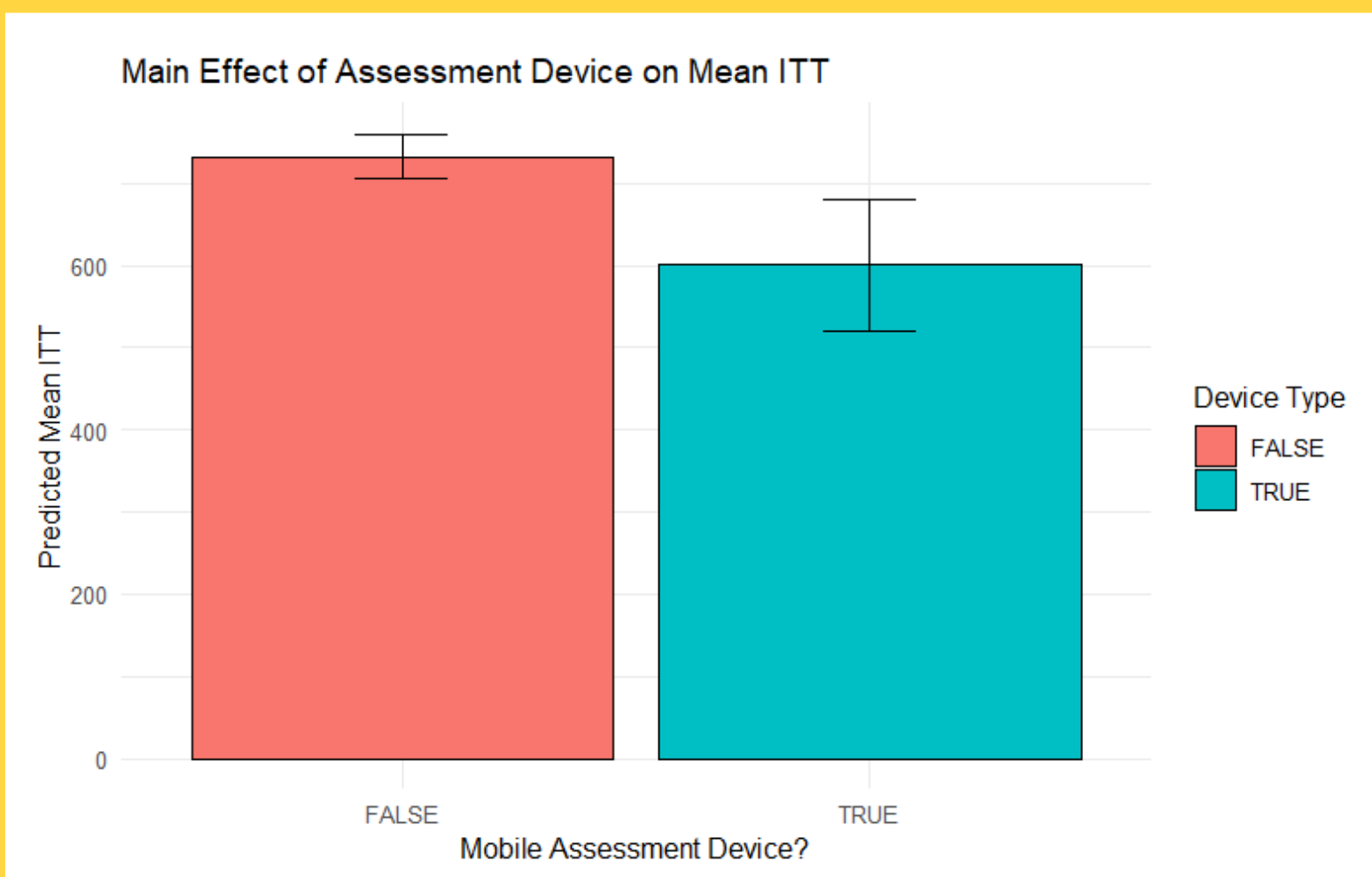
Results

Multilevel Model (MLM) Estimates for Mean ITT					
Mean Inter-Target Time					
Predictor	β	SE	CI	t	p
Intercept	781.86	37.08	(709.19 – 854.53)	21.09	<.001***
MTUA Composite Score	10.05	5.49	(-0.72 – 20.81)	1.83	0.067
Mobile Owned _{no}	215.52	187.05	(-151.12 – 582.15)	1.15	0.249
Non-Mobile Owned _{no}	-2.98	94.18	(-187.58 – 181.62)	-0.03	0.975
Wearables Owned _{no}	62.25	27.45	(8.46 – 116.05)	-2.27	.023*
High Speed Internet Access _{no}	185.11	188.09	(-183.57 – 553.79)	0.98	0.325
Assessment Device _{mobile}	-131.57	43.25	(-216.34 – -46.81)	-3.04	.002**
Num Layers Target _{no}	63.31	3.45	(56.55 – 70.07)	18.35	<.001***
Num Layers Targets	-52.62	3.58	(-59.63 – -45.62)	-14.73	<.001***
Pages Completed	-12.11	0.41	(-12.92 – -11.31)	-29.51	<.001***
Random Effects					
Level 1 Error Variance	625059				
Level 2 Error Variance (Participant)	34203.8				
ICC	0.36				
Num. Obs.	30009				
R ² Marginal	0.081				
R ² Conditional	0.408				

Notes. N = 216. p < .05*, p < .01**, p < .001***. Degrees of freedom calculated using Satterthwaite approximation. Categorical predictors coded as follows: '0' = No, '1' = Yes. Assessment Device compares mobile-based assessments to non-mobile assessments. Random effects included for Participant to account for individual variability.

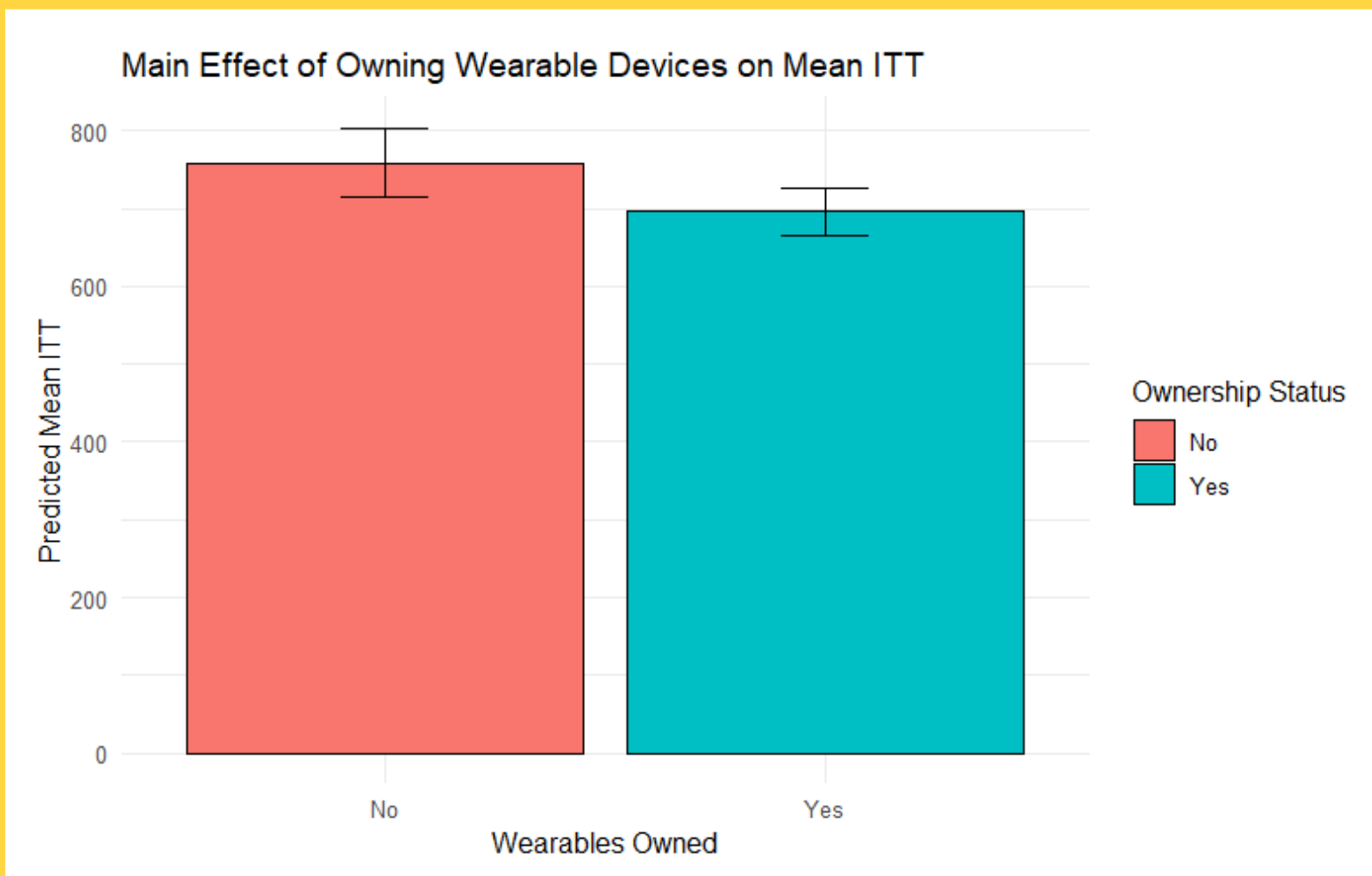


Estimated Marginal Effects of Non-Significant Predictors. Each panel displays the estimated marginal effects of a non-significant predictor on mean ITT while controlling for other variables in the multilevel model. Error bars represent 95% confidence intervals.



Estimated Marginal Effects of Assessment Device on Mean ITT.

This plot illustrates the predicted mean IT for assessments conducted on mobile devices (True) vs non mobile devices (False). Reference category = False.



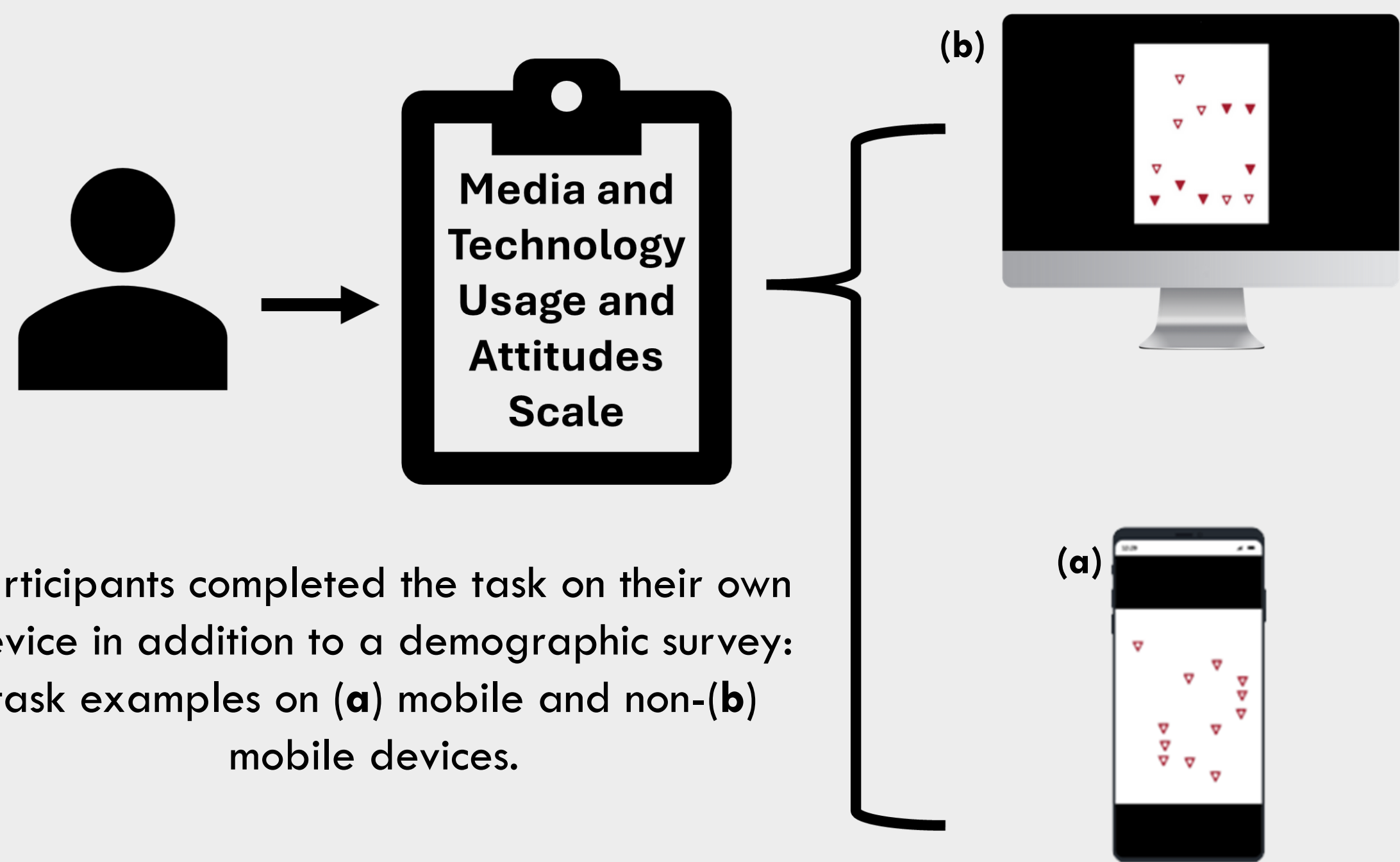
Estimated Marginal Effects of Assessment Device on Mean ITT.

This plots illustrates the predicted mean ITT for participants who own wearable devices ('Yes') vs. those who do not ('No'). Reference category = 'No'.

Discussion

- Smaller screens increase performance efficiency potentially by decreasing target distances on screen [4,5].
- Owning wearables may boost performance, however data remain inconclusive regarding the magnitude of the relationship.
- Future research should explore the effects of mobile device features on performance.
- Future work should establish mHealth baselining procedures for participant devices and develop test norming best practices for mobile assessment strategies.

Methods

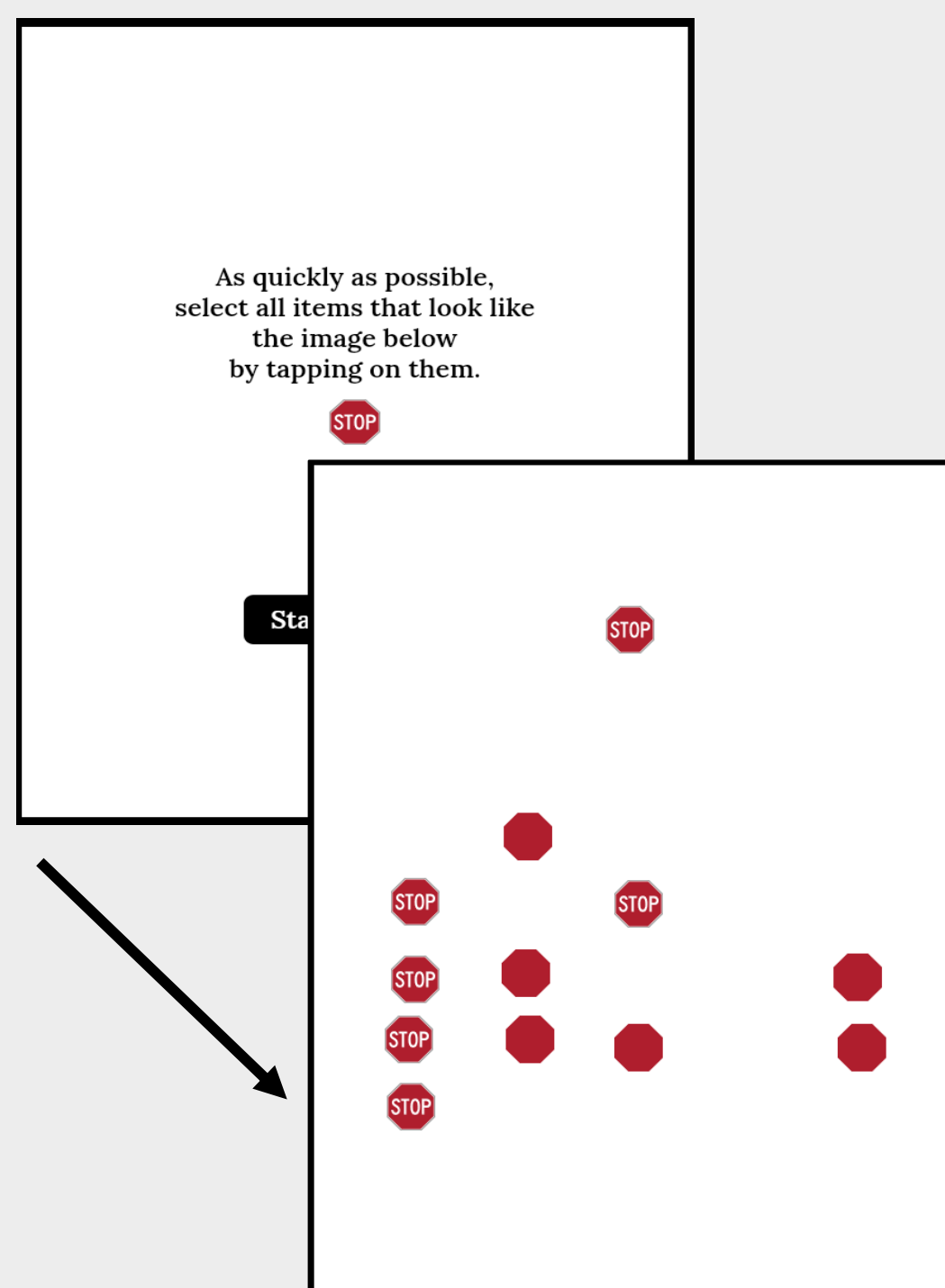


Participants completed the task on their own device in addition to a demographic survey: task examples on (a) mobile and non-(b) mobile devices.

Media and Technology Usage and Attitudes Scale Rosen et al., 2013 [6]

How often do you do each of the following activities?
(1 = Never, 5 = Several times a week, 10 = All the time)

Subscale	Example item
Email	Check your email looking for a specific email sender.
Internet	Search the Internet for information on any device.
SMS	Send and receive text messages on a mobile phone.
Videogames	Play games on a computer, video game console or smartphone BY YOURSELF.



Example task flow

References

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