

Brief Online Mindfulness Training in Young Drivers

A Pilot Randomized Controlled Trial

Derek A. Albert ^{1*}, Marie Claude Ouimet ², Thomas G. Brown ^{2,3}

¹ Department of Psychiatry, McGill University,
845, Sherbrooke St W, Montreal, Quebec, H3A 0G4, Canada

² Faculty of Medicine and Health Sciences, University of Sherbrooke,
150, Charles-Le Moyne PL, Suite 200, Longueuil, Quebec, J4K 0A8, Canada

³ Addiction Research Program, Douglas Hospital Research Centre,
Perry Pavilion, Room E-4109, 6875, Boulevard LaSalle, Montreal, Quebec, H4H 1R3, Canada

*derekalbert@icloud.com

Acronyms

FD = Focused Driving

MT = Mindfulness Training

MW = Mind Wandering

PMR = Progressive Muscle Relaxation

T1 = Time 1, Pre-Intervention

T2 = Time 2, Post-Intervention

Introduction

The Young Driver Problem

- Road traffic crashes are the leading cause of death among young people between 5 to 29 years of age¹
- Drivers under 25 years of age are overrepresented in crashes
 - In 2018, Individuals under 25 constituted 11.8% of Canadian drivers, but were involved in 22.9% of fatal and injury crashes²
- Human factors are involved in 90% of crashes³
- Inexperience, risk-taking, and impairment from alcohol or drugs only partially explain young driver crashes⁴

1. World Health Organization (2018); 2. Transport Canada (2020); 3. Dingus et al. (2016);
4. Rolison & Moutari, S. (2020)

Introduction

Driver Distraction & Mind Wandering

- Young drivers are particularly susceptible to distraction-related crashes¹
- People spend 30-50% of their daily lives engaged in MW³
- Retrospectively reporting “intense” MW before a crash is associated with a two-fold increase in the likelihood of being at-fault⁴
- MW is cited by drivers as a top contributor to crashes^{5,6}
- MW is linked to faster driving speeds, shorter headway distances, and slower reactions times⁷
- Age is negatively correlated with MW while driving⁸

1. Guo et. al (2017); 2. Dingus et al. (2016); 3. Killingsworth (2010); 4. Gil-Jardiné et al. (2017);
5. McEvoy et al. (2006); 6. Fofanova & Vollrath (2012); 7. Yanko & Spalek (2014); 8. Burdett et al. (2016)

Introduction

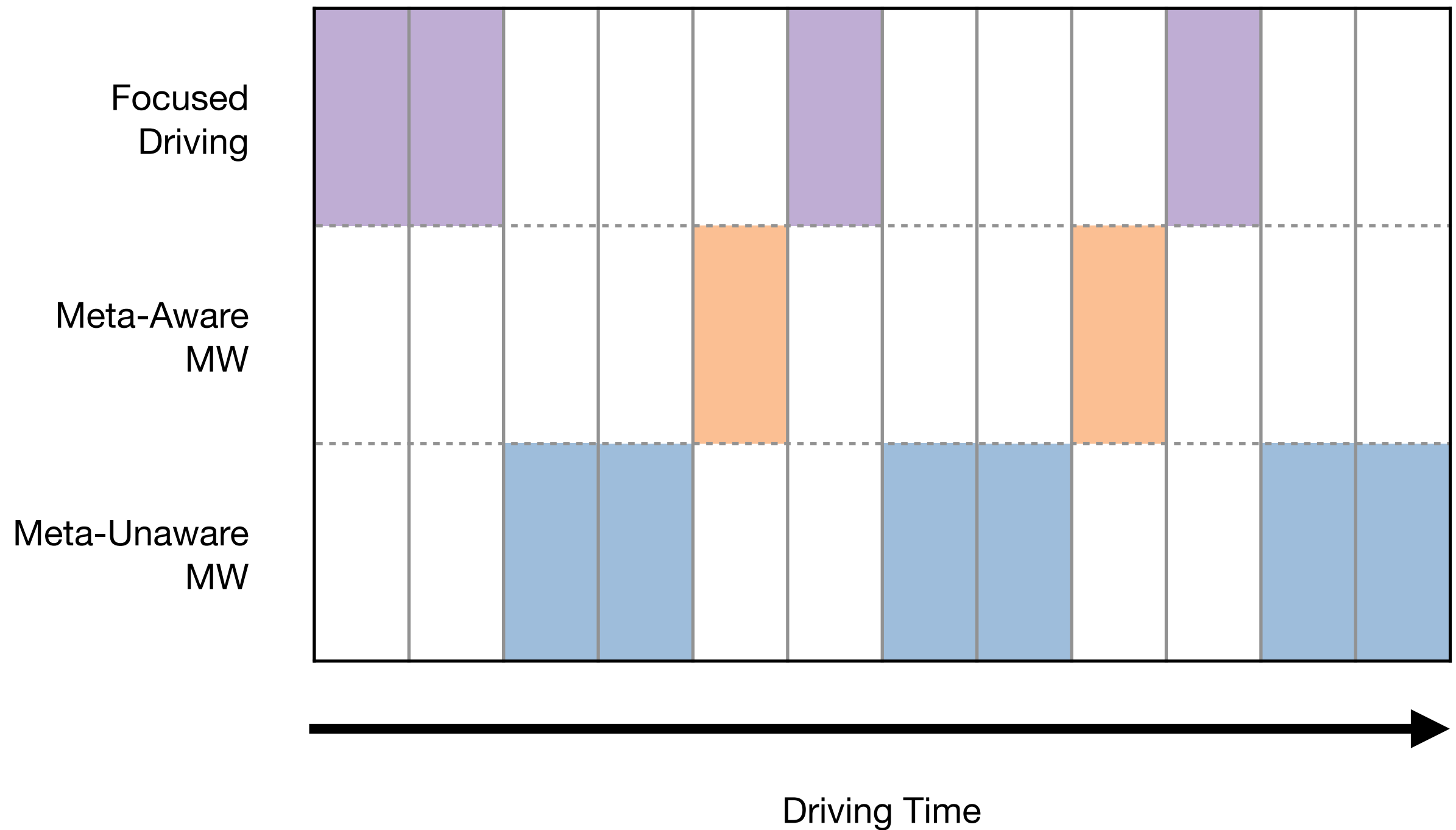
Mindfulness & Mind Wandering

- Mindfulness is a state and trait capacity to focus on the present moment^{1,2}
- Trait mindfulness negatively predicts MW while driving^{4,5}
- MT increases state and trait mindfulness³ and reduces MW⁶
- MT is proposed to cultivate meta-awareness of MW⁷
- Some evidence suggests that unsafe driving is less pronounced during meta-aware, compared to meta-unaware, MW^{8,9}

1. Kabat-Zinn (1994); 2. Mrazek et al. (2014) 3. Kiken et al. (2015). 4. Burdett et al. (2016); 5. Young et al. (2019); 6. Rahl et al., (2017); 7. Brandmeyer & Delorme (2021). 8. Albert et al. (2018); 9. Cowley (2013)

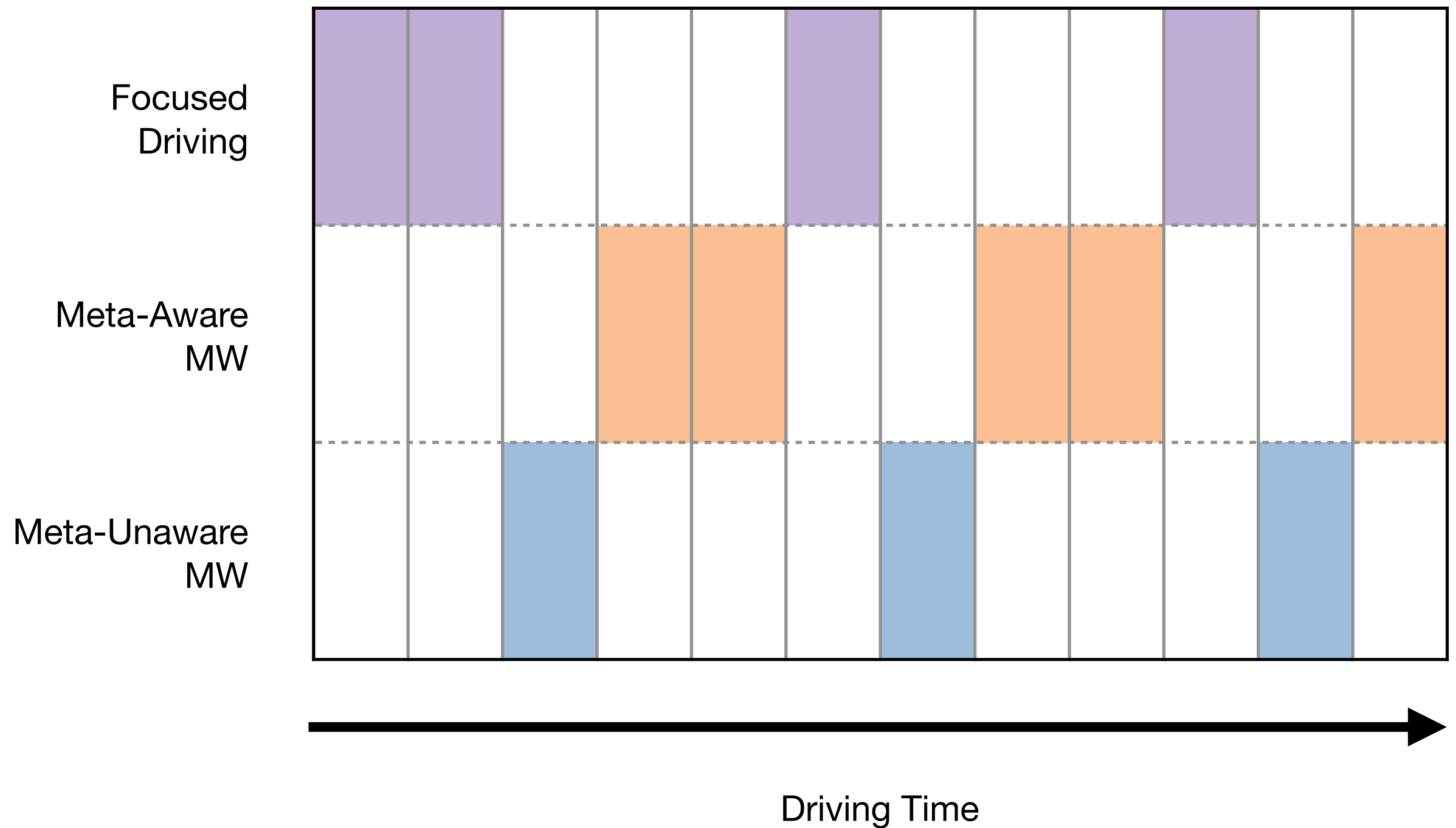
Hypotheses

H1: MT Increases
Meta-awareness of MW



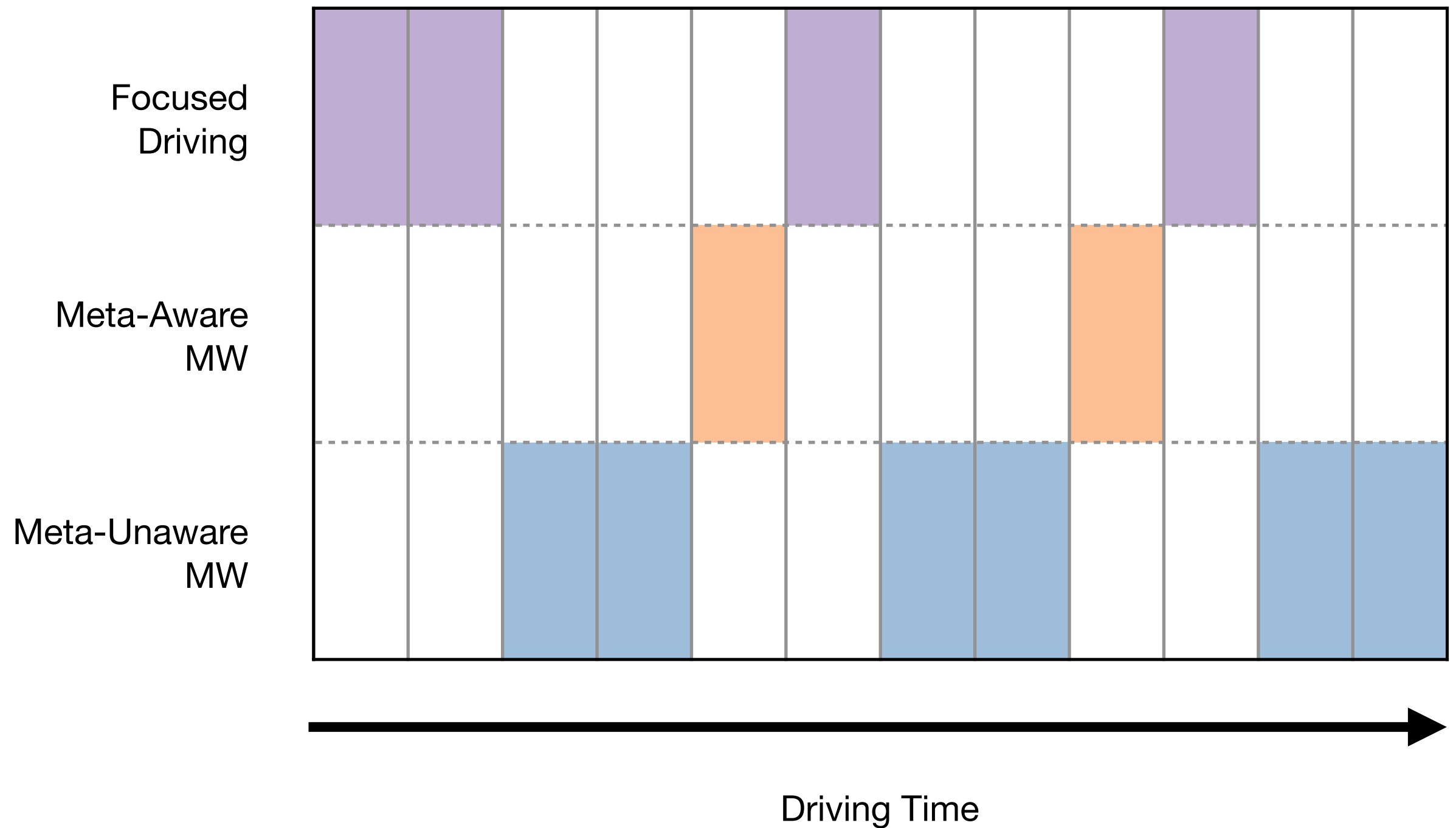
Hypotheses

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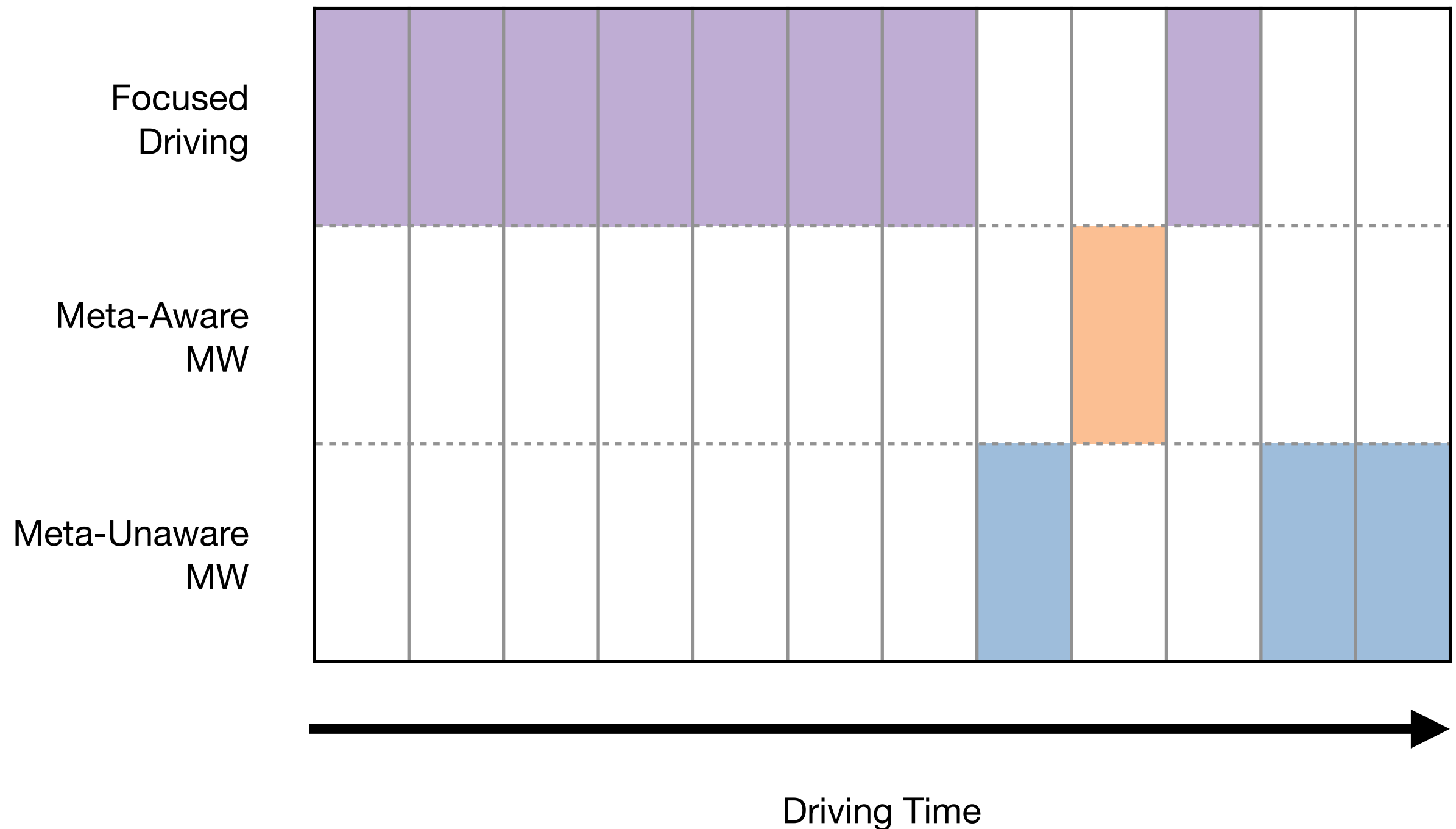
Hypotheses

H2: MT Reduces
MW While Driving



Hypotheses

H2: MT Reduces
MW While Driving



Exploratory Objectives

- E1. Specificity of action: whether brief online MT engenders greater state mindfulness and whether effects of MT are sensitive to motivation
- E2. Driving behaviour linked to MW, meta-awareness, and MT
- E3. Feasibility of brief online MT in young drivers

Methods

Methods

Recruitment

N = 26 Healthy Male and Female Drivers

Inclusion Criteria

- Age 21-25
- Valid driving license
- Normal or corrected vision and hearing

Exclusion Criteria

- History of driving while impaired
 - Diagnosed head injury, chronic illness, neurological condition, mental disorder
 - Alcohol or drug dependence symptoms
 - Detectable blood alcohol content
 - Previous meditation experience
 - Simulator Sickness
-

Methods

University of Sherbrooke
Driving Simulator



Methods

University of Sherbrooke
Driving Simulator



S1: Methods

Simulated Drive



S1: Methods

Simulated Drive



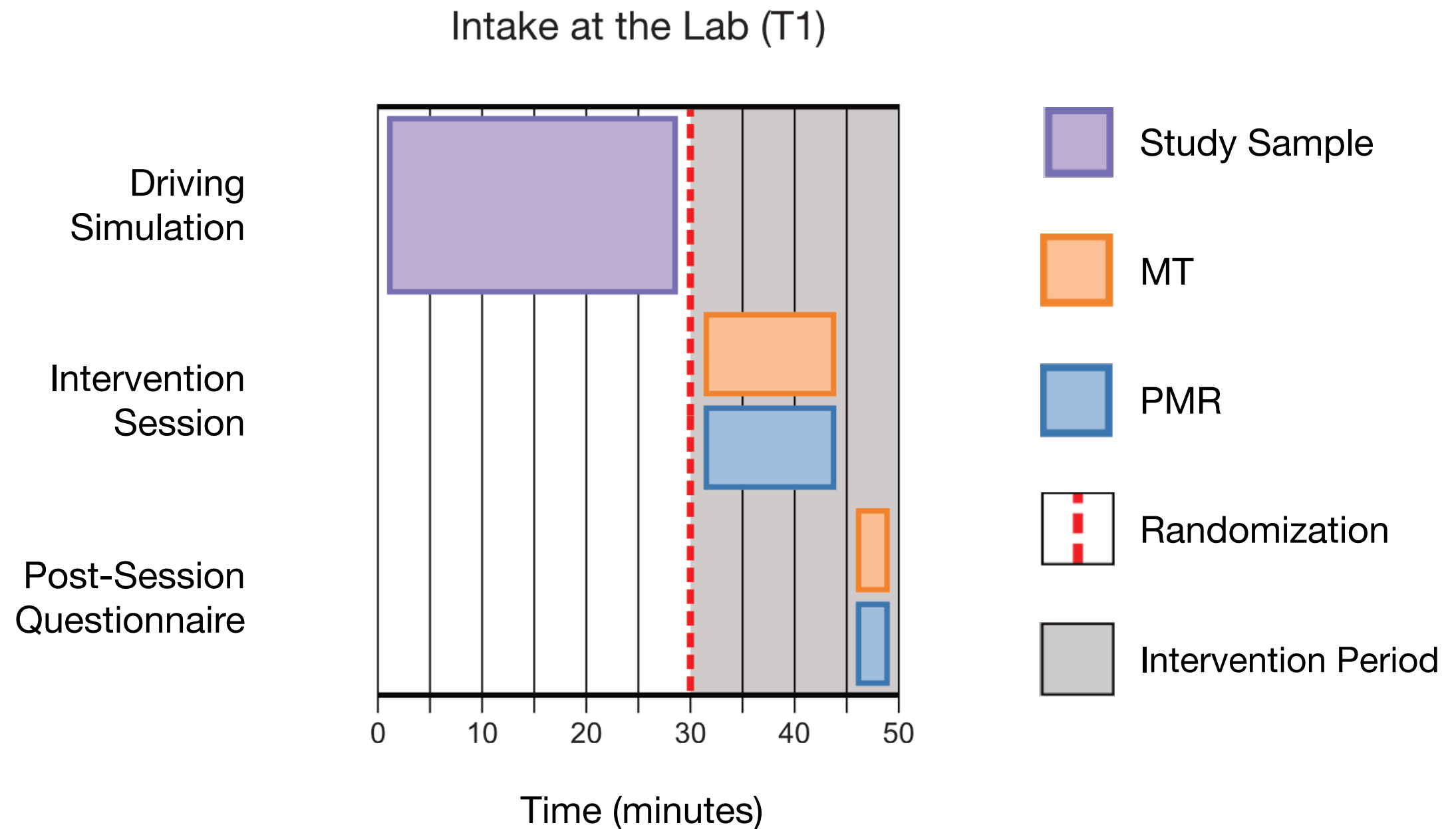
S1: Methods

Simulated Drive



Methods

Procedure

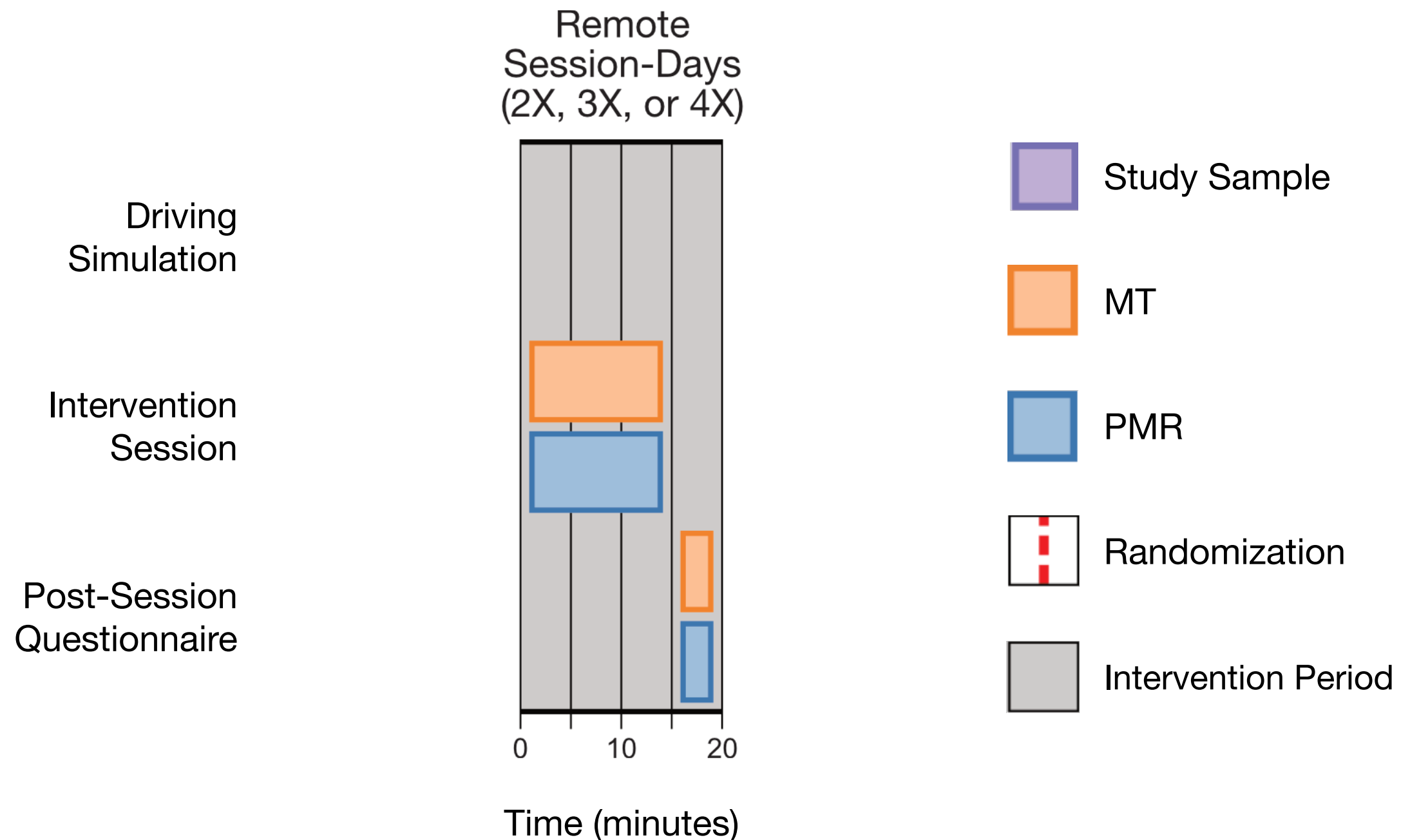


The Post-Session Questionnaire included the State Mindfulness Scale, the Intrinsic Motivation Inventory - Interest/Enjoyment scale, and a text box for participants to describe their experiences from the intervention session.

Procedures were approved by the Douglas Mental Health University Institute Research Ethics Board (IUSMD-19-10)

Methods

Procedure

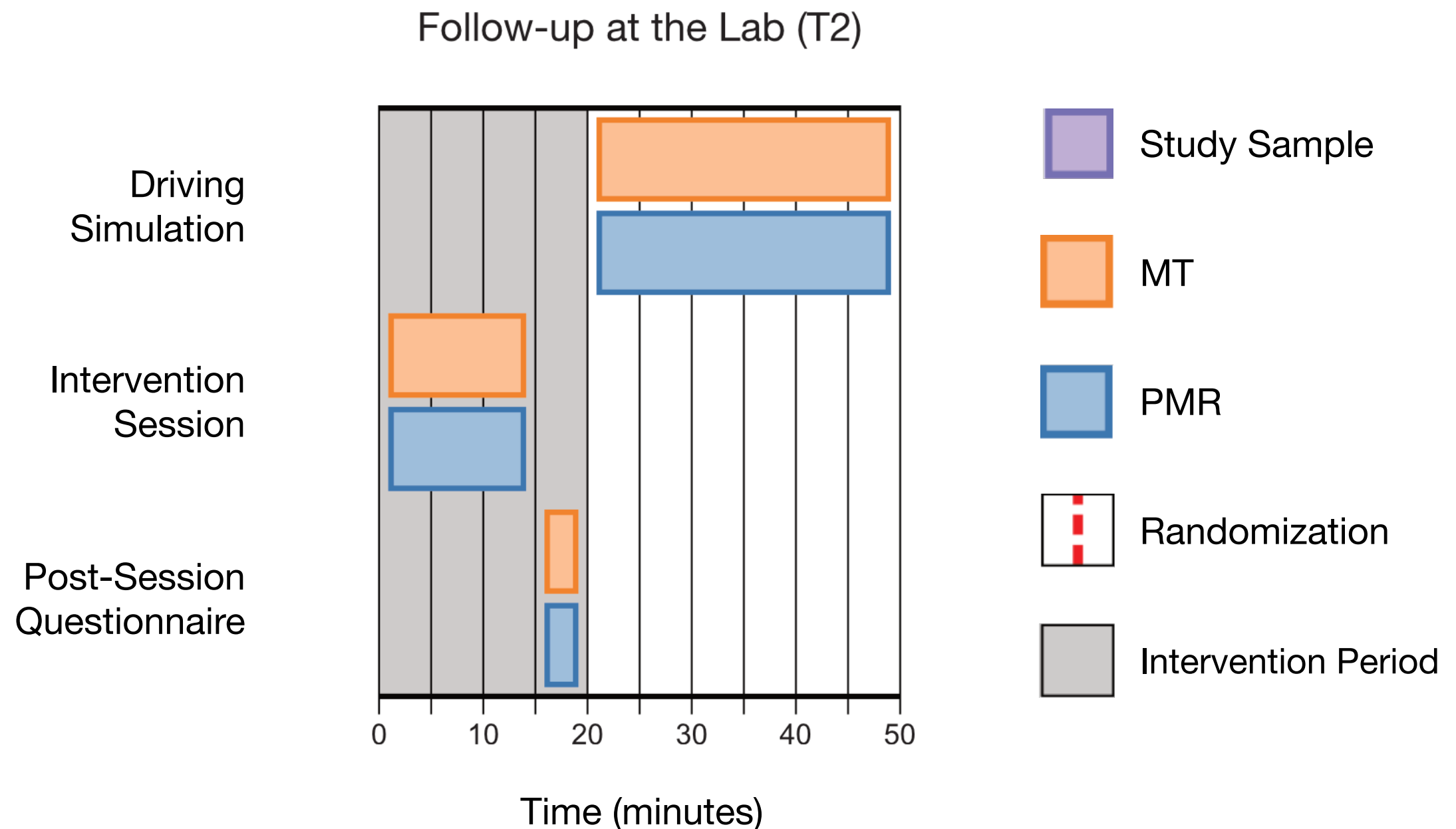


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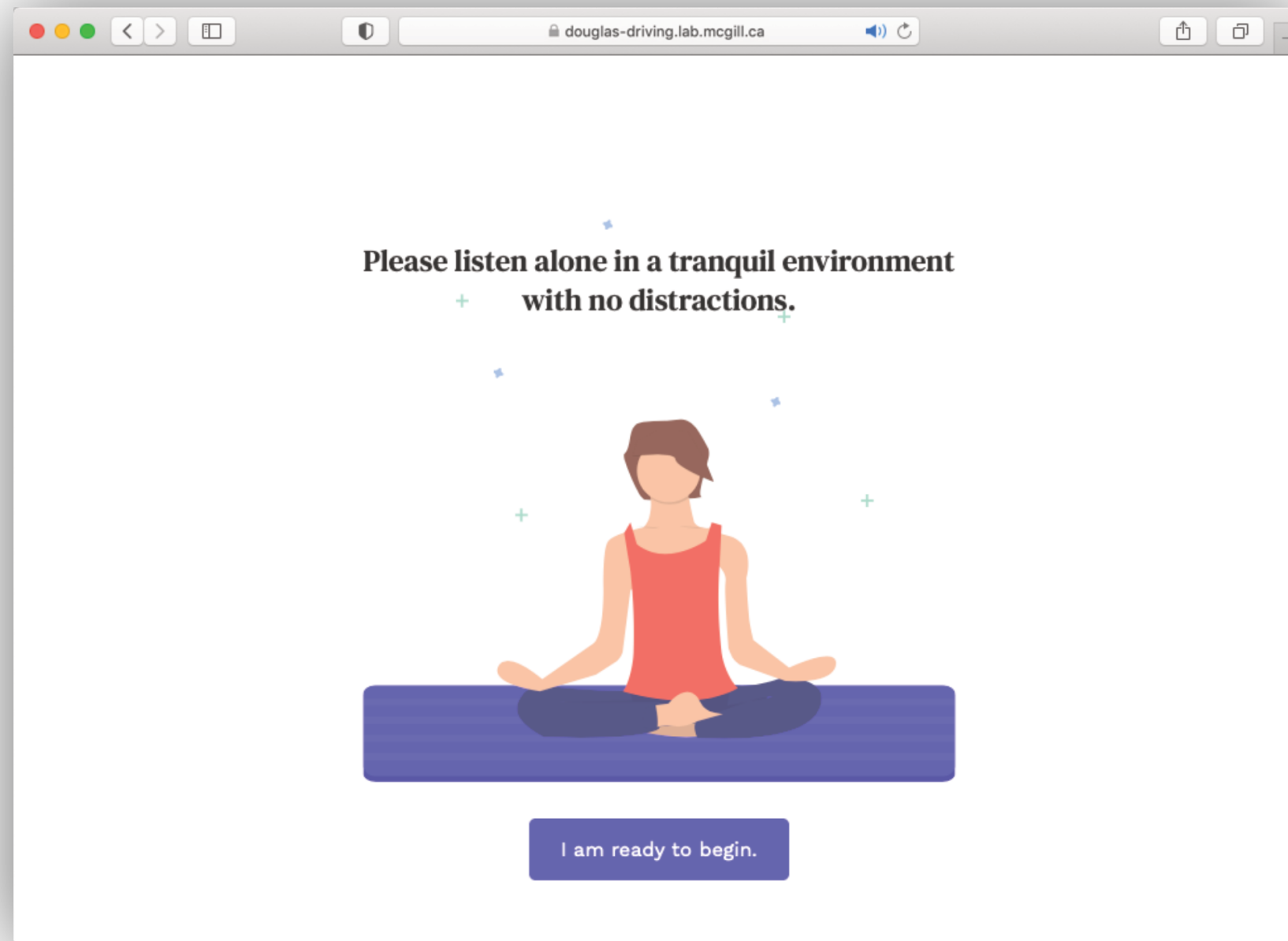


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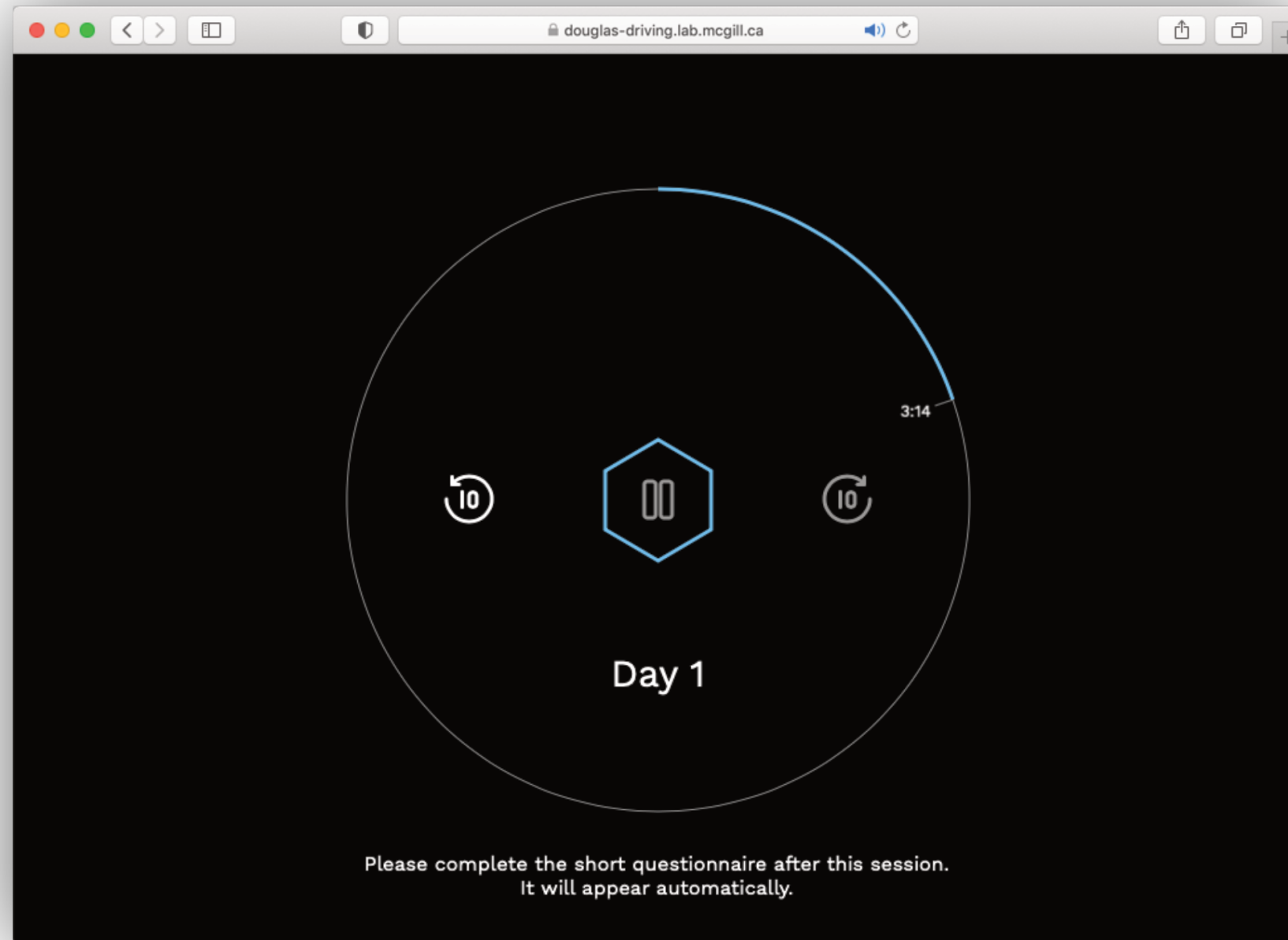
Intervention Website



Welcome Screen

Methods

Intervention Website



Web Audio Player

Methods

Intervention Website

Please indicate your perceived level of awareness and attention to your present experience during the past 15 minutes while following the relaxation instructions.

I was aware of different emotions that arose in me.

1 2 3 4 5
☐ ☐ ☐ ☐ ☐
Not at all Very well

I tried to pay attention to pleasant and unpleasant sensations.

1 2 3 4 5
☐ ☐ ☐ ☐ ☐
Not at all Very well

I found some of my experiences interesting.

1 2 3 4 5
☐ ☐ ☐ ☐ ☐
Not at all Very well

I noticed many small details of my experience.

1 2 3 4 5
☐ ☐ ☐ ☐ ☐
Not at all Very well

Post-Session Questionnaire

Results

Results

H2: MT Reduces MW While Driving

Variable	Contrast		<i>B</i>	<i>p</i>
	Group	Time		
MW	MT - PMR	T2 - T1	(0.35)	.009
	PMR	T2 - T1	(1.27)	NS
	MT	T2 - T1	(0.45)	.020

Results are based on planned comparisons of estimated marginal means from a generalized linear mixed model.
B reflects odds ratios. NS = $p > .05$

Results

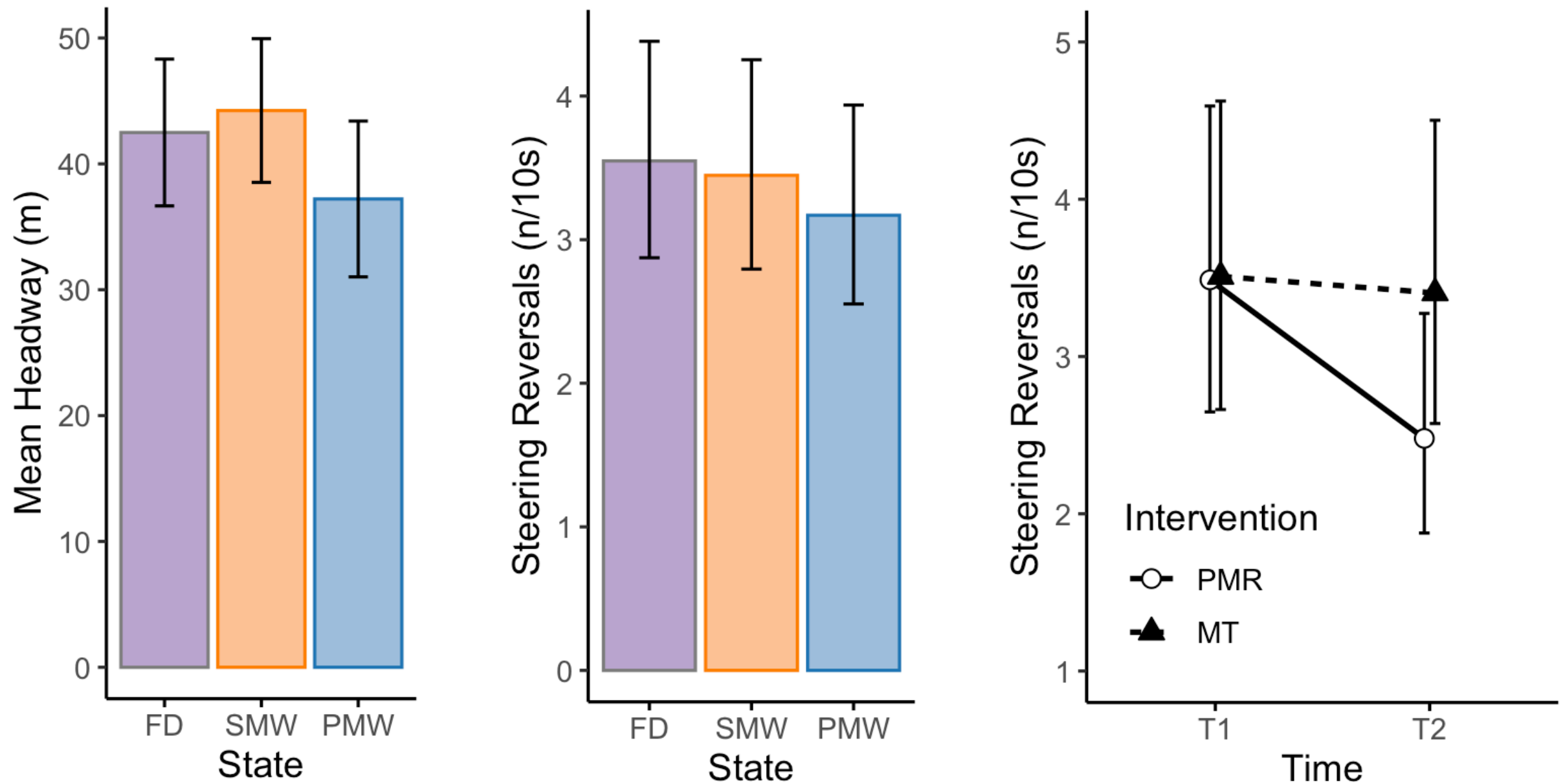
E1: MT Specificity of Action

Variable	Contrast		<i>d</i>	<i>p</i>
	Group	Time		
SMS	MT - PMR	T1, R, T2	0.89	NS
SMS-Mind	MT - PMR	T1, R, T2	1.03	.032
SMS-Body	MT - PMR	T1, R, T2	0.31	NS
IMI-Enjoy	MT - PMR	T1, R, T2	0.28	NS

SMS = State Mindfulness Scale, SMS-Mind = SMS mindfulness of mind sub-scale, SMS-Body = SMS mindfulness of body sub-scale, IMI-Enjoy = Intrinsic Motivation Inventory - Interest/Enjoyment scale, R = remote sessions completed at home. Results are based on planned comparisons of estimated marginal means from a linear mixed model. NS = $p > .05$

Results

E2: Driving Behaviour Linked to Meta-awareness and MT

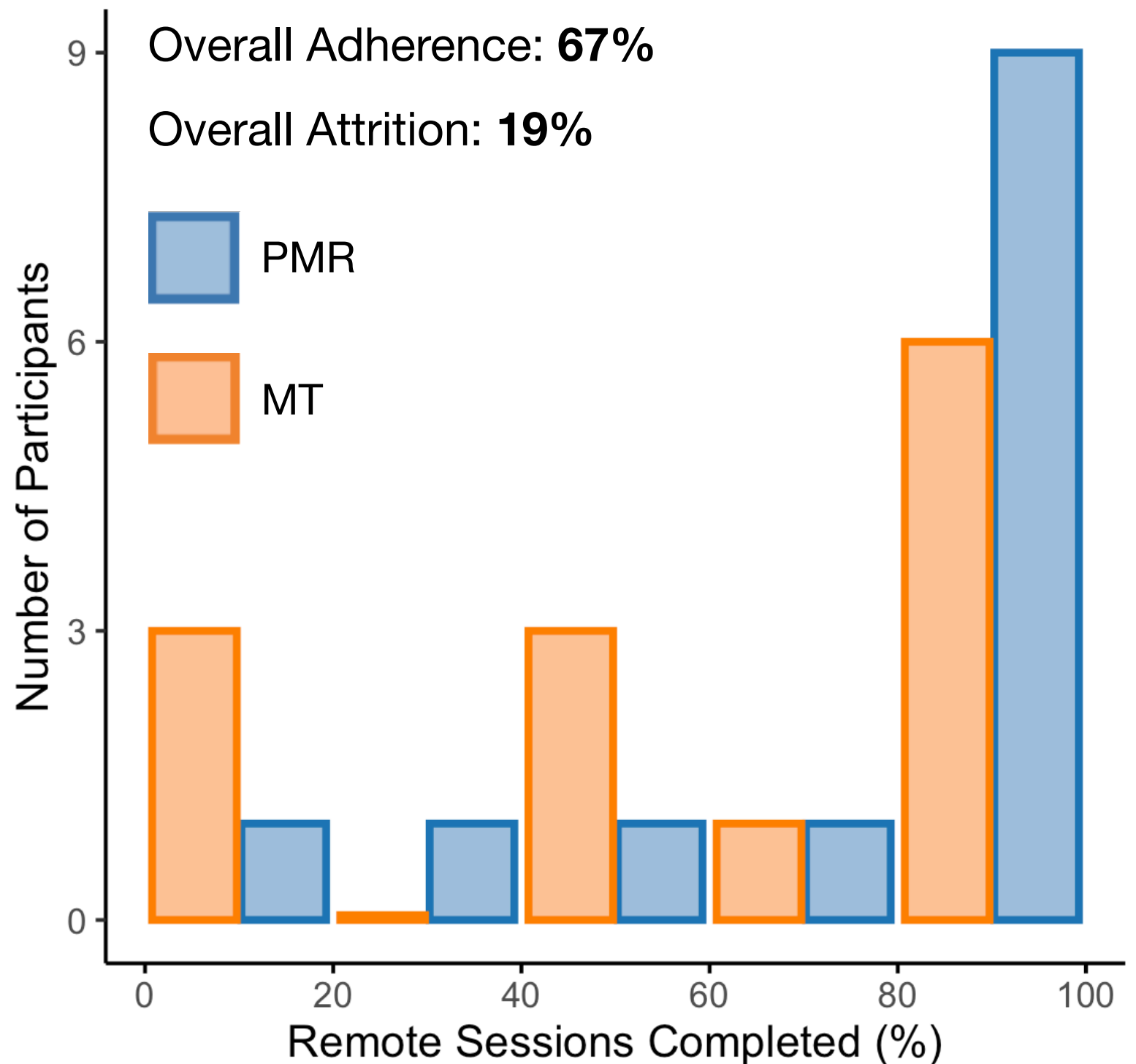


FD = Focused Driving, SMW = Self-caught MW (meta-aware), PMW = Probe-caught MW (meta-unaware).
Error bars represent 95% CIs.

Results

E3: Feasibility of Brief Online MT in Young Drivers

Participant Experiences



Discussion

Discussion

MT Decreases MW While Driving

- Results showing a decrease in MW from MT support its potential for reducing MW-related crash risk in young drivers
 - May be a mechanism by which MT could reduce crash risk
 - MT has been linked to greater situational awareness¹ and less risky driving and crashes in simulation²
- Extends evidence from attention tasks and other real-world contexts to the context of driving^{3,4}

1. Kass et al. (2011); 2. Baltruschat et al. (2021); 3. Mrazek et al. (2012); 4. Rahl et al. (2017)

Discussion

MT and Meta-awareness Mitigate MW-Related Driving

- More focus-like driving behaviour associated with meta-awareness and resulting from MT may reflect a mitigation of MW-related unsafe driving
 - Meta-awareness is associated with less pronounced MW^{1,2}
 - Did not find an increase in meta-awareness from MT
 - By reducing MW, MT may reduce MW-related changes in driving behaviour, such as lowering steering reversals³

1. Schooler et al. (2011); 2. Smallwood et al. (2007); 3. Baldwin et al. (2017)

Discussion

Feasibility of Brief Online MT in Young Drivers

- Adherence was slightly lower than that found in similar studies¹
 - Shorter and less frequent sessions may boost adherence² but lower efficacy³
- MT and PMR differed in acceptability, but no adverse effects were reported
 - Difficulty and frustration associated with redirecting attention from MW may explain higher attrition rates commonly found in MT relative to controls⁴
- There is mounting evidence that MT is not risk-free^{5,6}

1. Forbes et al. (2018); 2. Levensky et al. (2006); 3. Strohmaier (2020); 4. Nam & Toneatto (2016);
5. Van Gordon et al. (2017); 6. Britton et al. (2021)

Discussion

Strengths and Limitations

- Strengths
 - Rigorous randomized controlled designs
 - Ecologically valid driving tasks
 - Limitations
 - Preliminary results should be replicated with larger samples
 - Effects may vary by MW measurement method
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Conclusions

- MT shows promise as a feasible intervention for reducing the potential threat of MW to young driver safety
- Findings may inform the development of interventions targeting MW in at-risk young drivers



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Thank you!

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