Time-of-day affects prospective memory differently in younger and older adults

Nicolas Rothen & Beat Meier

Institute of Psychology, University of Bern, Switzerland

Theoretical Background

spontaneous
automatic

strategic
controlled

Theoretical Background

spontaneous
automatic

strategic
controlled

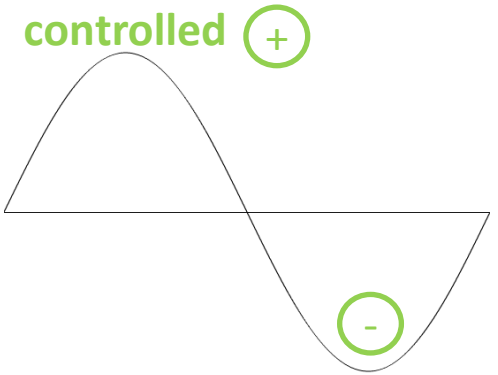
In retrospective memory, efficacy of automatic and controlled processes is differentially affected by circadian arousal

Theoretical Background

spontaneous
automatic

strategic
controlled

In retrospective memory, efficacy of automatic and controlled processes is differentially affected by circadian arousal

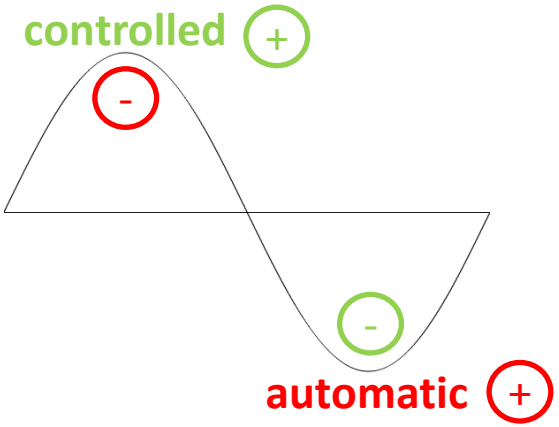


Theoretical Background

spontaneous
automatic

strategic
controlled

In retrospective memory, efficacy of automatic and controlled processes is differentially affected by circadian arousal



Theoretical Background

- Effects of circadian arousal on prospective memory performance have previously been predicted to vary according to the specific retrieval situation (i.e., spontaneous vs. strategic; McDaniel & Einstein, 2007, p. 78).

Theoretical Background

- Effects of circadian arousal on prospective memory performance have previously been predicted to vary according to the specific retrieval situation (i.e., spontaneous vs. strategic; McDaniel & Einstein, 2007, p. 78).

- Peak time of circadian arousal in older adults shifting toward the morning (i.e., morning-types)
- Peak time for young adults more in the middle toward the evening of a day (i.e., neutral-/evening-types)

Goal

Investigate time-of-day effects in a laboratory-based prospective memory setting as a function of age

Hypothesis

- Younger participants > older participants
- On-peak > off-peak if controlled processes
- Off-peak > on-peak if automatic processes

Methods: participants

Younger

- N = 115
- Age: 23.05 (SD=3.53) years, 18-34 years
- 66 female, 49 male
- Edu: 14.73 (SD = 2.11) years
- N = 113 native German
  N = 2 fluent in German
- D-MEQ = 49.51 (SD=9.58), range = 24-73

Older

- N = 113
- Age: 67.58 (SD=5.97) years, 56-95 years
- 68 female, 45 male
- Edu: 13.67 (SD = 3.64) years
- N = 109 native German
  N = 4 fluent in German
- D-MEQ = 60.37 (SD=8.95), range = 34-77

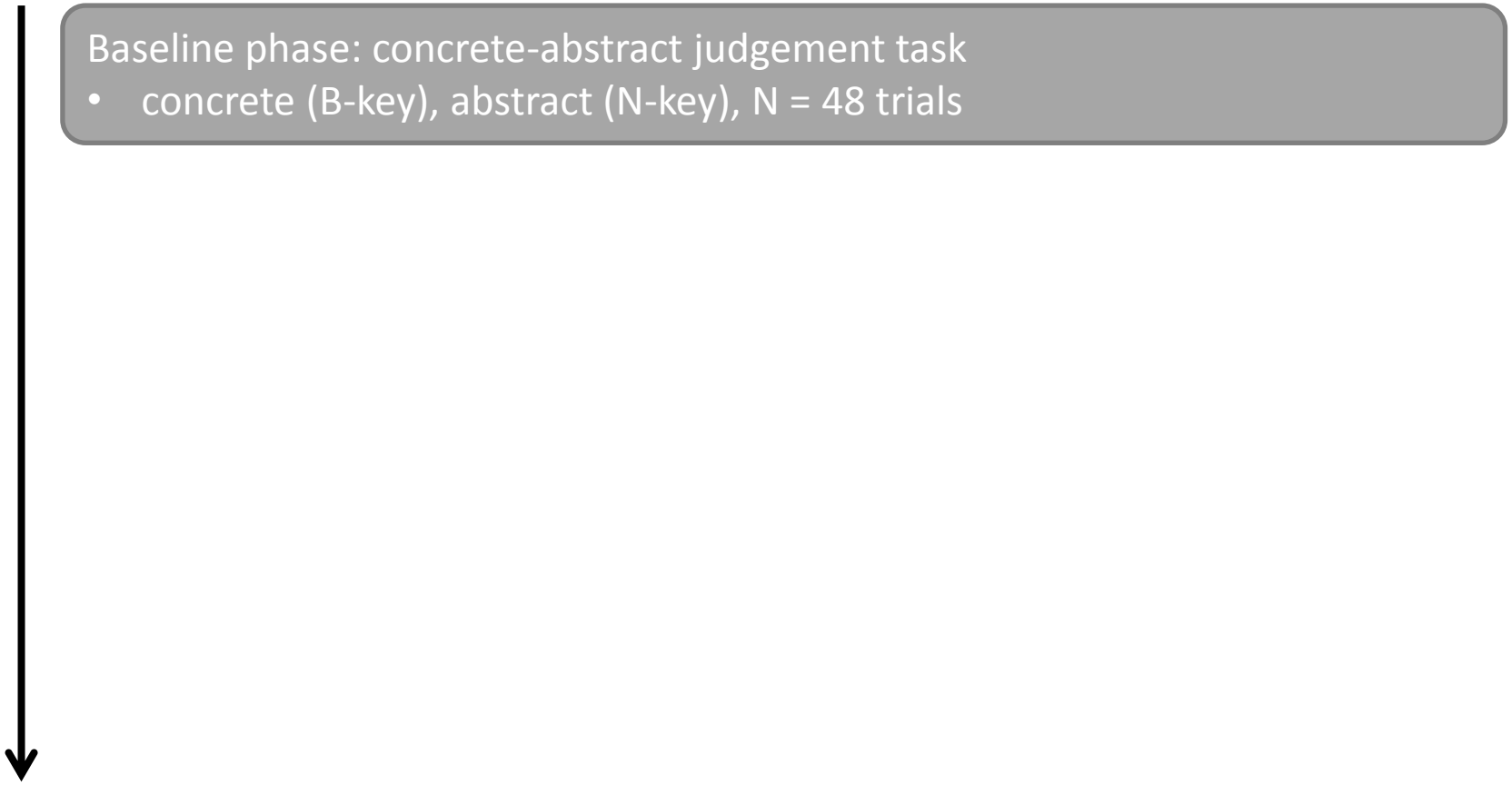
D-MEQ: evening-type 16 <--- (42-58) ---> 86 morning-type

Methods: procedure

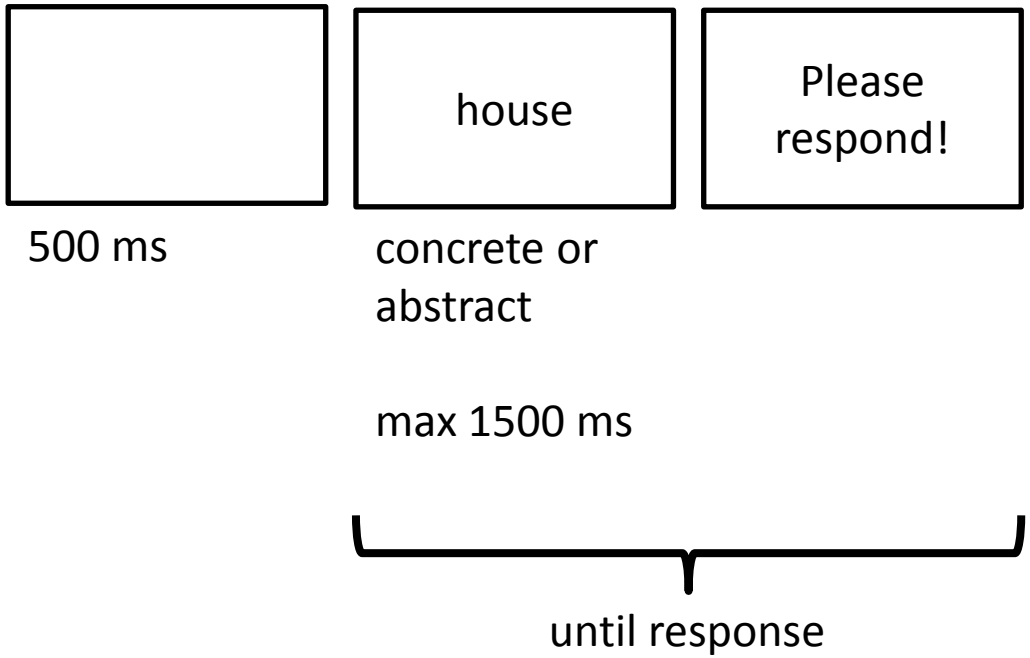
- Morning 08:00-12:00 vs. Evening 16:00-20:00

Methods: procedure

- Morning 08:00-12:00 vs. Evening 16:00-20:00



Methods: trial



Methods: procedure

- Morning 08:00-12:00 vs. Evening 16:00-20:00

Baseline phase: concrete-abstract judgement task
- concrete (B-key), abstract (N-key), N = 48 trials

Prospective memory instruction:
- press «1» whenever you see one of the words *bird*, *horse*, *insect*, and *snake*

Methods: procedure

- Morning 08:00-12:00 vs. Evening 16:00-20:00

Baseline phase: concrete-abstract judgement task
- concrete (B-key), abstract (N-key), N = 48 trials

Prospective memory instruction:
- press «1» whenever you see one of the words *bird*, *horse*, *insect*, and *snake*

Distractor phase:
- unrelated filler task (15-20 min)

Methods: procedure

- Morning 08:00-12:00 vs. Evening 16:00-20:00

Baseline phase: concrete-abstract judgement task
- concrete (B-key), abstract (N-key), N = 48 trials

Prospective memory instruction:
- press «1» whenever you see one of the words *bird*, *horse*, *insect*, and *snake*

Distractor phase:
- unrelated filler task (15-20 min)

Test phase: concrete-abstract judgement task
- concrete (B-key), abstract (N-key), N = 204 trials
- Prospective memory cues: 50th, 100th, 150th, and 200th trial

Methods: procedure

- Morning 08:00-12:00 vs. Evening 16:00-20:00

Baseline phase: concrete-abstract judgement task
- concrete (B-key), abstract (N-key), N = 48 trials

Prospective memory instruction:
- press «1» whenever you see one of the words *bird*, *horse*, *insect*, and *snake*

Distractor phase:
- unrelated filler task (15-20 min)

Test phase: concrete-abstract judgement task
- concrete (B-key), abstract (N-key), N = 204 trials
- Prospective memory cues: 50th, 100th, 150th, and 200th trial

Completion of D-MEQ (German Morningness-Eveningness Questionnaire)

Methods: design

- 2 x 2 between subjects design:
  - Age group (younger vs. older)
  - Testing time (on-peak vs. off-peak)

Results: ongoing task

age group	testing time	N	baseline (ACC)	test (ACC)
young	on-peak	62	.90 (.010)	.91 (.010)
	off-peak	53	.90 (.012)	.92 (.007)
old	on-peak	63	.93 (.010)	.94 (.007)
	off-peak	50	.91 (.011)	.94 (.008)

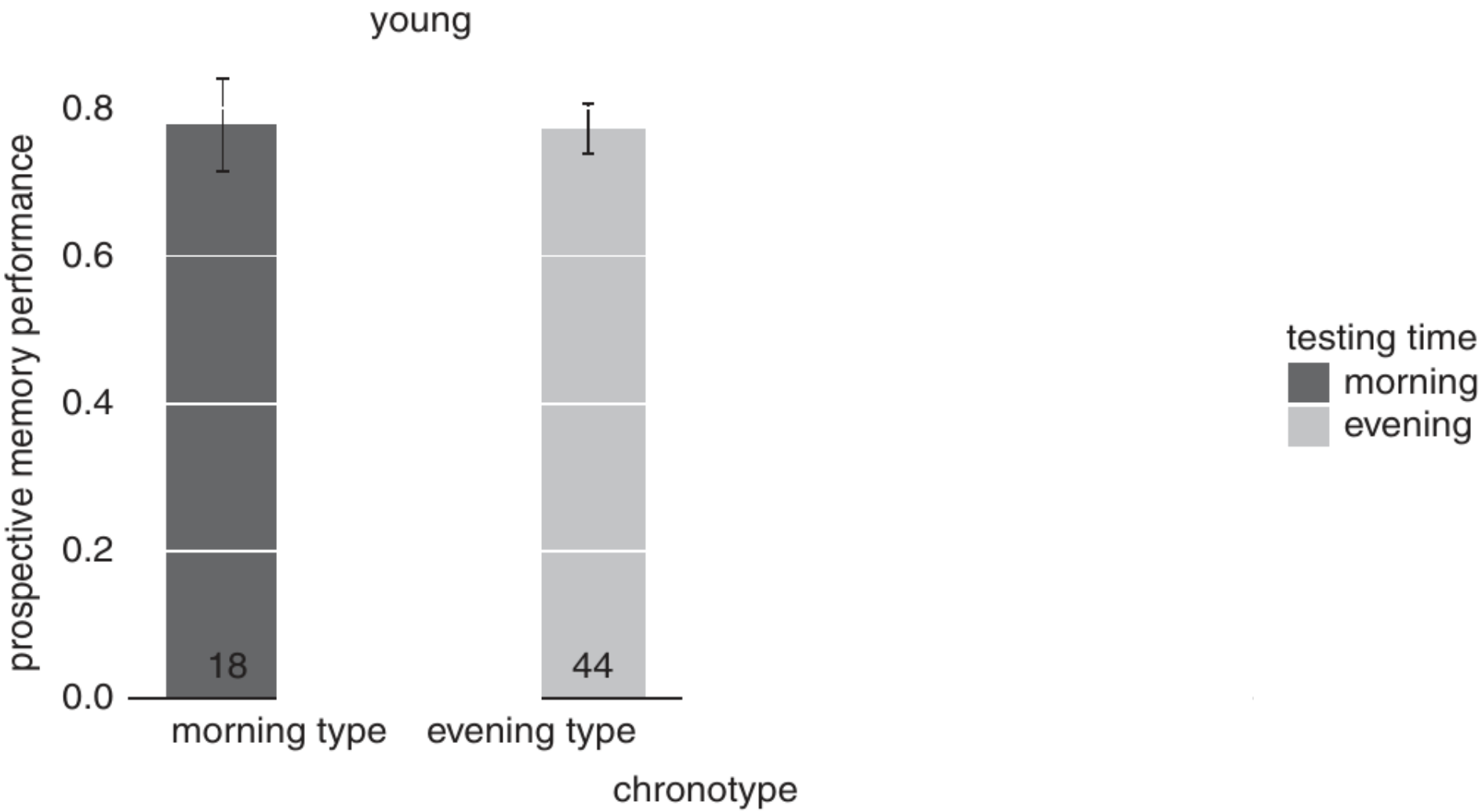
Results: ongoing task

age group	testing time	N	baseline (ACC)	test (ACC)	baseline (RT)	test (RT)
young	on-peak	62	.90 (.010)	.91 (.010)	897 (20)	889 (18)
	off-peak	53	.90 (.012)	.92 (.007)	879 (25)	930 (34)
old	on-peak	63	.93 (.010)	.94 (.007)	1193 (42)	1074 (35)
	off-peak	50	.91 (.011)	.94 (.008)	1110 (34)	1031 (29)

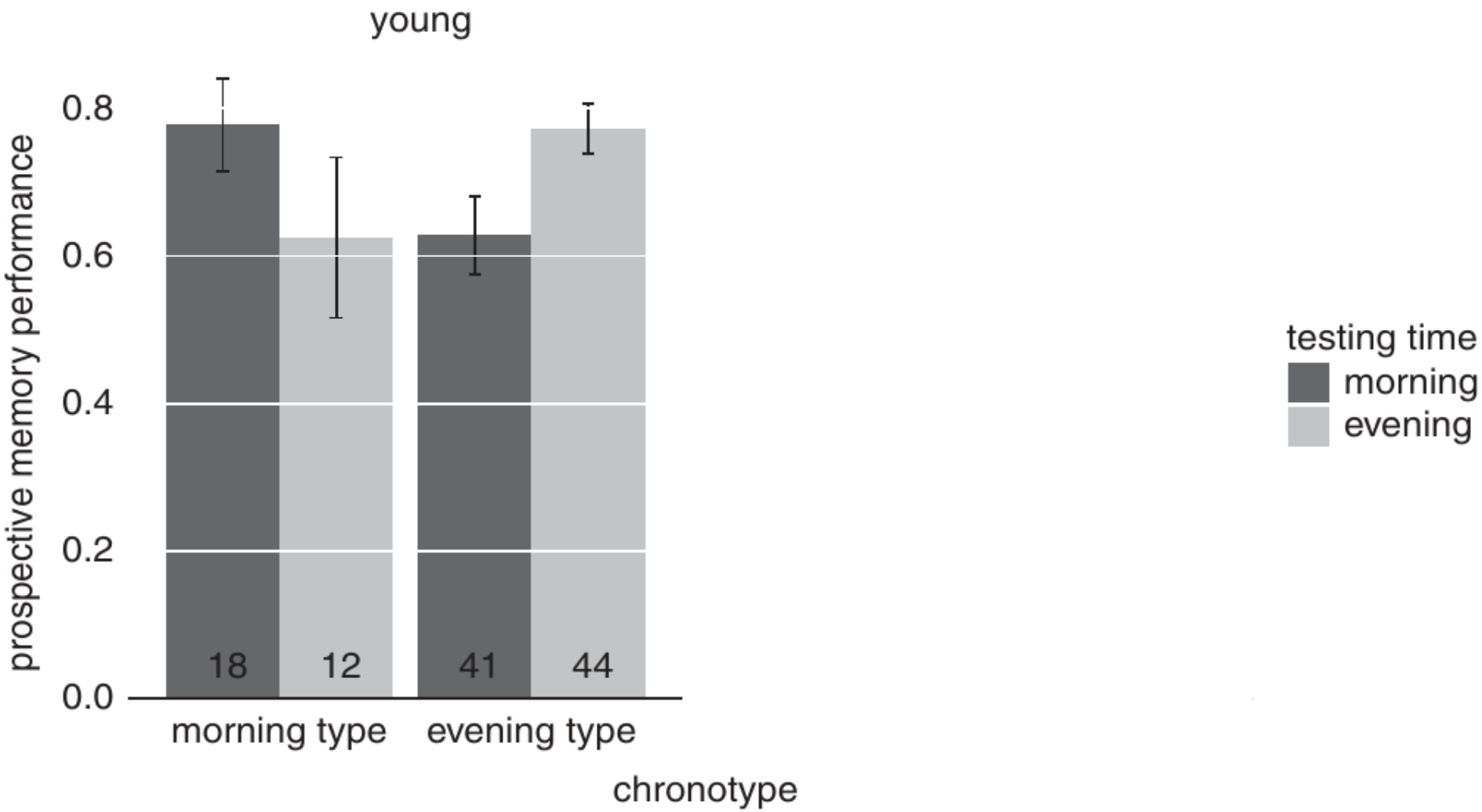
Methods: design

- 2 x 2 x 2 between subjects design:
  - Age group (younger vs. older)
  - Chronotype (morning type vs. evening type)
  - Testing time (morning vs. evening)

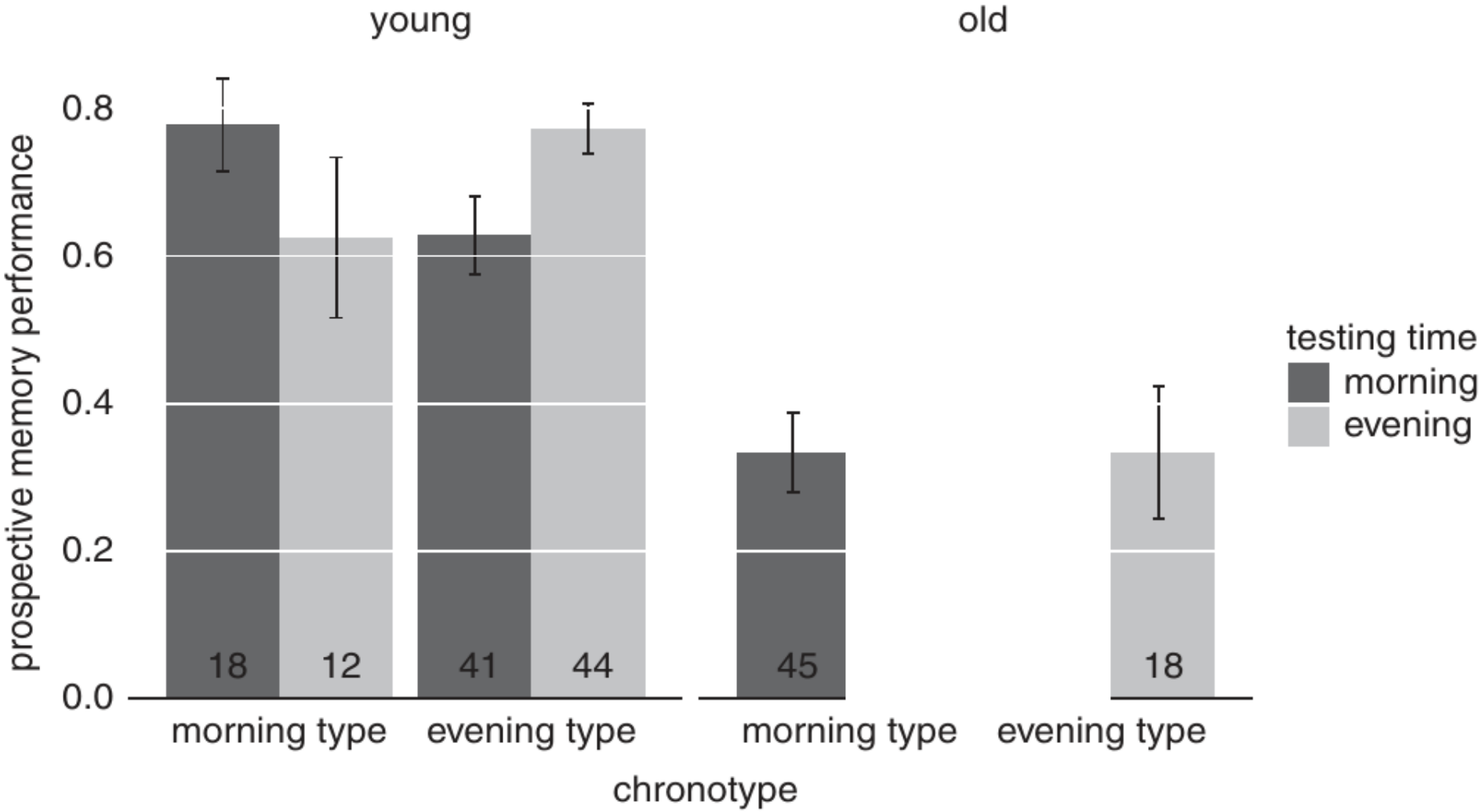
Results: prospective memory task



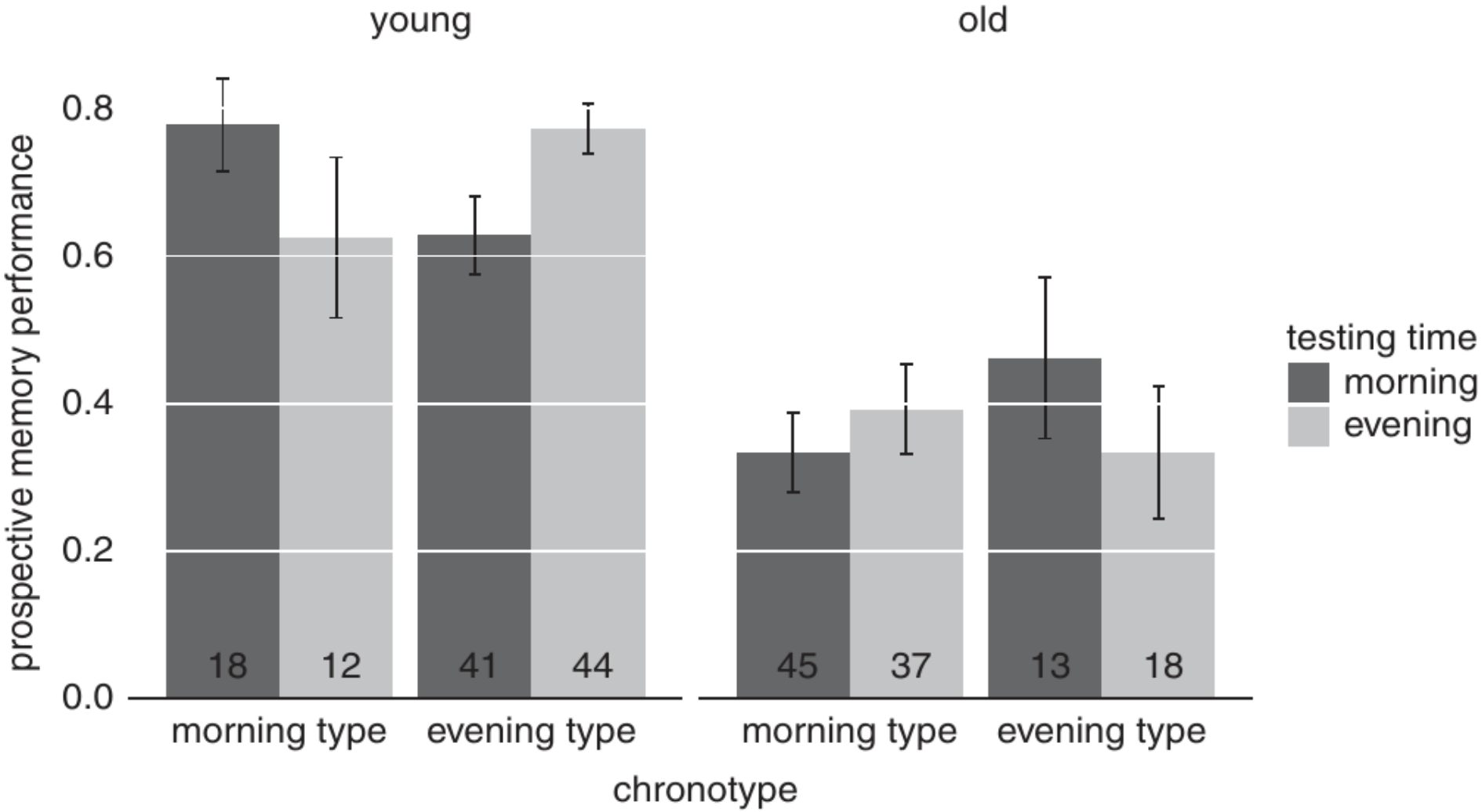
Results: prospective memory task



Results: prospective memory task



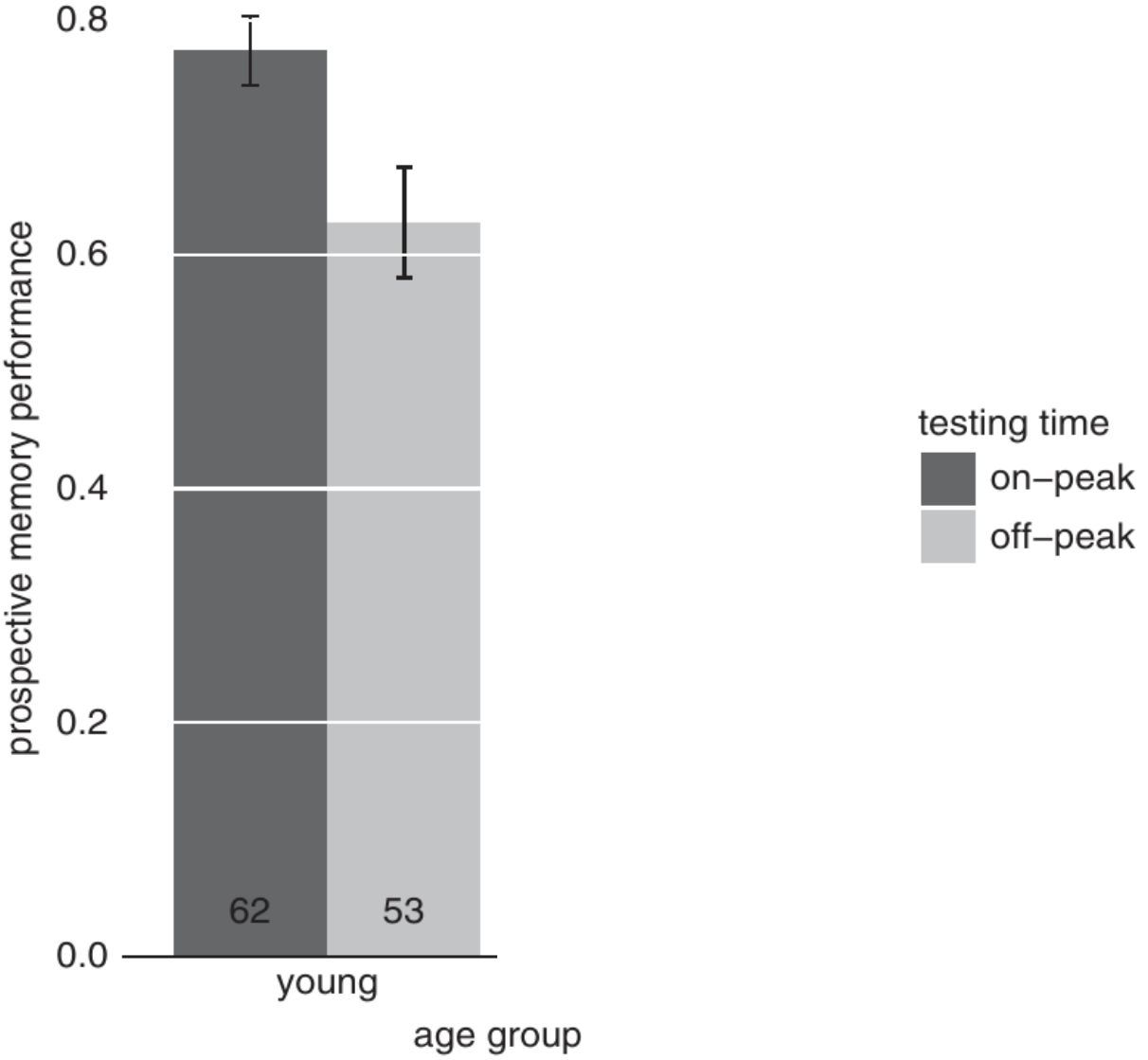
Results: prospective memory task



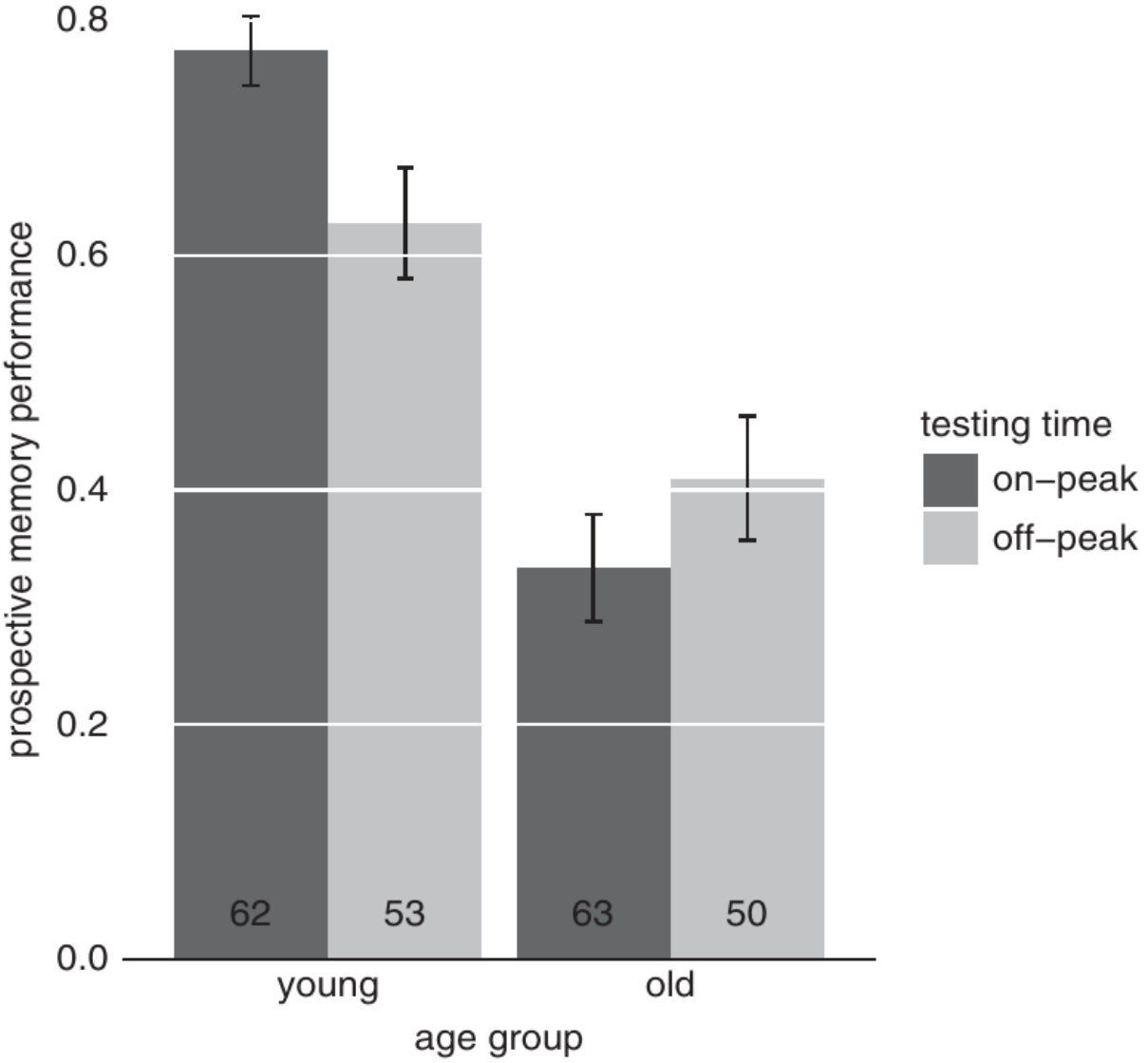
Methods: design

- 2 x 2 between subjects design:
  - Age group (younger vs. older)
  - Testing time (on-peak vs. off-peak)

Results: prospective memory task



Results: prospective memory task



Summary

- Younger outperformed older

Summary

- Younger outperformed older
- Younger better on-peak 

strategic
controlled

Summary

- Younger outperformed older
- Younger better on-peak

strategic
controlled

- Older better off-peak

spontaneous
automatic

Take home message

AGING, NEUROPSYCHOLOGY, AND COGNITION, 2016
http://dx.doi.org/10.1080/13825585.2016.1238444

Routledge
Taylor & Francis Group

Time-of-day affects prospective memory differently in younger and older adults

Nicolas Rothen and Beat Meier

Institute of Psychology and Center for Cognition, Learning and Memory, University of Bern, Switzerland

Thank you for your attention!

Acknowledgements

Collaborator

- Prof. Dr. Beat Meier

Institutions & Funding

UNIVERSITÄT BERN

FNSNF
FONDS NATIONAL SUISSE
SCHWEIZERISCHER NATIONALFONDS
FONDO NAZIONALE SVIZZERO
SWISS NATIONAL SCIENCE FOUNDATION

Contact:
nicolas.rothen@gmail.com

Rothen, N., & Meier, B. (2016). Time-of-day affects prospective memory differently in younger and older adults. Aging, Neuropsychology, and Cognition, 1–13.

Results: prospective memory task

- Regression: Age group (young vs. old), Testing time (morning vs. evening), D-MEQ score and all potential interaction terms.

- => triple interaction, $\beta = 0.46$, $t = 1.66$, $p = .098$.

- Pattern confirms the Age group × Testing time (on-peak vs. off-peak) interaction of the median-split based ANOVA.

Methods: D-MEQ

- D-MEQ scores were normally distributed (Mean = 54.89, Median = 55, min = 24, max = 77)
- Mean and median in neutral range (i.e., 42–58)
- younger evening-types > younger morning-types
- older morning-types > older evening-types

=> **Median-split**