

# Multitasking and healthy aging: Differential age effects on dual-tasking and task switching

## Introduction

- Performing two tasks at once (**dual-tasking**) or in close succession (**task switching**) usually leads to behavioral **costs** relative to single-task performance [1,2]. These costs often **increase** with advanced **age** [3,4,5].
- Aim:** To examine previously reported age effects on dual-task and task-switching performance.

## Methods

**Participants:** 26 young adults (mean age: 25.4 years; 18♀),  
27 older adults (mean age: 58.5 years; 17♀)

**Tasks:** • **Psychological Refractory Period (PRP) paradigm [Fig.1]:** two choice-reaction tasks with variable temporal overlap (stimulus onset asynchrony [SOA]: 50, 100, 350 or 800 ms) [4]

- **Task 1:** discrimination of low (pressing left index finger) and high (pressing right index finger) tones
- **Task 2:** discrimination of low- or high-intensity letters “a” (pressing left middle finger) and “e” (pressing right middle finger)

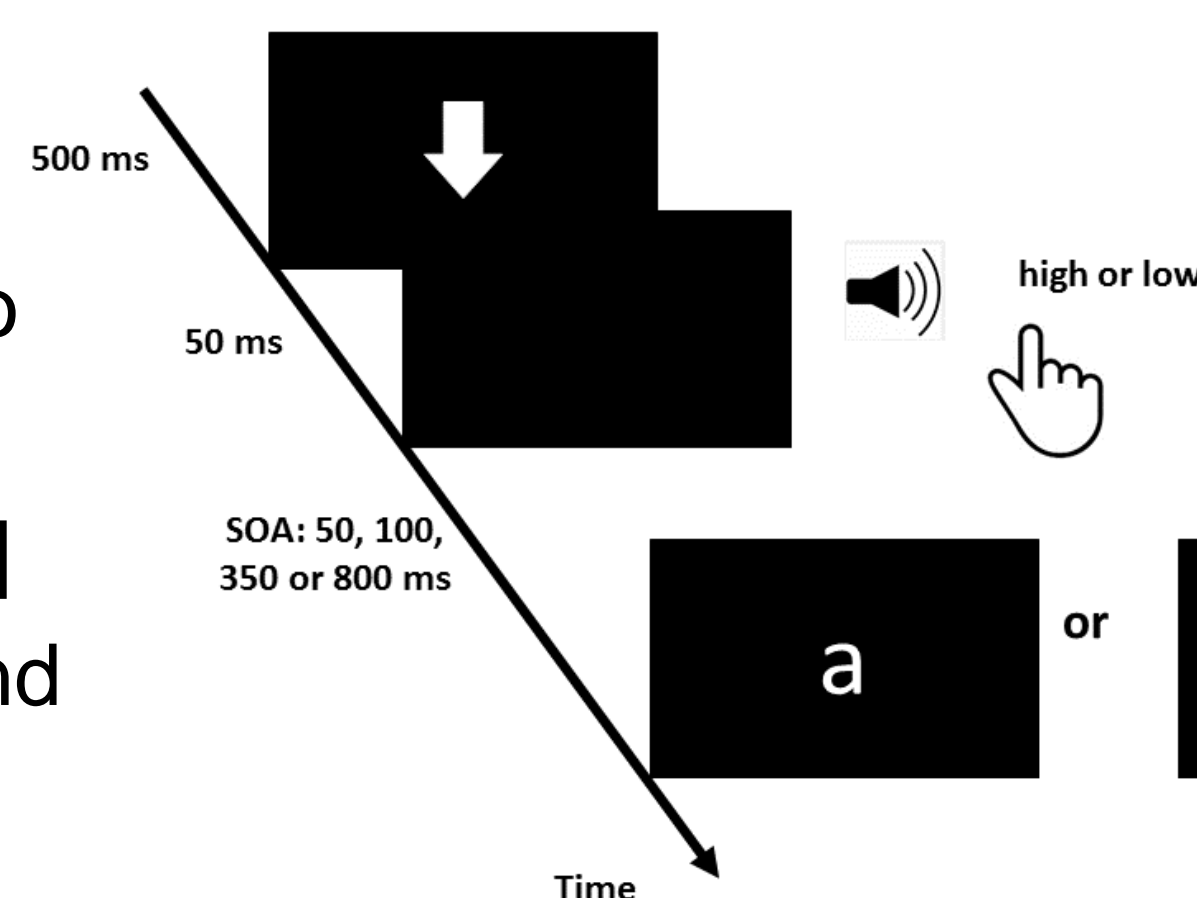


Fig. 1. PRP paradigm

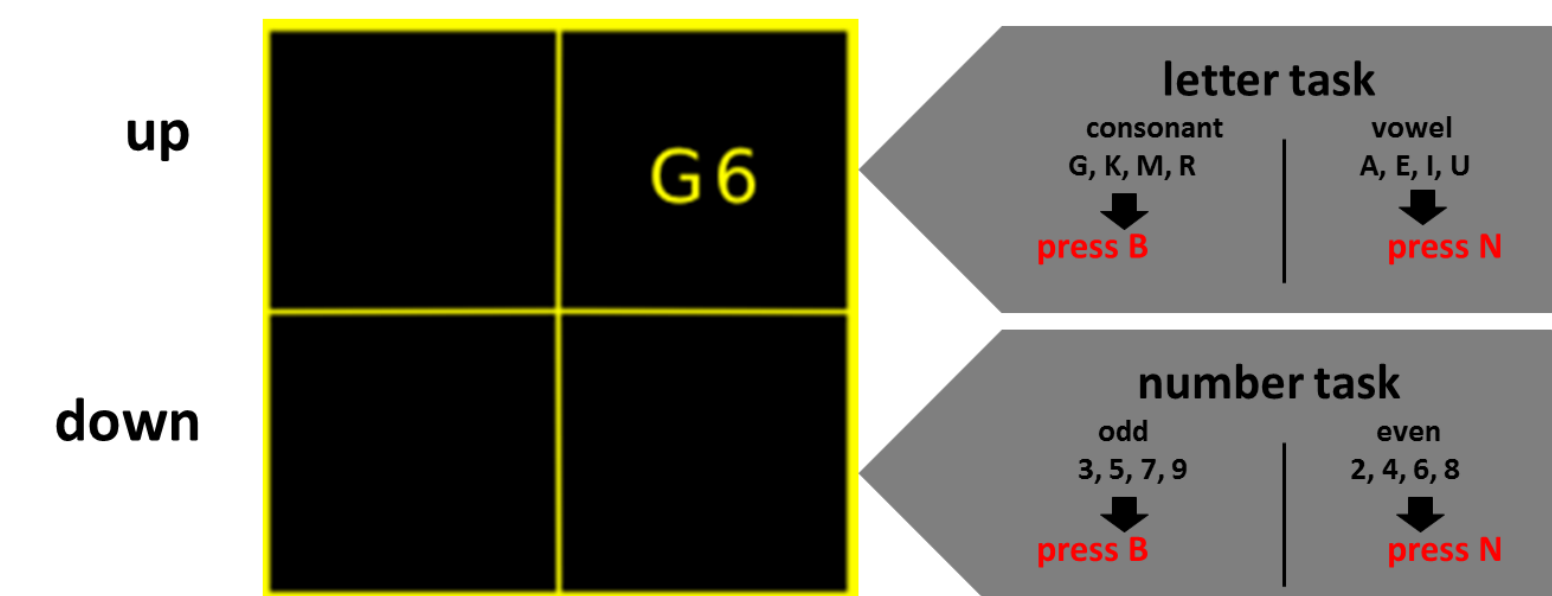


Fig. 2. Task-switching paradigm

- **Task-switching paradigm [Fig. 2]:** **local costs** (switch vs. non-switch trials) and **global costs** (non-switch vs. single-task trials)

**Statistics:** repeated-measures analysis of variance on reaction time (RT), error rate (ER), and a combined measure of speed and accuracy (bin score; cf. [6])

## Results

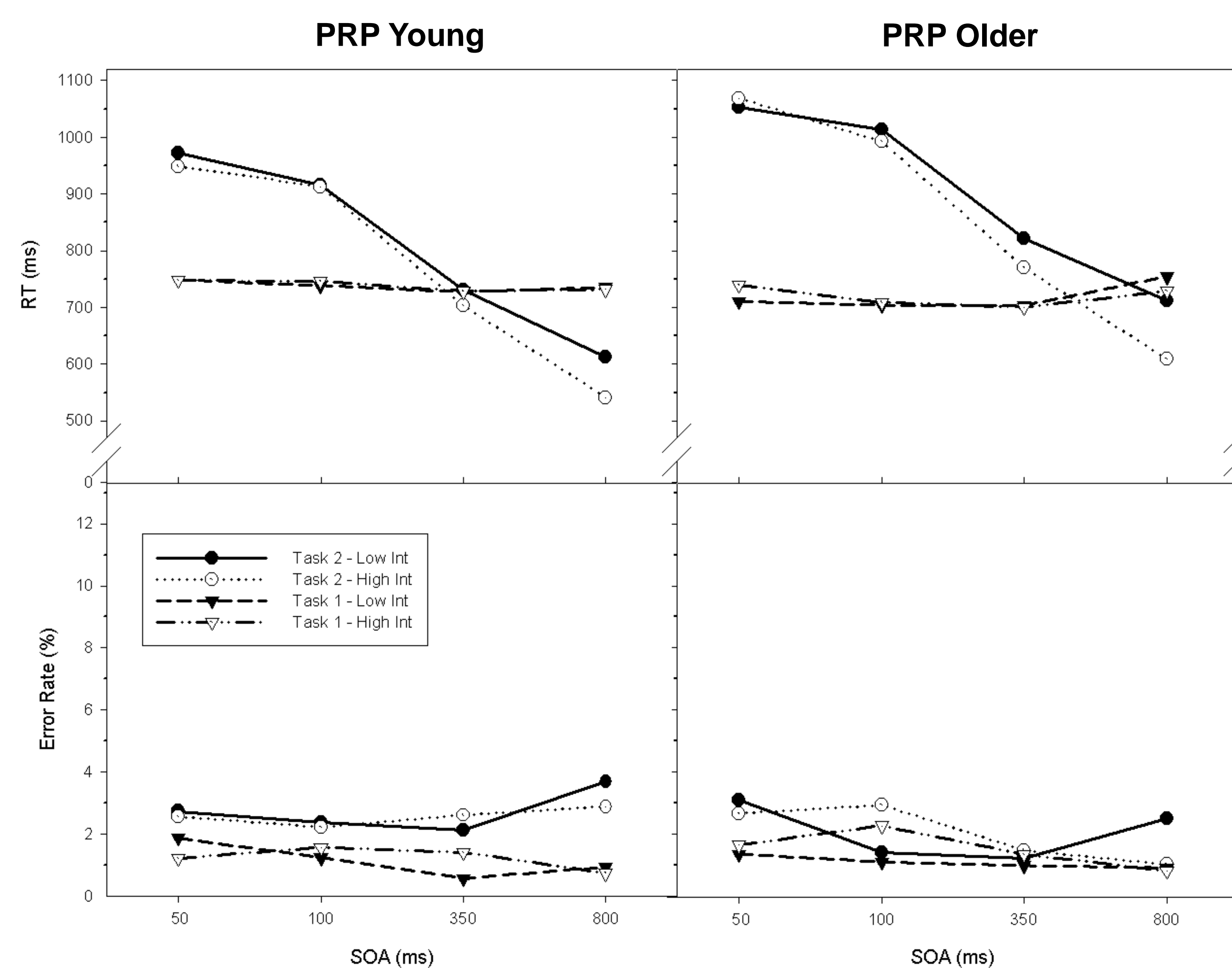
### PRP

#### Task 2:

- Significant main effects (SOA, Intensity, & Age) on RT2
- Sign. SOA × Intensity interaction ( $p < .001$ ) and SOA × Intensity × Age interaction ( $p = .006$ ) effects on RT2
- Sign. SOA × Age interaction effect ( $p = .023$ ) on ER2, but not on RT2

#### Task 1:

- no sign. effects



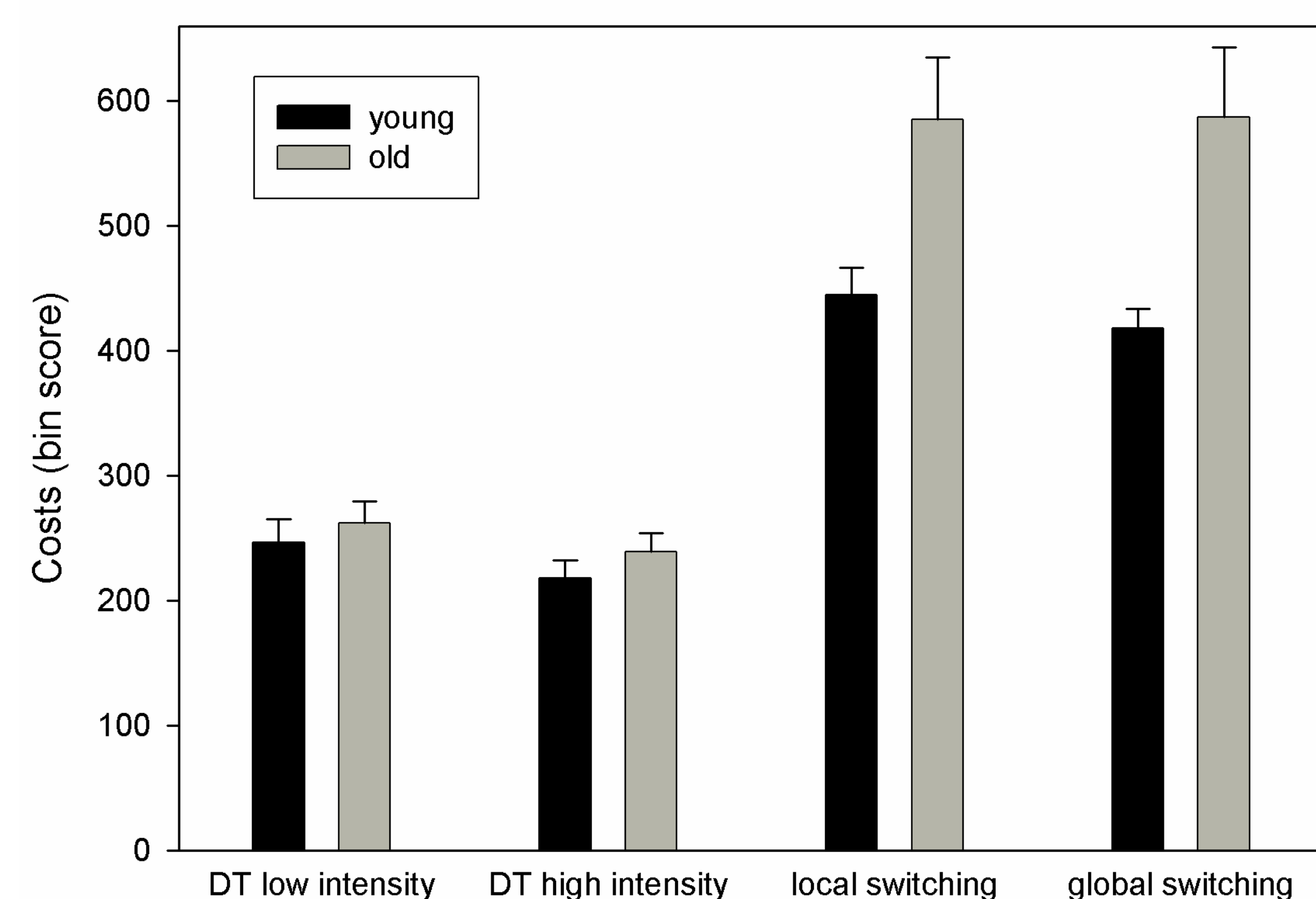
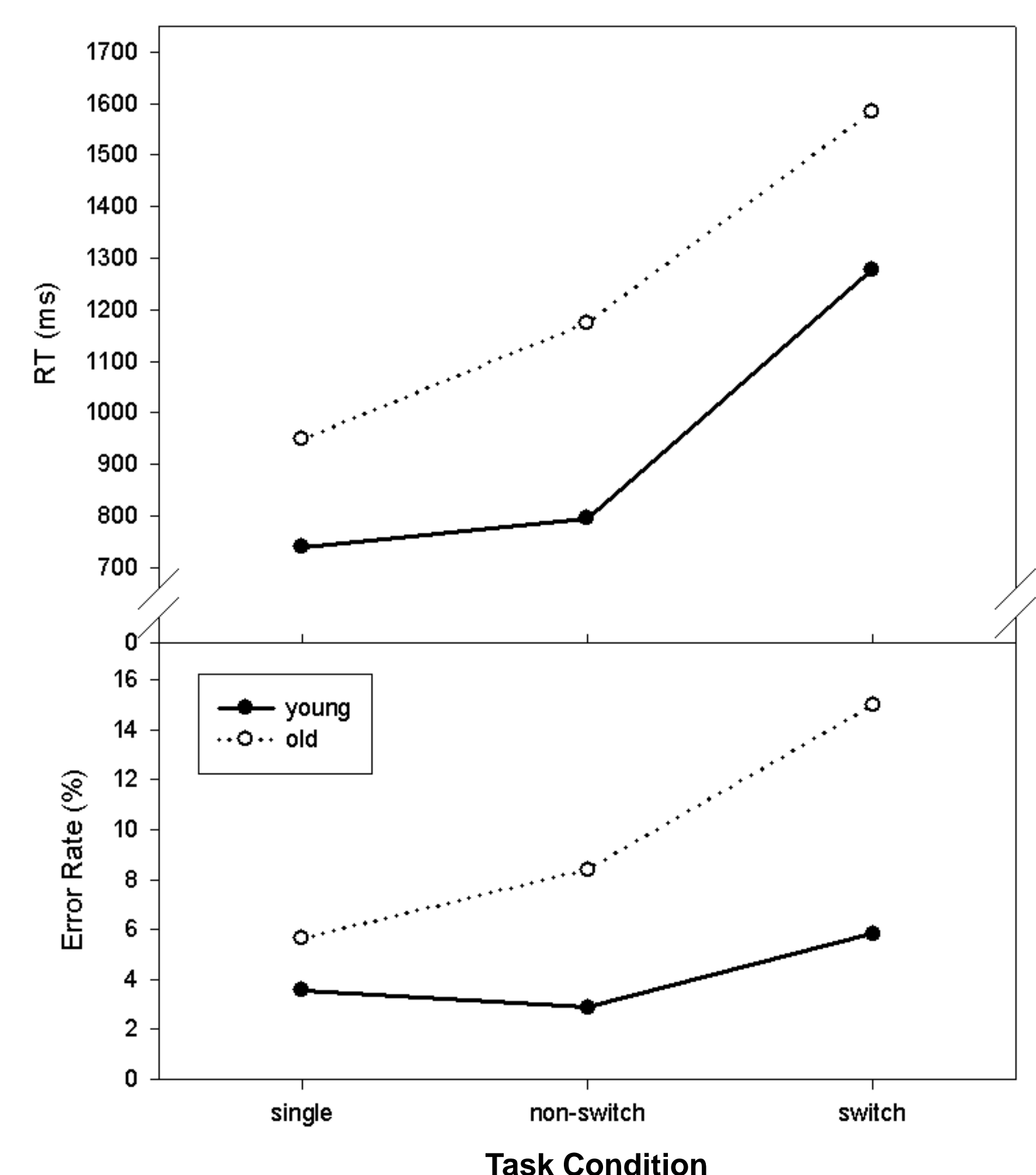
### Task switching

#### Global costs:

- Sign. global switch costs on both RT and ER
- Global latency and accuracy costs increase with age ( $p = .001$ ).

#### Local costs:

- Sign. local switch costs on both RT and ER
- Local accuracy (but not latency) costs increase with age ( $p = .016$ ).



**Dual-tasking (DT) and task-switching costs as expressed by a combined accuracy–latency bin score:**

- no age effect on DT costs
- sign. age effects on global and local switch costs

## Conclusion

- Aging did not affect dual-task costs but was linked to higher costs of switching between tasks, both globally and locally.
- In dual-tasking, aging was linked to a stronger impact of highly salient Task 2 stimuli, which led to increased dual-task costs. There was, however, no decisive evidence for backward crosstalk mediating these higher costs, as suggested by [4].
- Previous findings on age modulations of the PRP effect [4] were not replicated, in line with several other PRP studies reporting no such modulatory effects.

- ➔ Our results indicate that multitasking is not generally impaired in higher age.
- ➔ The difference between age effects on performing two tasks at once vs. in close succession suggests distinct mechanisms underlying the general performance decline during these two types of multitasking as well as a distinct sensitivity of these mechanisms to aging.
- ➔ Healthy aging appears to bring about specific limitations in the activation and shielding of multiple task representations (“between-set selection”) [7].

References: [1] Sigman M, Dehaene S (2006) *PLoS Biol*, 4:e220. [2] Pashler H (1994) *Psychol Bull*, 116:220-44. [3] Verhaeghen P, et al. (2003) *Psychol Aging*, 18:443-460. [4] Hein G, Schubert T (2004) *Psychol Aging*, 19:416-432. [5] Wasylyshyn C, et al. (2011) *Psychol Aging*, 26:15-20. [6] Draheim C, et al. (2016) *Persp Psychol Sci*, 11:133-155. [7] Mayr U (2001) *Psychol Aging*, 16:96-109.