THE IMPACT OF PHYSICAL ACTIVITY AND GENDER ON INTRA-INDIVIDUAL VARIABILITY IN INHIBITORY PERFORMANCE IN OLDER ADULTS

Delphine Fagot[1,2], Christian Chicherio[1,3], Cédric T. Albinet[4], Nathalie André[4] & Michel Audiffren[4]

[1] Center for Interdisciplinary Study of Gerontology and Vulnerability, University of Geneva, Switzerland
[2] Swiss National Centre of Competence in Research LIVES–Overcoming vulnerability: life course perspectives
[3] Neuropsychology Unit, Neurology Clinic, Department of Clinical Neurosciences, Geneva University Hospitals, Switzerland
[4] CeRCA (CNRS-UMR 7295), Faculty of Sport Sciences, University of Poitiers, France

INTRODUCTION

- Cognitive abilities decline with advancing age in adulthood
  - ✓ Processing speed (e.g., Salthouse, 1996; 2000)
  - ✓ Executive functions (e.g., Braver & West, 2008; Salthouse et al., 2003)
- Intra-individual Variability (iiV) increased with aging (e.g. Li et al., 2004, 2010)
  - ✓ iiV predicts long-term decline in some cognitive skills (Hultsch et al., 2000; Lövdén et al., 2007)
- Physical activity has a positive impact on cognitive performance in aging
  - ✓ Better performances in executive functions (e.g., Colcombe et al., 2004; Albinet et al, 2012) and more specifically for inhibition task (e.g., Boucard et al., 2012)
  - ✓ Older women are generally more sedentary and less active than older men (e.g., CDC, 2000) and engaged less frequently in physical activity in later life (e.g., Kaplan et al. 2001)

OBJECTIVE

- **Investigate the influence of physical activity on an inhibitory task performance with a large sample of older participants, using:**
  - ✓ Classical measures of intra-individual variability (iSD)
  - ✓ The ex-Gaussian parameter estimates (Sigma et Tau)
  - ✓ The Diffusion parameter estimates (drift rate)
- **Determine whether this influence is modulated by gender**

METHOD

The PRAUSE Study – Participants

✓ The **PRAUSE** study is a large interdisciplinary research which investigates the weight of the different factors that are crucial for the autonomy of non-institutionalized elderly

	Female (N=91)		Male (N=71)	
	No-Activity	Activity	No-Activity	Activity
Age	75.53 (9.82)	69.71 (9.19)	73.51 (12.08)	70.02 (7.43)
Education	10.10 (3.31)	11.19 (3.57)	12.08 (4.25)	10.4 (3.04)

Note: Mean and (standard deviation)

Task

Arrow task (Salthouse, Toth, Hancock, & Woodard, 1997, Mella et al., 2014)

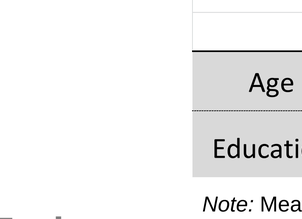
- ✓ Indicate the direction to which the arrow pointed independently of its spatial location
- ✓ 2 conditions : Congruent & Incongruent; 300 items
- ✓ Analyses based on correct reaction times (RTs)

Physical activity

- ✓ Two questionnaires: Historical Leisure Activity Questionnaire (HLAQ, Kriska et al., 1988) and NASA / JSC Physical Activity Scale (PAS, Ross & Jackson, 1986)
- ✓ No-Activity = PAS ≤ 3 and / or HLAQ < 10 METS-h / week
- ✓ Activity = PAS ≥ 3 and / or HLAQ > 10 METS-h / week

Measures

- ✓ Classical : Intra-individual mean (iM) and standard deviation (iSD) in RTs
- ✓ The ex-Gaussian parameter estimates



Mean = $mu + tau$

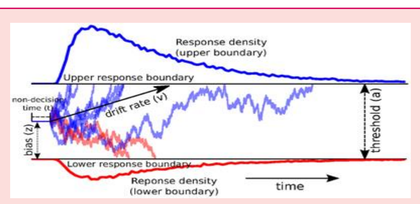
Variance = $sigma^2 + tau^2$

μ = The mean of Gaussian component

α = The SD of Gaussian component

τ = Both the mean and the SD of the exponential component

- ✓ The diffusion model parameter estimates



v = Mean of between-trial drift rate distribution (accumulation rate of the decision process)

Ter = Non decision time (e.g., encoding and motor response)

a = Upper response boundary (response conservativeness

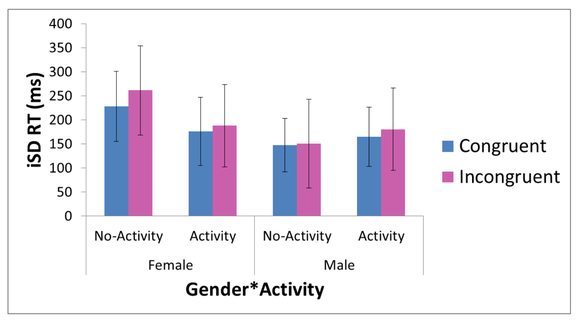
RESULTS

ANCOVAs with Physical activity (2) * Condition (2) * Gender (2) as independant variables and Age as a covariate were computed.

1. Classical measures

Variability level (iSD):

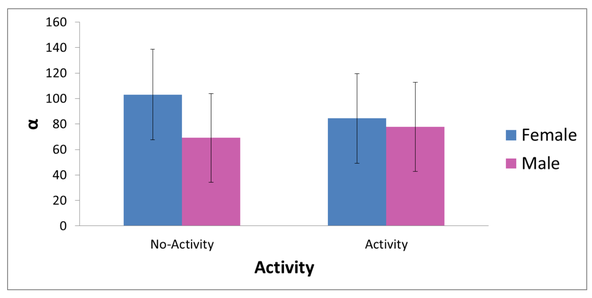
- Female > Male (η_p^2=.14)
- Gender * Activity (η_p^2=.09)
- Gender * Activity * Condition (η_p^2=.03)



Performance level (iM):

- Female > Male ; Gender * Activity ; Gender * Activity * Condition

2. Ex-Gaussian parameters

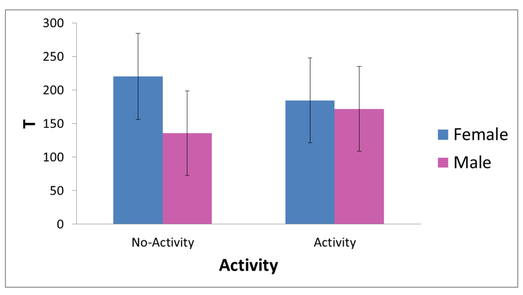


α:

- Female > Male (η_p^2=.08)
- Incongruent > Congruent (η_p^2=.03)
- Gender * Condition (η_p^2=.03)
- Gender * Activity (η_p^2=.04)

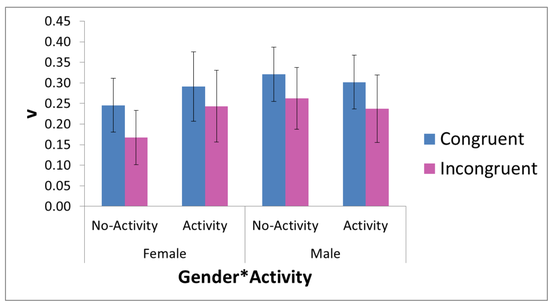
T:

- Female > Male (η_p^2=.13)
- Gender * Activity (η_p^2=.07)



μ: Female > Male ; Gender * Activity ; Gender * Condition ; Gender * Activity * Condition

3. Diffusion model parameters



v:

- Female < Male (η_p^2=.09)
- Gender * Activity (η_p^2=.08)
- Gender * Activity * Condition (η_p^2=.03)

a: Female > Male ; Gender * Activity ; Gender * Activity * Condition

Ter: Female > Male ; Gender * Activity ; Gender * Activity * Condition

Conclusion

- ✓ The physical activity alone has no impact on cognitive performance and variability
- ✓ Nevertheless, the physical activity interacts with Gender
  - ✓ Whatever the type of measure,
    - ✓ Inactive women are slower and more variable than all other groups
    - ✓ No difference between active women and active men
  - ✓ More surprisingly, active men are often slower and more variable than inactive men
- ✓ Inhibition (e.g., incongruent) condition amplifies these effects.

FUTURE DIRECTIONS

- ✓ Does the level of activity across the lifecourse have more impact on cognitive performances than the current activity level ?
- ✓ Does the previous occupation (e.g., penibility at work) have an influence on the level of physical activity and cognitive performances?

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Contact: delphine.fagot@unige.ch