

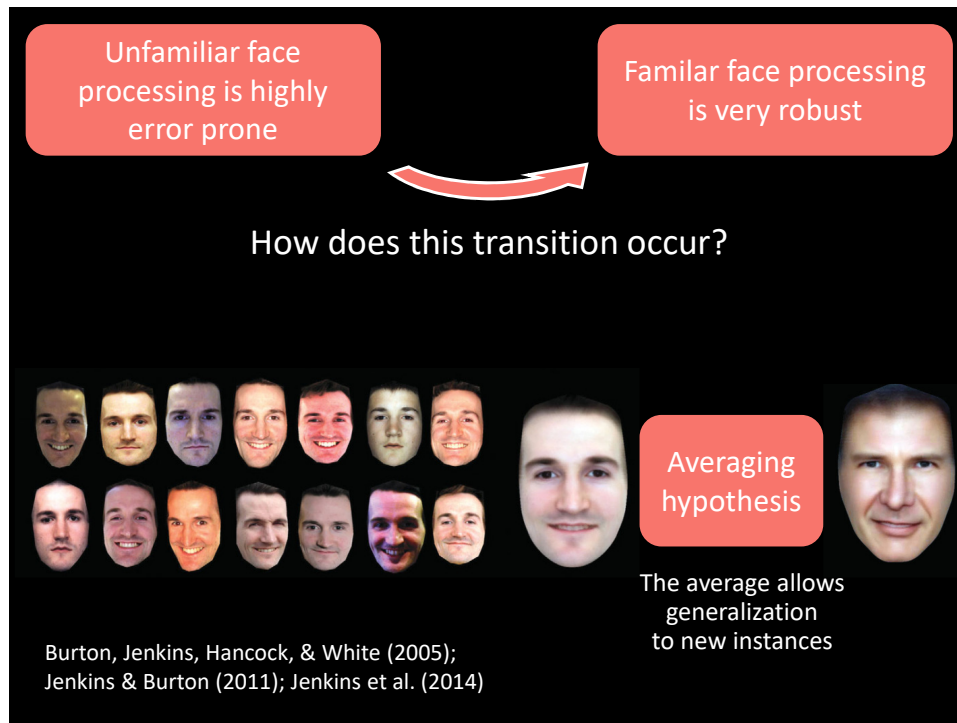
Learning faces efficiently: Reconciling contradictory findings on variability (not...)

Christel Devue

17 July 2026

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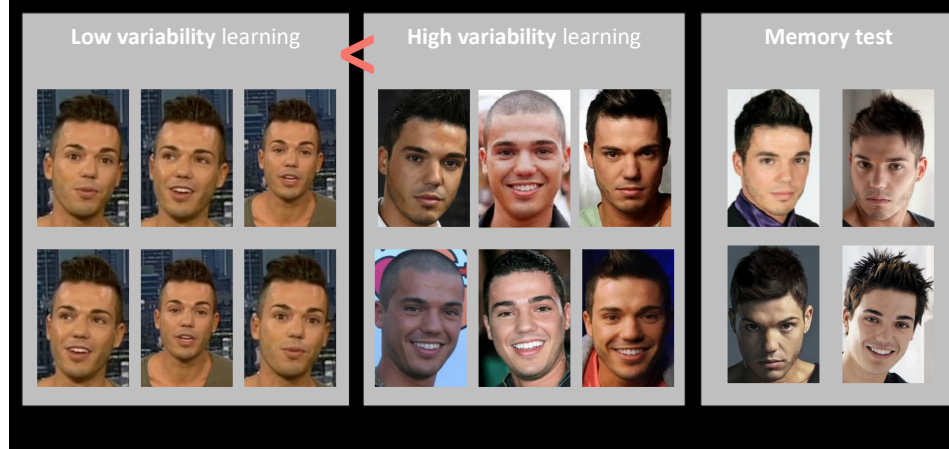




Exposure to **natural variations** in **ambient images** fast-tracks face learning in lab-based tasks.

Burton, Jenkins, Hancock & White (2005); Jenkins & Burton (2011); Jenkins et al. (2014)

Ritchie & Burton (2017):



Exposure to **natural variations** in **ambient images** fast-tracks face learning in lab-based tasks.

Burton, Jenkins, Hancock & White (2005); Jenkins & Burton (2011); Jenkins et al. (2014)

Ritchie & Burton (2017):

The diagram is a conceptual map with a central node and two main branches. The central node is a light blue rounded rectangle containing the text "Face representation". To its left is a light blue rounded rectangle labeled "Method Questions" in bold, which contains two sub-questions: "Which variation(s) help?" and "Is the lack of variation in LV learning unnatural?". To the right of the central node is a light blue rounded rectangle labeled "Theoretical Question" in bold, containing the question "Is it plausible that we store a comprehensive average for each face we learn?". Surrounding these central nodes are several smaller images of faces, categorized into three groups: "Low variation" (top left), "Ability learning" (top right), and "Memory test" (bottom right). The "Low variation" group shows two identical images of a man's face. The "Ability learning" group shows three different faces. The "Memory test" group shows three different faces, including one that is a negative (inverted) image of a face.

```
graph LR; A[Face representation] --- B[Method Questions]; A --- C[Theoretical Question]; B --- D[Which variation(s) help?]; B --- E[Is the lack of variation in LV learning unnatural?]; C --- F[Is it plausible that we store a comprehensive average for each face we learn?];
```

Face representation

METHOD QUESTIONS

- Which variation(s) help?
- Is the lack of variation in LV learning unnatural?

THEORETICAL QUESTION

- Is it plausible that we store a comprehensive average for each face we learn?

Cost-efficient face learning hypothesis

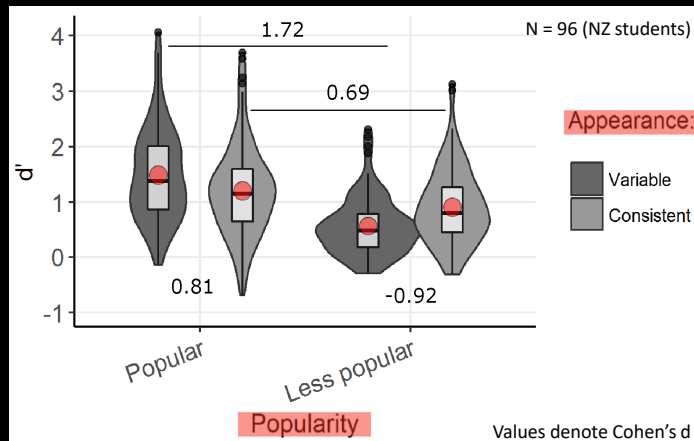
→ Focus on appearance

Coarse-to-fine encoding strategy

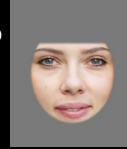
Diagnostic information weighted based on its relative stability

Devue & de Sena (2023), Cognition

Impact of appearance in familiar face recognition



Test image



Stability supports the encoding of inner features (at first)

More robust representations of variable faces (eventually)

Representations refine over time, especially in variable faces

Devue & de Sena (2023), Cognition

Can we demonstrate
such cost-efficient encoding
in lab-based face learning studies,
using **highly controlled**
but **ecological** facial stimuli?

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Dynamic and Image Variation Archive (DIVA-Face)

A novel controlled facial stimuli set



Wenrui
Li



Raphaël
Legrand



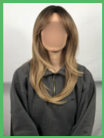
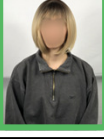
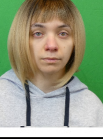
William
Daro

Li*, Legrand*, Daro, & Devue (under review)

A. Step 1: Wig selection and grouping

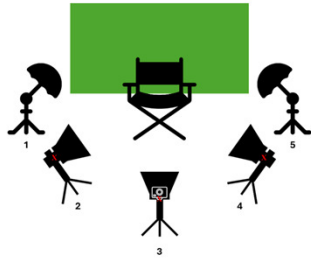
> independent distinctiveness
and pairwise similarity ratings

**B. Step 2: Actress selection
and pairing**

     	Group 1	→	Pair 1	 
     	Group 2	→	Pair 2	 
     	Group 3	→	Pair 3	 
     	Group 4	→	Pair 4	 

C. Step 3: Acquisition of videos and images

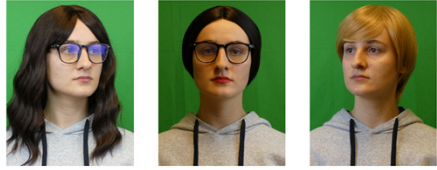
Six wigs + one balaclava per actress +
 and/or  and/or 
 = 28 appearance combinations per actress
 x three light sources (left, frontal, right)



x 12 standardised actions = **1,008 videos per actress**



x 3 viewing angles = **252 pictures per actress**



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The database is fully available via
the ULiège Dataverse repository:



The role of
variability in appearance,
exposure and learning procedure
 in dynamic face learning


 Wenrui
 Li


 Raphaël
 Legrand

Preprint



Li, Legrand, & Devue (in revision)



Methods

Learning phase: 4 identities to learn (2 stable, 2 variable)

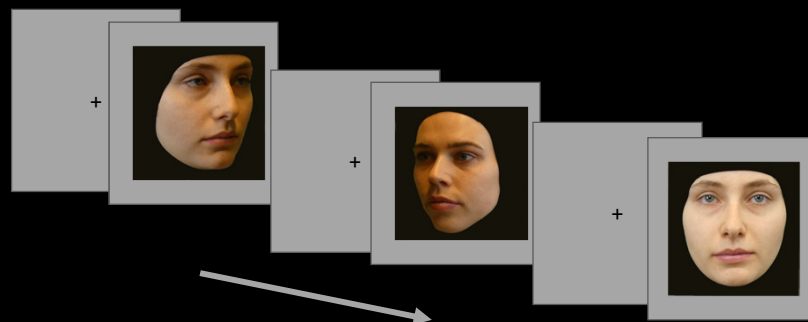


Exposure (between-subject):
3, 6, 9, or 12 video clips
per identity

Learning procedure
Presentation of IDs
blocked or **interleaved**
(subsets of 3 videos) in
different experiments

Methods

Old/new recognition test: 4 targets + 4 foils (6 images each)

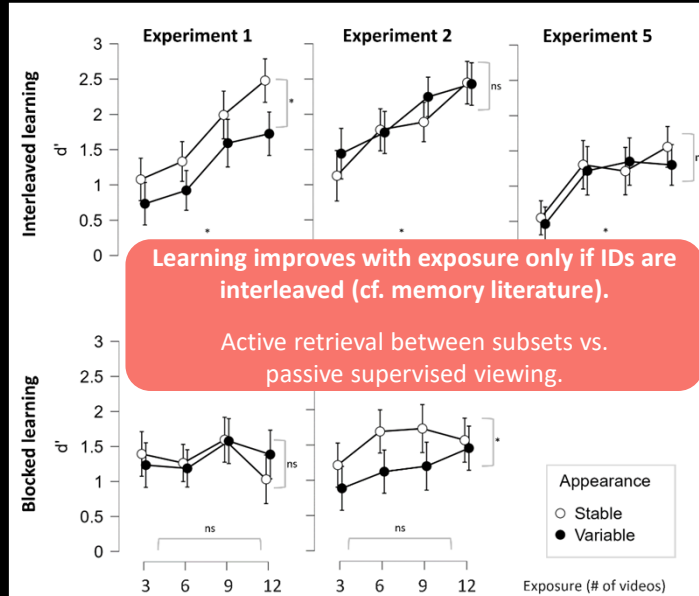


Prediction: Appearance x Exposure interaction

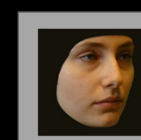
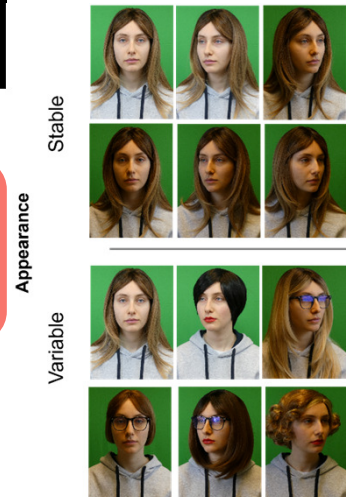
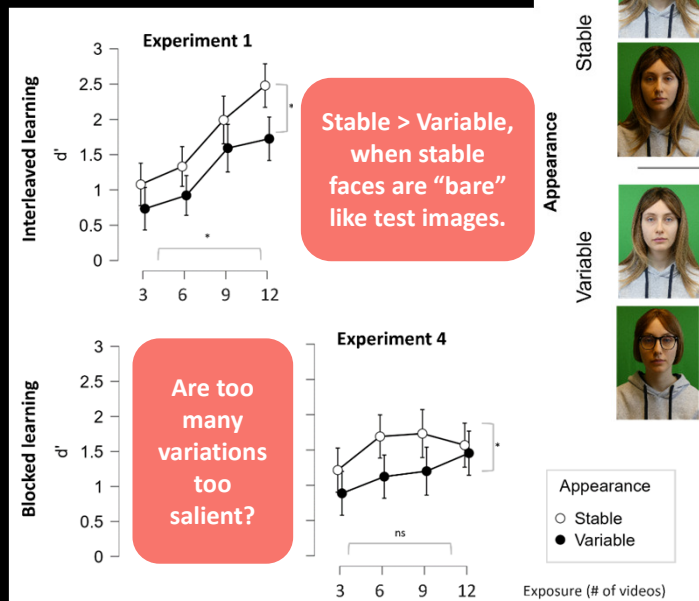
Stable > Variable after 3 videos
Variable > Stable after 12 videos

Results

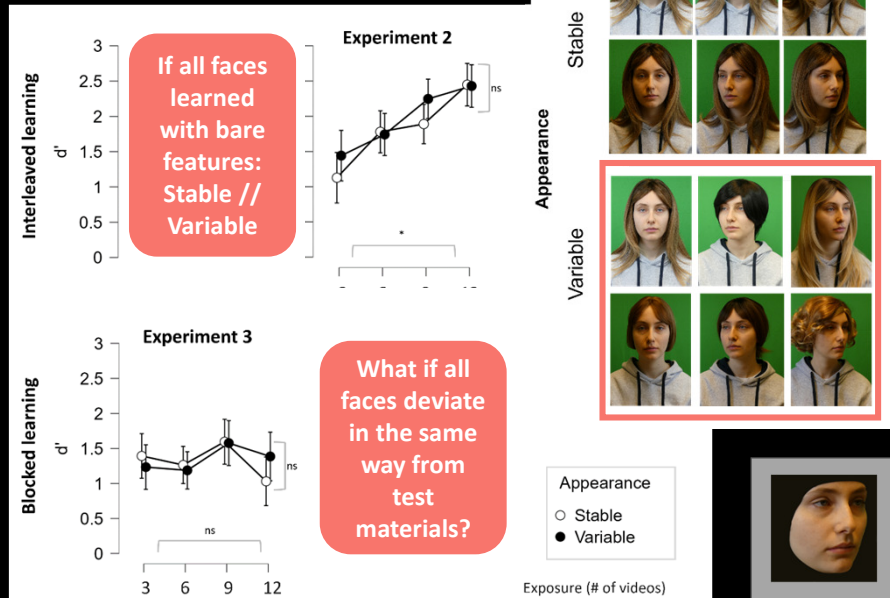
(N = 184 or 185 per experiment)



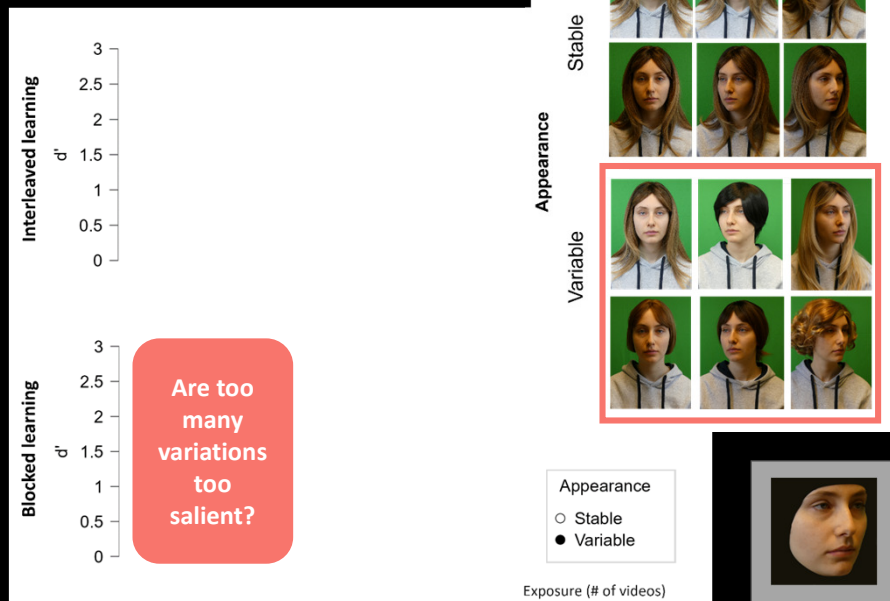
Results



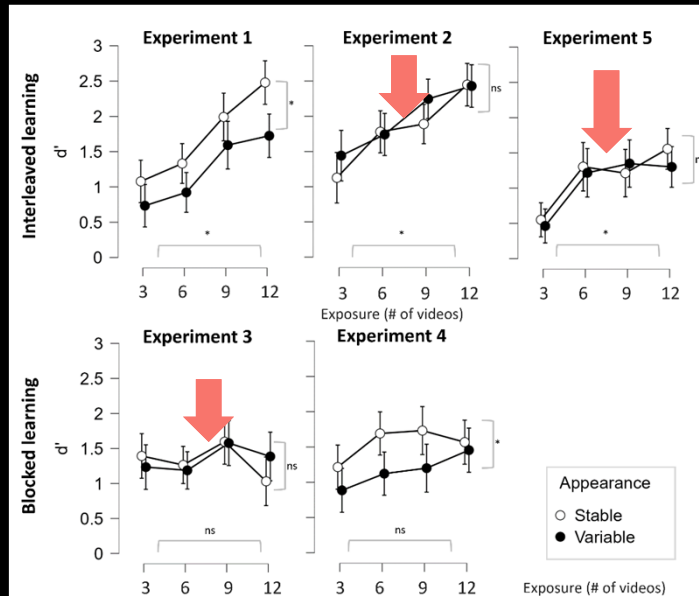
Results



Results



Results



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The role of learning-test image correspondence on face recognition

Wenrui
LiH      
Gaupin

Li, Gaupin, & Devue (in preparation)

Methods

Learning phase

(4 IDs, 6 videos each)



Recognition test (headshots)

Correspondence

Identical

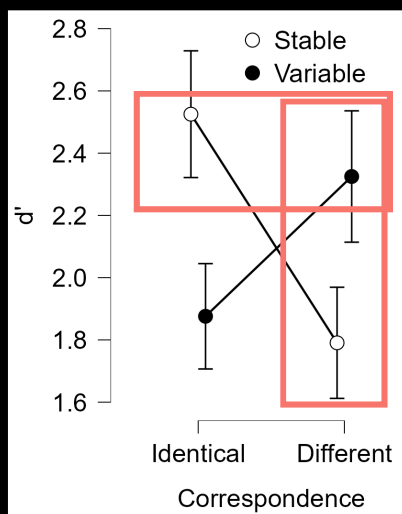
Different



6 images/ID/condition

Results

(N=96)

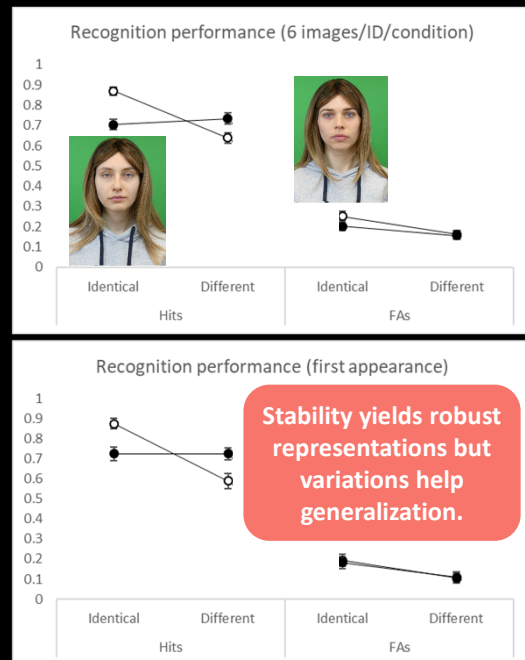
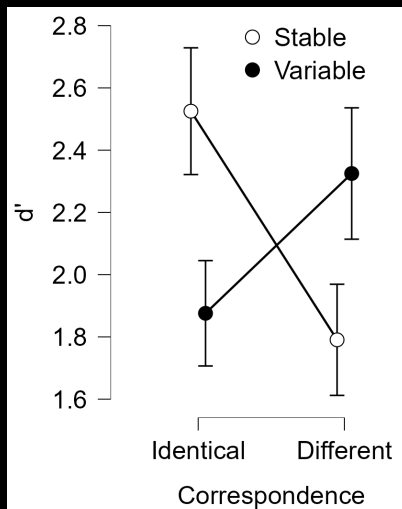


← Performance is higher when the same appearance is tested repeatedly...

This resembles to what was done and found in past research

←

Results



Interim conclusions

- Past research seems to have underestimated benefits of stability.
- Stable and variable information both contribute to develop efficient representations.
(see also Moore et al., 2024)
- The present advantage for stable faces is consistent with real-world findings and could reflect early learning stages (cf. Devue & de Sena, 2023)

BUT...

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Kévin
NguyTom
Lapadula

Other data in our lab show an advantage for variable faces over stable ones (Nguy, Lapadula, & Devue, under review)

- 8 faces to learn instead of 4
 - Learning from static images instead of videos
 - Blocked presentation of IDs
- Closer to methods used in most previous research

Does variability-based learning kick in when more items are involved? TBD...

Do people allocate learning resources strategically?

Strategic learning of people's names as a function of **expected utility** in young and older adults

Marie
BadolleSerge
Brédart

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Devue, Badolle, & Brédart (2024)
Aging, Neuropsychology and Cognition



Methods

Incidental learning

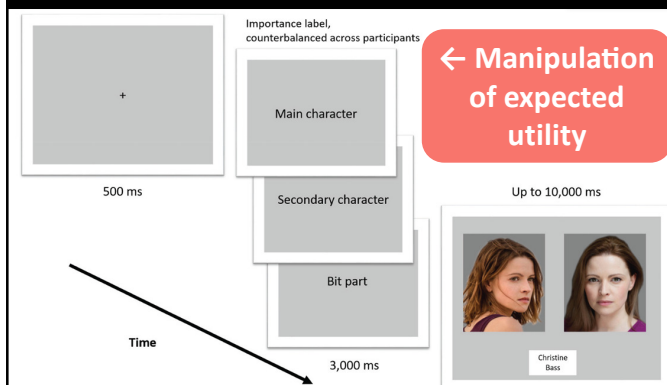
→ Cover story
that sounded like this:



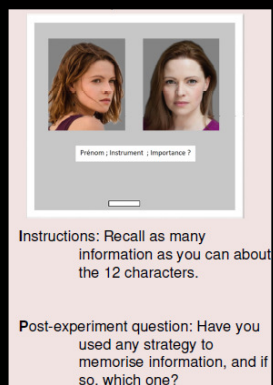
(Participants did not see such AI generated image!)

Methods

Incidental learning (12 IDs, self-paced)



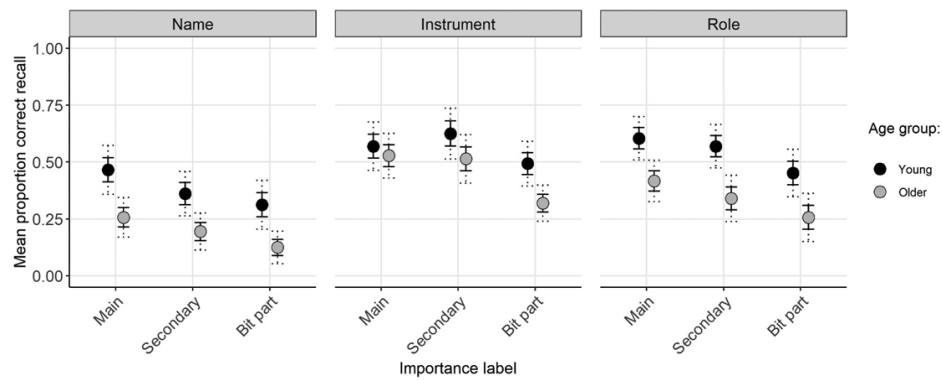
Cued recall



Two repetitions: younger adults go through IDs faster the second time than older adults.

Results

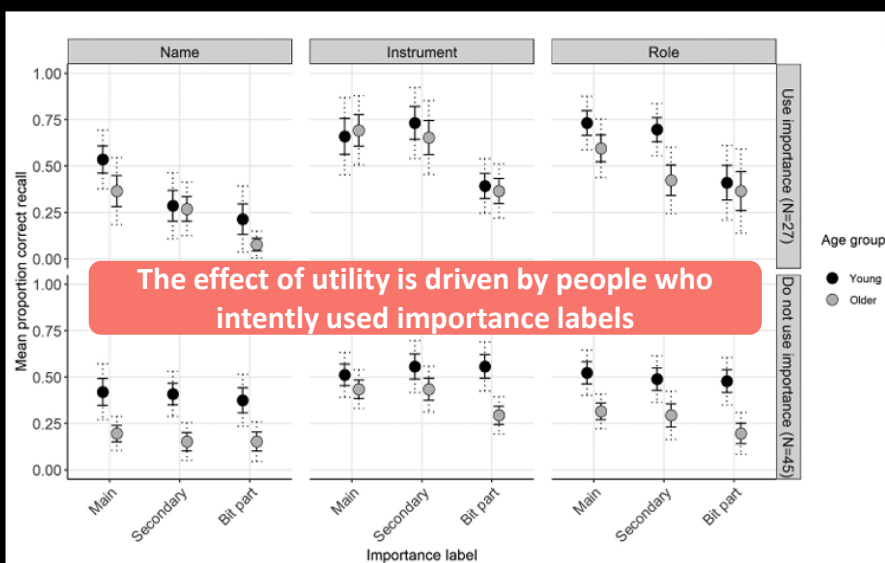
(N = 72)



People encode ID information based on expected utility, regardless of age

Results

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The effect of utility is driven by people who intently used importance labels

Take home message

- Humans do not passively accumulate perceptual information!
 - Complex interplay between perceptual factors, learning context, task demands, and individual differences.
→ Stimuli, procedures and instructions must be chosen intently.
 - It is plausible that face and identity learning is cost-efficient... TBC!
 - Stability and variations both contribute to building efficient memory representations.
- Higher-level cognitive processes (attention, memory, decision making, etc.) must be better accounted for in future theoretical developments.

Thank you!

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Perception, attention and memory lab



Lyse
Gathoye



Wenrui
Li



Kévin
Nguy



Marie
Badolle



William
Daro



Sofie
de Sena



Valentine
Vanootighem



Serge
Brédart



Hélène
Gaupin



Tom
Lapadula



Raphaël
Legrand



ARC

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