MEANING MATTERS:
Outcome Value Shapes Habit Formation Across Aging

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BACKGROUND

- Maintaining independence is central to healthy aging and dementia risk reduction[1].
- Aging is often associated with stronger reliance on habits[2,3] which could support many automatic, daily behaviours.
- Understanding habit formation and change across the adult lifespan could help inform interventions that promote healthy aging.

AIM

To explore the balance between goal-directed (GD) and habitual control across adulthood and improve understanding of age-related differences in forming and changing habits.

METHOD

- Previous outcome-revaluation paradigms[4] were adapted to develop the novel *Symmetrical Known-Associations Revaluation Task* (sKART).
- Older (*n*=38, *Mage*=69.03, 26F) and younger adults (*n*=36, *Mage*=23.39, 22F) GD and habitual responding was measured using the sKART.
- The sKART used semantically related stimulus-outcome (S-O) pairings to better facilitate associative learning during aging.
- The task used a two-choice response design instead of Go/NoGo to reduce non-response ambiguity and preserve reaction time data for richer insight into this behavioural balance during aging.

SCAN FOR MORE sKART INFO

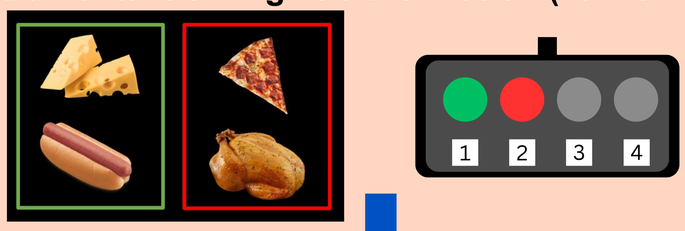
REFERENCES

1. World Health Organization. (2020). *Decade of healthy ageing: Plan of action*. World Health Organization. https://www.who.int/publications/m/item/decade-of-healthy-ageing-plan-of-action
2. Hennessy, C., Pace, T., Blatch-Williams, R., van Timmeren, T., de Wit, S., & Andrews, S. C. (2025). Switching gears: Age-related differences in goal-directed and habitual behavior. *Neuropsychology*, 39(4), 305-320. https://doi.org/10.1037/neu0000997
3. van de Vijver, Brinkhof, L. P., & de Wit, S. (2023). Age differences in routine formation: the role of automatization, motivation, and executive functions. *Frontiers in Psychology*, 14. https://doi.org/10.3389/fpsyg.2023.1140366
4. Watson, P., Gladwin, T., Verhoeven, A., & de Wit, S. (2022). Investigating habits in humans with a symmetrical outcome revaluation task. *Behaviour Research Methods*. https://doi.org/10.3758/s13428-022-01922-4

sKART

Pavlovian stimulus-outcome learning

Instrumental training habit formation (val vs. nonval)



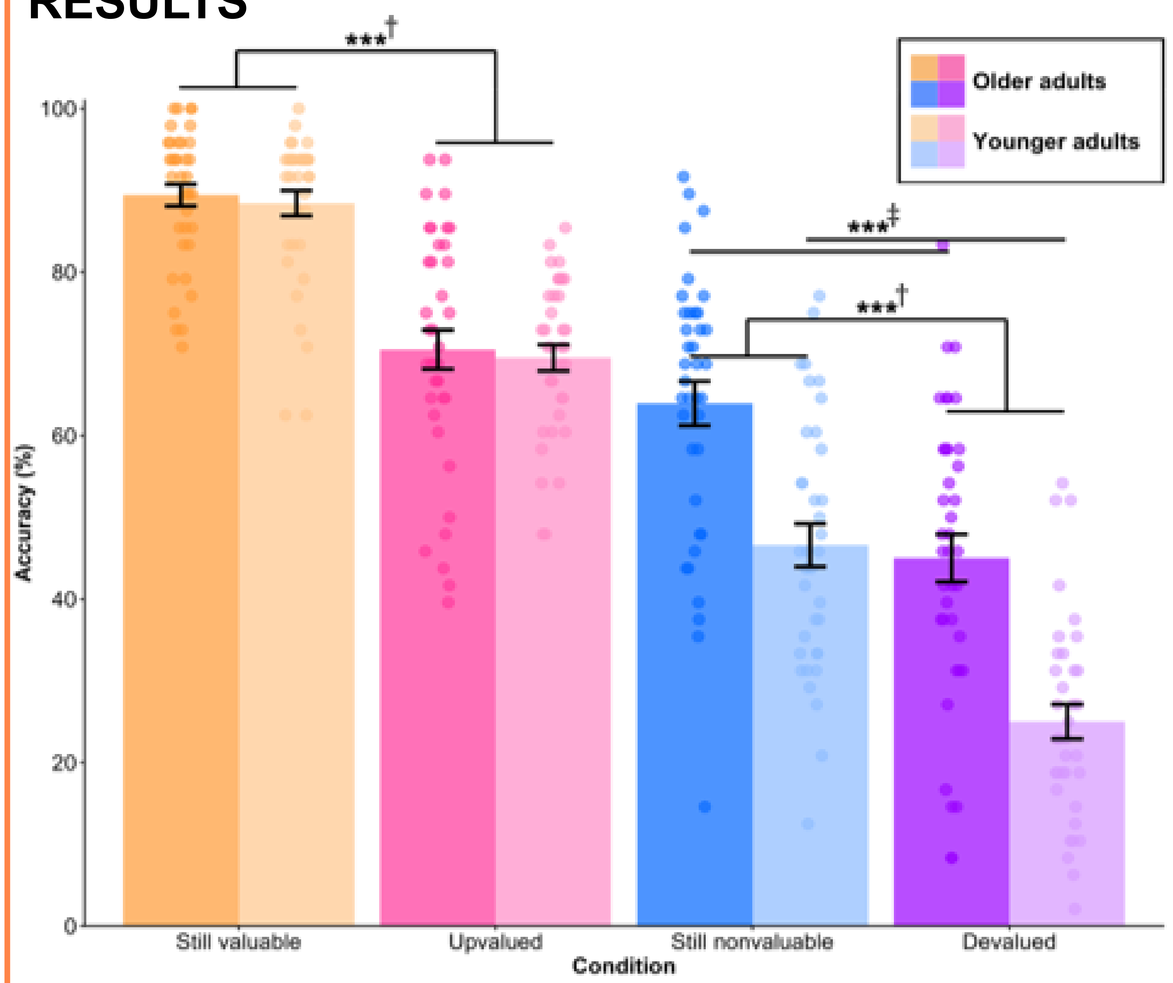
Outcome-revaluation test

Correct responding = updated GD control

Incorrect responding = habitual slips-of-action

Stimulus	Outcome Value: Training phase	Outcome Value: Test phase	Trial type (Congruency, Value)
			Still valuable (congruent, valuable)
			Upvalued (incongruent, valuable)
			Still nonvaluable (congruent, nonvaluable)
			Devalued (incongruent, nonvaluable)

RESULTS



Note. N=74 (*n*=38 older, *n*=36 younger). Error bars represent ± SEM. *** $p < .001$.
†Significant main effects of congruency were observed for both value-conditions.
‡A significant main effect of age was only present on nonvaluable conditions.

- Both age-groups formed **stronger valuable S-R habits during training.**
- At test, **habits interfered** with updated GD control for both age-groups (valuable: $M_{diff} = -18.92$, $p < .001$, 95% CI [-21.35, -16.49], $d = 1.80$; nonvaluable: $M_{diff} = -20.25$, $p < .001$, 95% CI [-23.62, -16.88], $d = 1.28$).
- **Age related differences were entirely specific to nonvaluable conditions** ($M_{diff} = 18.67$, $p < .001$, 95% CI [12.10, 25.25], $d = 1.18$)

CONCLUSIONS

- Aging does not appear to reflect a uniform shift toward habitual control.
- Valuable outcomes produced stronger habits than nonvaluable outcomes with value appearing important for learning and habit formation across adulthood.
- Interventions promoting healthy aging may benefit from leveraging meaningful, rewarding outcomes to build durable, health-supporting habits.