David and Goliath in Old Age: Asymmetric Competition and Resource Allocation in Younger and Older Adults

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Abstract

Weaker agents can stand a chance of winning occasionally against stronger agents in asymmetric competitions waged over several fields if they follow the normative strategy to give up on some fields and concentrate resources on the remaining ones. But how sensitive are younger and older players to their relative strengths and how does aging affect resource allocation in competitive games?

Introduction

- Competition is ubiquitous. As in the archetypal battle between David and Goliath, competing agents often differ in their resources they can allocate for competition.
- Weaker agents can stand a chance of winning occasionally if evaluation of performance is incomplete and involves chance.[1,2]
- Normative analyses indicate that weaker agents should give up on some occasions to match stronger agents on remaining ones.[3]
- Competitive distribution of limited resources (e.g., allocation of political funds or advertising over sectors, etc.) has been modeled with the classic game of “Colonel Blotto”.[4]
- We use this paradigm to investigate age-related differences in asymmetric competition

Aging and Competitive Allocation

- Older adults have more experience than younger in allocating scarce resources and use strategies of life management, like loss-based selection, optimization, and compensation (SOC).[5] Older adults may thus selectively focus on specific occasions (and ignore or give up others).
- Alternatively, older adults may show higher cautiousness and tendency to prevent error. This may lead them to distribute resources more evenly.
- Finally, variabilty in numeric and fluid abilities could account for age-related differences in the Blotto game.

Participants

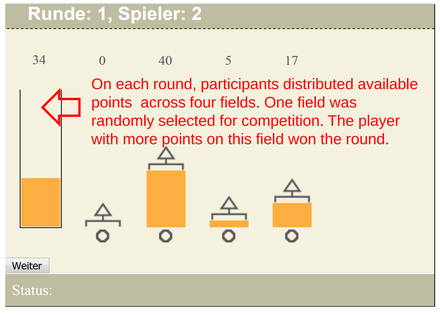
N = 60 community-dwelling older adults (31 male)
N = 60 younger adults (26 male)

	Younger Adults		Older Adults	
	M	*SD*	*M*	*SD*
Age	26.61	2.77	70.43	3.93
Vocabulary *	31.13	3.01	33.30	2.35
Pos. affect bef. game	2.99	0.59	3.18	0.64
Neg. affect bef. game	1.30	0.43	1.18	0.24
Pos. affect aft. game *	3.02	0.72	3.35	0.87
Neg. affect aft. game *	1.19	0.26	1.07	0.14
Speed Test *	86.55	15.38	57.68	12.86
Reasoning Matrices (CFT) *	11.82	1.81	7.70	2.91
Numeracy Test *	9.52	1.32	7.88	2.79

* main effect of age group ($p < .05$)

Procedures and Design

- Groups of 4 players per session: Participants played the allocation game in the same room and competed against some of the present participants (with rematching). Social interaction was discouraged. Participants received a performance-contingent monetary bonus. Blotto Game (“jar” version):

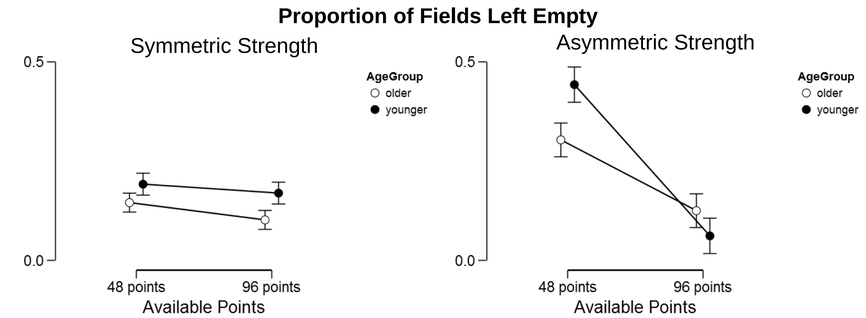


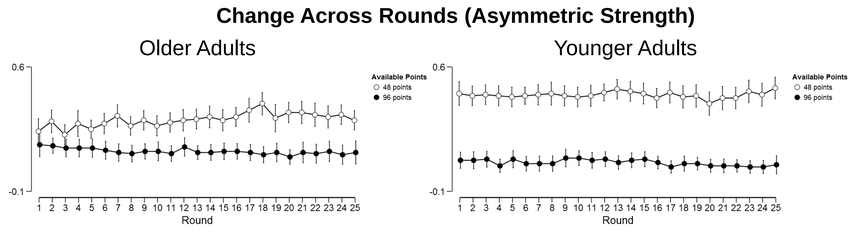
- 2×2×2 mixed design: Btw-factor *Age Group,* btw-factor *Experimental Group,* within-factor *Strength* (counterbalanced)

Age Group	Experimental Group (symmetric vs. asymmetric competition)	Strength (48 or 96 available points)	
		Phase 1 (25 rounds)	Phase 2 (25 rounds)
younger adults	symmetric (control) *N* = 20	48-48	96-96
	asymmetric *N* = 40	48-96	96-48
older adults	symmetric (control) *N* = 20	48-48	96-96
	asymmetric *N* = 40	48-96	96-48

Results

Assuming that available resources to two competitors are *a* and *b*, (with $a \geq b \geq 0$): the optimal strategy for a stronger player is to divide resources in a uniform distribution (ranging from 0 to twice the player’s average resources across fields). The weaker player should leave a proportion of $1-(b/a)$ fields empty and distribute across remaining ones to match stronger player.[3]





Summary

- Both younger and older adults adaptively gave up on fields to stand a chance as weaker players in asymmetric competition. Hence, their strategy differed strongly as a function of the opponent’s resources.
- Older adults were more cautious and tended to cover more of their fields than younger adults.
- Allocation behavior across game rounds was surprisingly stable; older adults’ allocation tended to change slighty more than youngers’.

References

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