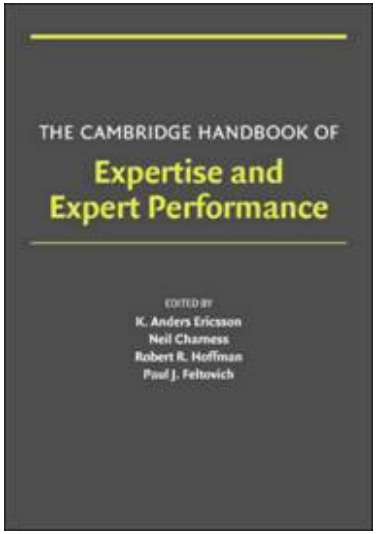

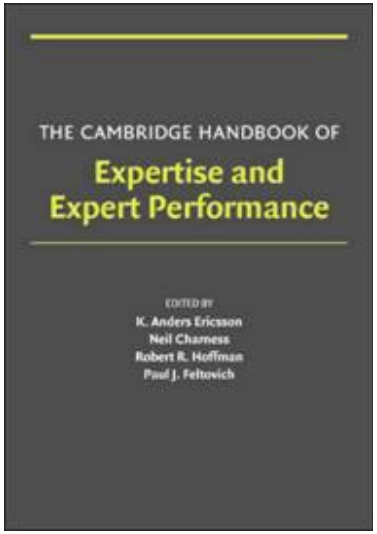

Can Expertise Mitigate Cognitive Aging?

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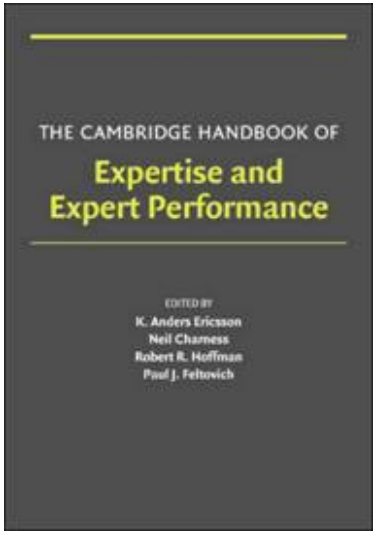
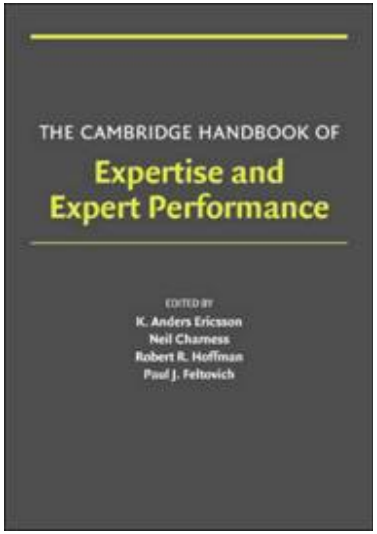




Definitions

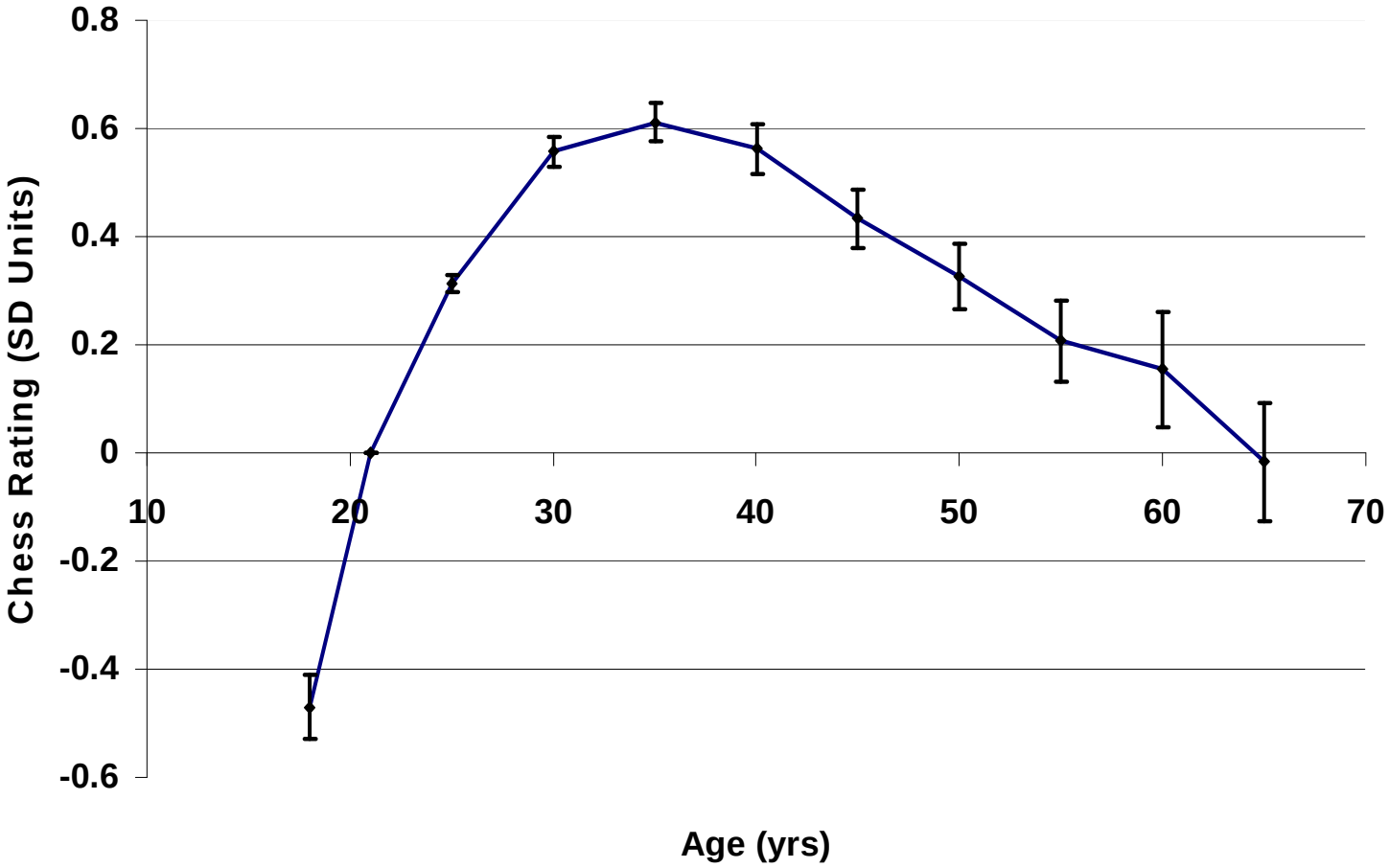
- *Mitigate (from Merriam Webster)*

  1 : *to cause to become less harsh or hostile*

  2 a : *to make less severe or painful*

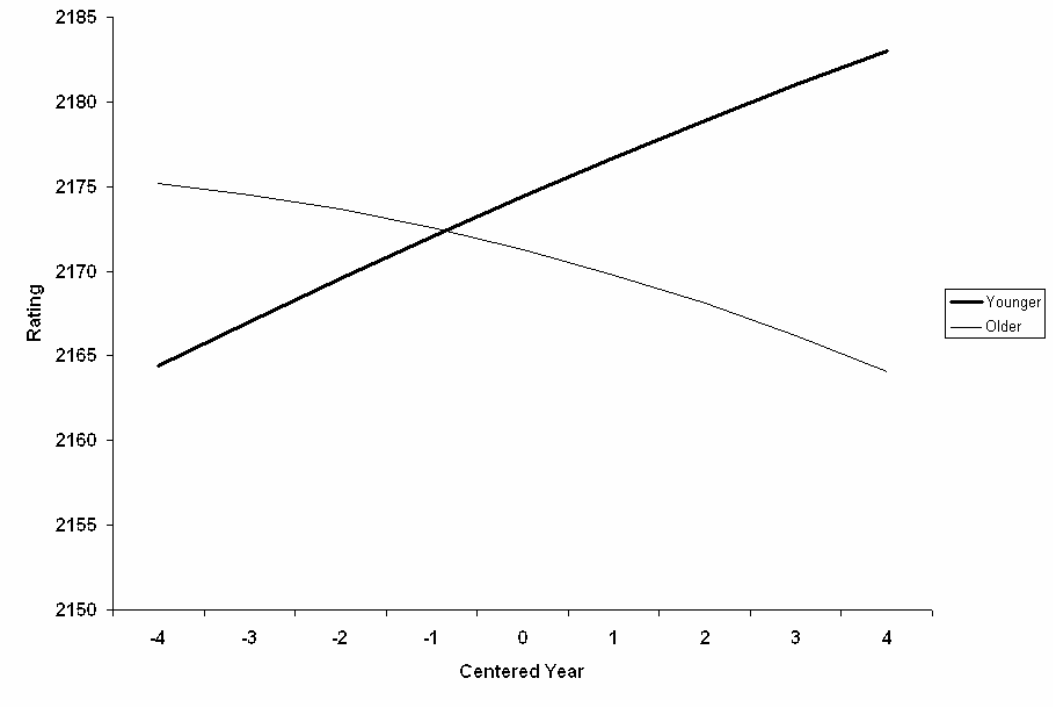
- *Mitigation:* Variables that moderate or mediate the generally negative age-cognition relationship
- *Expert:* Someone demonstrating consistently superior (+2 SD) performance on representative tasks from a domain

Elo's (1965) Data: Chess Grandmaster Careers (n~30)



Elite chess sample (n~5000)

- Multi-level model estimated trajectories for younger and older adults (mean ages 25 and 55 respectively)
- Improvement for young & decline for older players
- Given no interaction of tournament games played and age, this age decline is possibly independent of the frequency of tournament competition.
- Age also negatively predicted the intercept rating, showing that older adults tend to have lower ratings during the middle of their careers (reflected by mean age)
  - Suggestive of generational improvement in chess playing in the population
    - Flynn effect

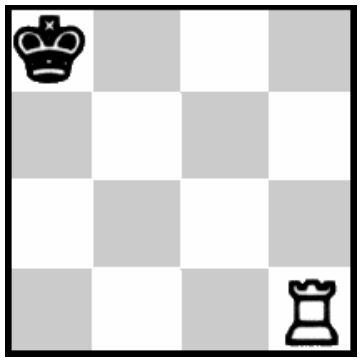


Roring, R.W. & Charness, N. (2007). A multilevel model analysis of expertise in chess across the lifespan. *Psychology and Aging, 22*, 291-299.

Peak Age: 44 Years

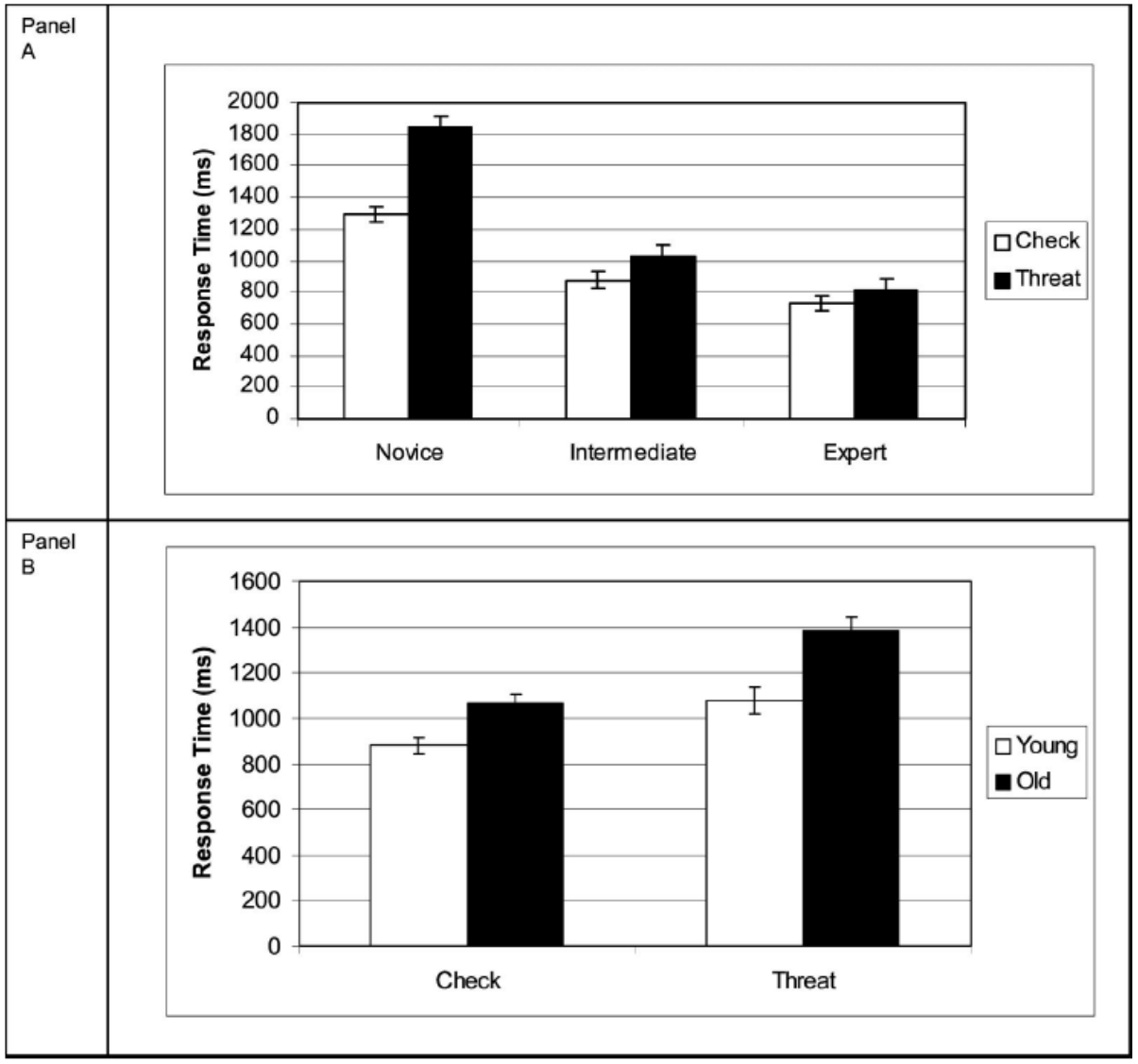
- Peak age estimated to be 43.8
  - 95% confidence interval of [39, 49]
  - peak ages occur about a decade later than proposed by Elo (1965/1986)
    - Again suggests generational improvements
      - Flynn on IQ
      - Manton on health, disability

Task x Skill, Age x Task Interactions in Check/Threat Detection Task



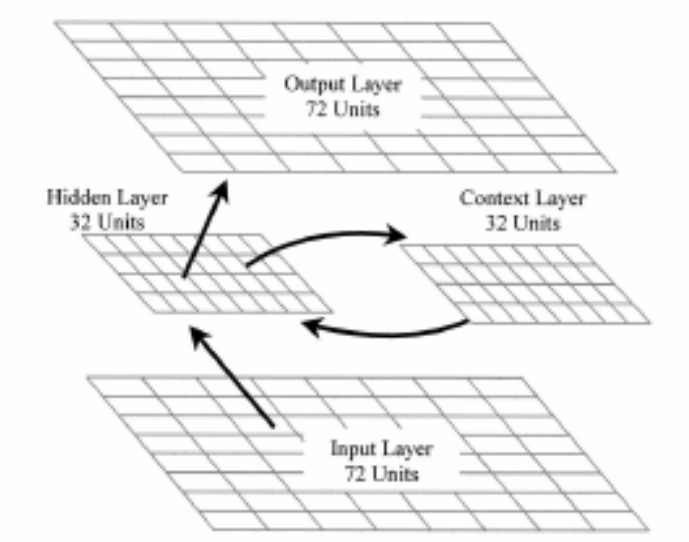
Check: Is the King in check?

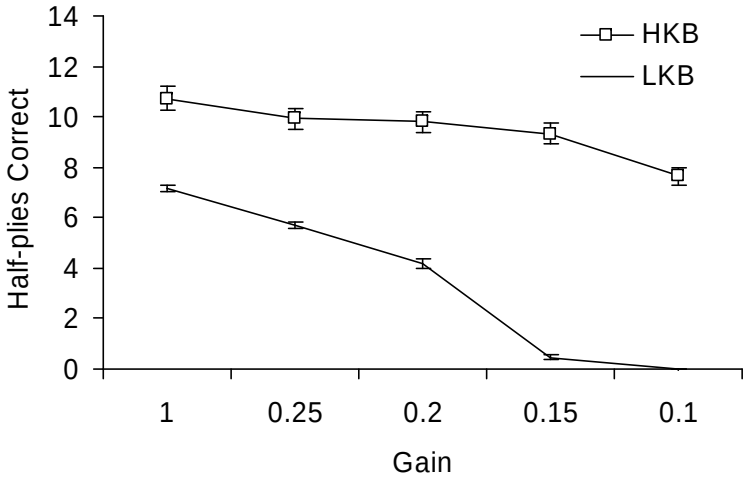
Threat: Can the King be checked?



Jastrzembski, T., Charness, N., & Vasyukova, C. (2006). Expertise and age effects on knowledge activation in chess. *Psychology and Aging, 21,* 401-405.

Neural Net Simulation of Knowledge Effects on Recall of Chess Opening Moves



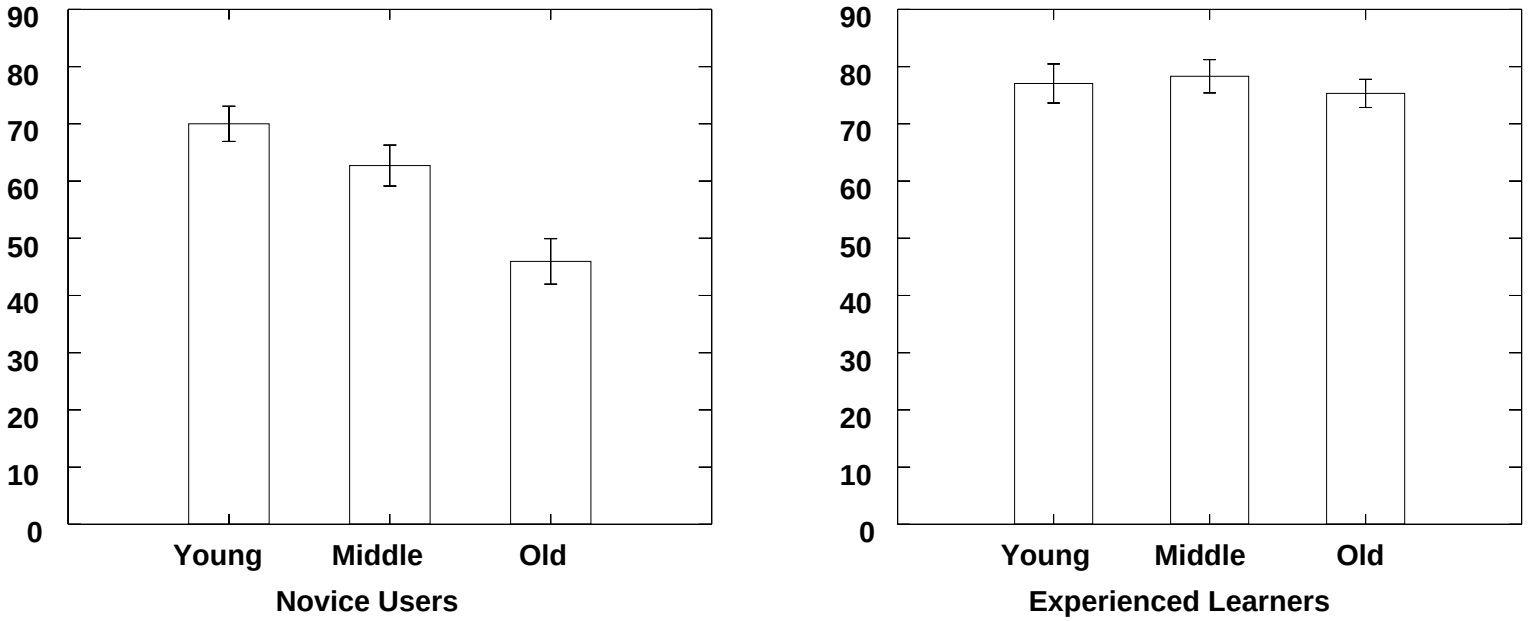


Mireles, D. E., & Charness, N. (2002). Computational explorations of the influence of structured knowledge on age-related cognitive decline. *Psychology and Aging, 17*, 245-259.

Acquired knowledge base (high vs. low) allows you to transfer better to new chess opening sequences and to resist aging (modeled by changes in gain, a parameter that slows processing in the network).

Transfer to a New Word Processor

Accuracy on Final Performance Test
(max=90)



Charness, N., Kelley, C. L., Bosman, E. A., & Mottram, M. (2001). Word processing training and retraining: Effects of adult age, experience, and interface. *Psychology and Aging, 16*, 110-127.

Predictors of Word Processing Skill	B	SE	Beta	p (2-tail)
		Performance Factor Score		
Constant	0.093	0.071	0	0.195
Interface	0.329	0.070	0.326	0.000
Age	-0.298	0.085	**-0.296**	0.001
JOL score	0.201	0.078	0.200	0.013
Digit-Symbol Median RT	-0.242	0.084	-0.244	0.006
Software Experience (Breadth)	0.377	0.077	**0.393**	0.000
Age X Software experience	0.239	0.074	**0.230**	0.002
		Time Factor Score		
Constant	-0.016	0.065	0	.000
Age	0.49	0.065	**0.471**	.000
Clock RT	0.19	0.066	0.184	.006
Software Experience (Breadth)	-0.529	0.064	**-0.534**	.000
Age x Software Experience	-0.247	0.067	**-0.230**	.000

F (6, 68) = 24, p < .01, R^2 = .68, for Performance; F (4, 72) = 49, p < .01, R^2 = .73, for Time.

Conclusions

- Acquiring expertise can mitigate age-related declines in basic cognitive abilities *thought to underlie* skilled performance
- Why?
- Basic abilities may decouple from narrow cognitive skills as people acquire expertise because specialized brain circuitry develops to support skilled performance
- There are limits on mitigation by skill
  - Seems to work best where knowledge structures are critical to performance
  - Seems to work less well where speeded performance is required (e.g., Schulz & Curnow, 1988, hypothesis for sports)
- Moderation may be less frequent than mediation but too few domains and tasks have been explored

Next Steps

- Interventions
  - Cognitive training can boost basic abilities such as speed of processing
    - However, transfer to other abilities and tasks seems to be minimal
  - Suggests that we may need to intervene in young adulthood for greatest societal efficiency, and possibly more intensively in older adulthood to preserve performance
- Individual versus group problem solving
  - Researchers are being asked to attack big issues in collaborative teams
    - cognition and aging
  - Older adults sometimes rely on advice from family members and friends for decision making
  - How might we facilitate collaboration in intergenerational teams?
- Individual differences
  - Some older individuals age well and others not so well
    - Could we learn something valuable by studying successful older experts?
    - What are the neural mechanisms supporting expert performance?