



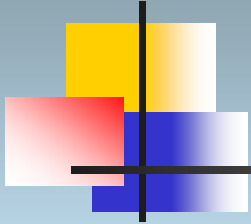
Behavioral Interventions to Promote Healthy Cognitive Aging

Dr. Karlene Ball

University of Alabama at Birmingham

**Roybal Center for Translational Research on Aging and
Mobility**

Disclosure: Stockholder and consultant to Visual Awareness, Inc. & Posit Science



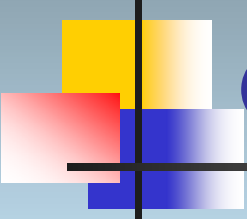
Cognitive Training: What is it?

Strategy Training

Practice

Feedback

Novelty



Improving and/or Maintaining Cognitive Function

Studies recruiting individuals with significant decline show immediate improvement

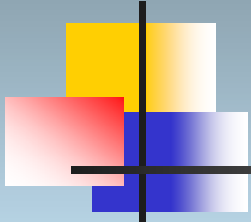
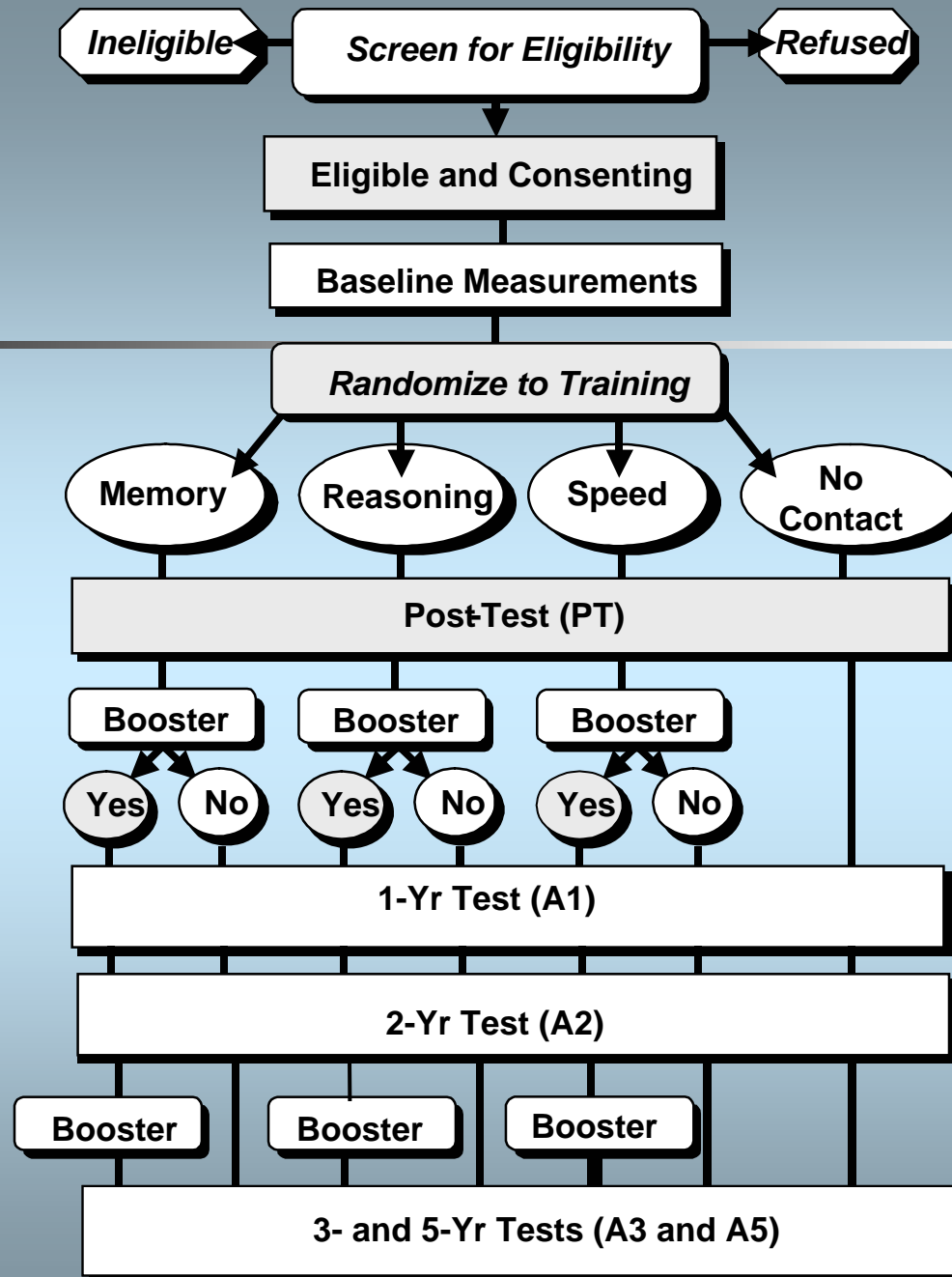
Studies recruiting individuals with little to no age-related decline show maintenance over time

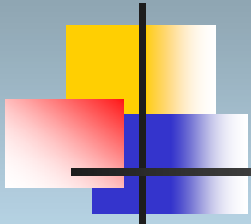


ACTIVE

ACTIVE vs. other cognitive training research

1. multisite, randomized controlled, single-blind trial
2. intent-to-treat analytical approach that included all randomized participants rather than only those compliant with the intervention,
3. primary outcome measures of everyday functioning
4. a more socioeconomically and racially diverse study sample



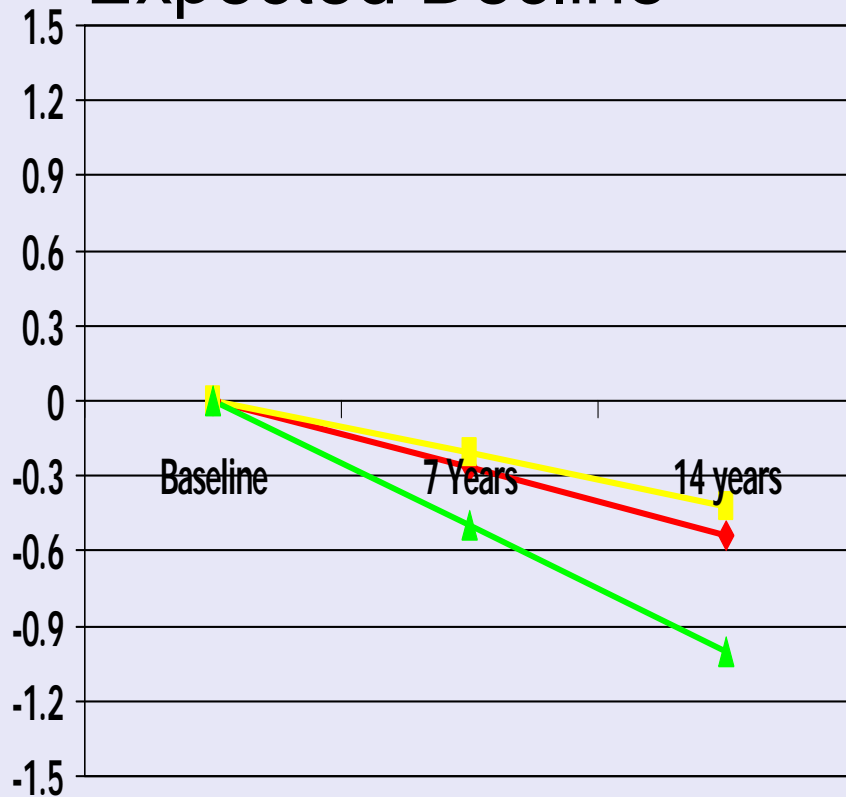


Attrition at 5 Years

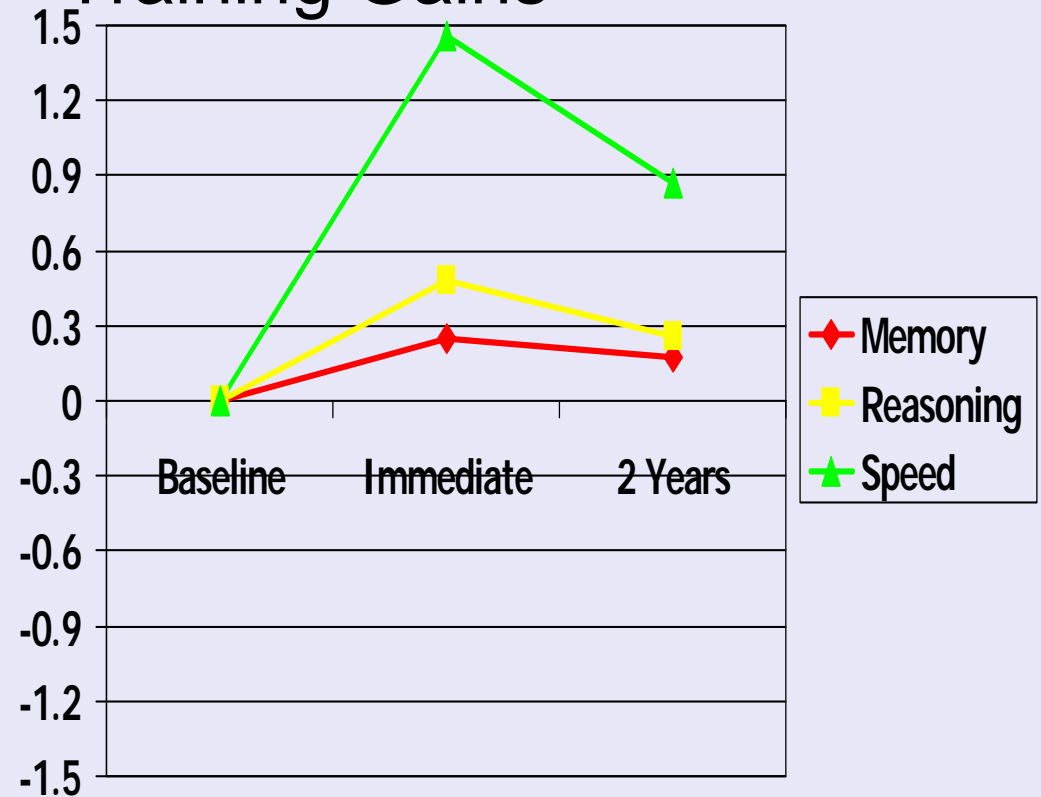
- Retained 67% (1,877) of sample
- Attrition higher if male, older, lower MMSE, lower Reasoning and Memory Scores, less education, and more health problems at baseline
- No differences across treatment groups

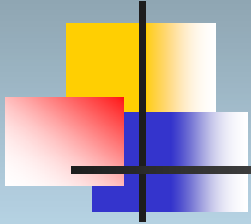
Initial Effect Sizes (JAMA 2002)

Expected Decline



Training Gains

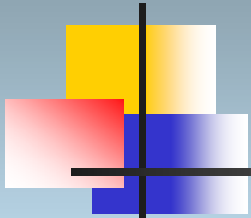




Initial Training Effects

- Each intervention reliably improved the targeted cognitive ability at post test in:
 - 87% of Speed trained
 - 74% of Reasoning trained
 - 26% of Memory trained

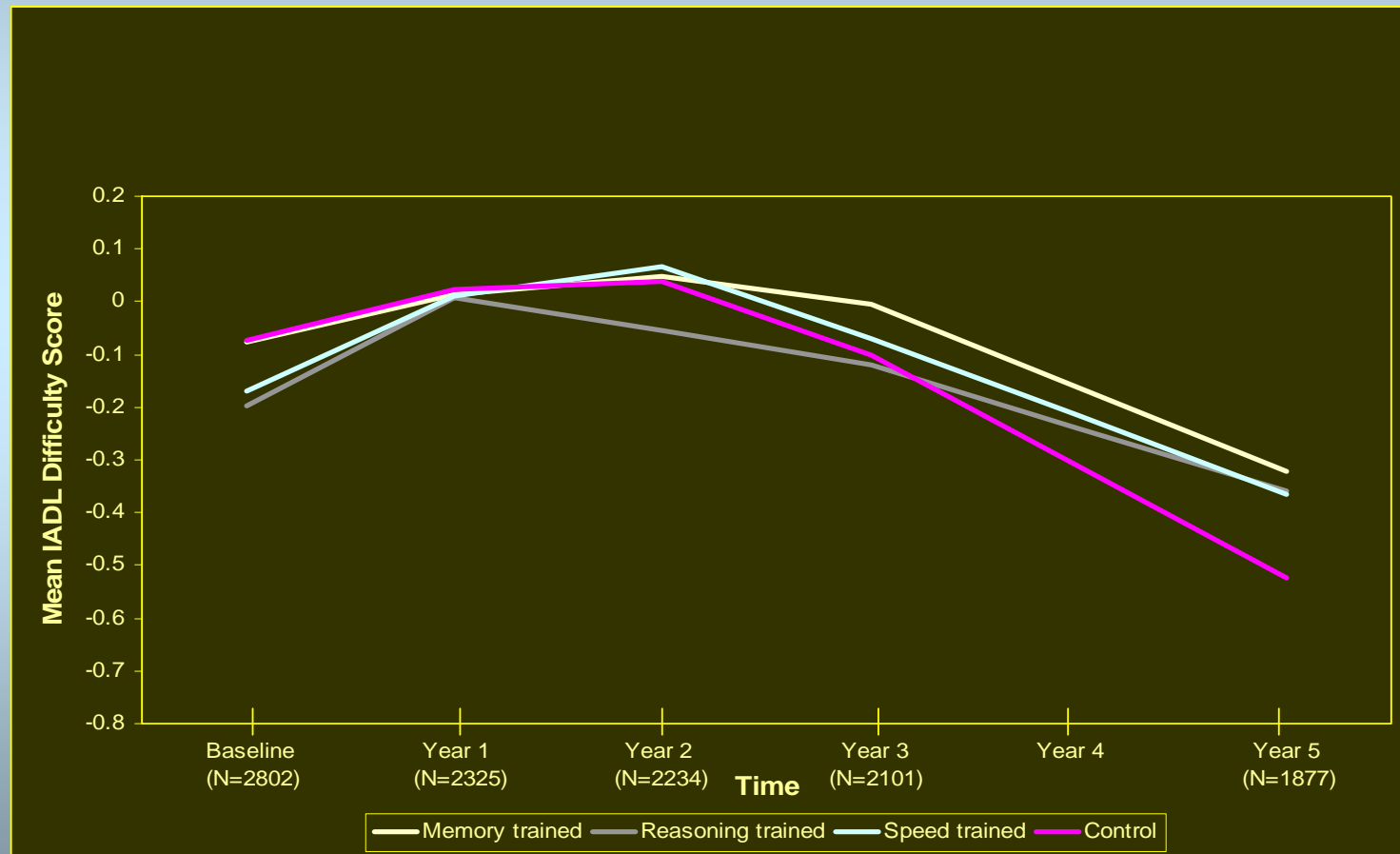
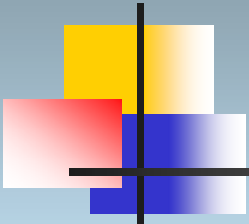
Effect of Training on Cognitive Abilities at 5 years (JAMA 2006)



Cognitive Gain Mediates Functional Gain

Net Effect of Reliable Gain in Cognitive Outcomes (within Trained Group) on Everyday Outcome Composites			
	Memory composite SEM gain	Reasoning composite SEM gain	Speed composite, SEM gain
Problem-solving composite (+) A1	0.191 †	0.12 †	0.207 **
A2	-0.030	0.037	-0.006
Functioning composite (-) A1	-0.044	-0.054	-0.207 †
A2	-0.232	-0.133	0.022
Everyday Speed composite (-), PT	-0.195 *	-0.154 *	-0.192 **
A1	-0.024	-0.156 *	-0.190 **
A2	0.064	-0.089	-0.215 **

Effect of Training on Function: Self-Reported IADLs

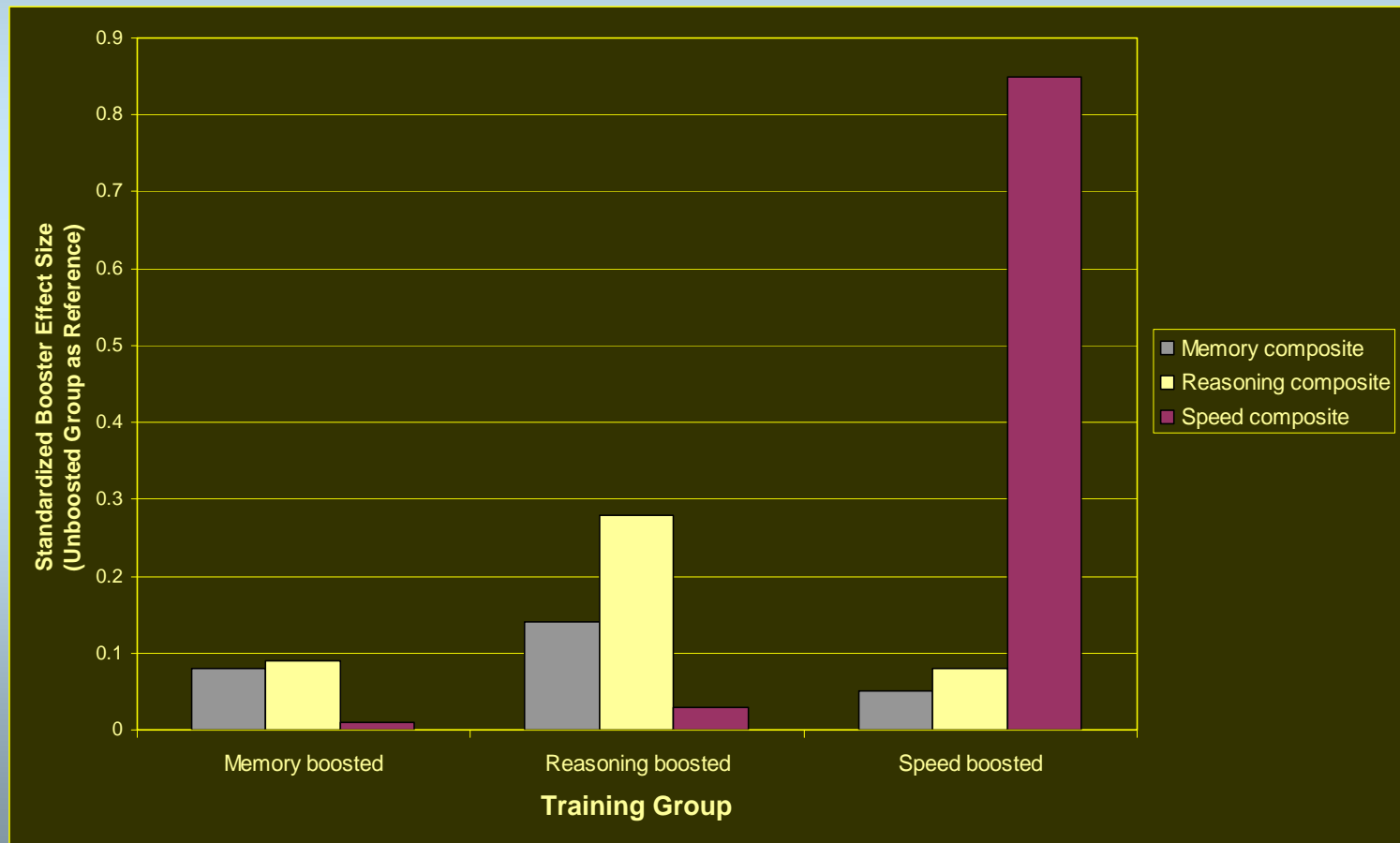




Effects of Booster Training

- For Reasoning and Speed training, better performance on targeted cognitive ability, durable through 5 years.
- For Speed training, better performance on Everyday Speed of Processing at 5 years.

Effects of Booster Training



Net Effect of ACTIVE Booster Training on Cognitive & Everyday Composites

	Memory booster	Reasoning booster	Speed booster
Memory composite (+), A1	0.044	-0.043	-0.004
A5	0.080	0.140	0.050
Reasoning composite (+), A1	-0.009	0.304***	0.125**
A5	0.090	0.280**	0.080
Speed composite (-), A1	-0.030	-0.043	-0.919***
A5	0.010	0.030	-0.850***
Problem-solving composite (+), A1	-0.007	0.001	0.019
A5	0.040	0.220†	-0.020
Functioning composite (-), A1	-0.088	-0.206†	-0.246*
IADL Difficulty (+), A5	0.200†	0.290*	0.260†
Everyday Speed composite (-), A1	0.041	-0.068	-0.149*
A5	-0.008	-0.080	-0.290**



Impact of Training on Secondary Outcomes in ACTIVE

- Health-related quality of life
 - Protective effect of speed training against clinically relevant decline in HRQoL at 2 yrs.
 - Protective effect of memory, reasoning & speed training at 5 yrs.
- (Speed) Maintain driving (controls drive less)
- (Speed) Maintenance of driving space
- (Speed) No increase in driving difficulty relative to controls



Other Cognitive Training Studies

- Speed of Processing training has been shown to result in:
 - Fewer dangerous maneuvers (on-road driving)
 - Reduced by 40% relative to controls
 - Improved hazard detection in driving simulations
 - drivers stopped significantly sooner to an unexpected event (23 feet) following training relative to controls
 - Faster reaction times to road signs
 - Increased mobility/maintained driving mobility
 - Improved Timed IADLs (3 different studies)



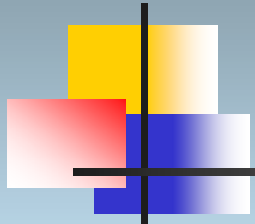
Conclusions – Cognitive Benefits

- Training gains are relatively specific
- Training gains are durable (5 yrs.)
- Almost everyone benefits from training
- More training is better (e.g. boosters)
- When should we intervene?
 - Maintenance vs. Improvement



Conclusions – Everyday Function

- Training gains generalize more broadly
- Training gains, when they occur, are durable
- Participants who gain cognitively get the most benefit in everyday function.
- More training is better (e.g. boosters)
- When should we intervene?
 - Maintenance vs. Improvement



Future Directions

- Can we extend training to more impaired samples?
- Can we match interventions to individual profiles?
- Evaluate interventions that combine cognitive training with other behavioral and non-behavioral interventions (exercise, nutrition, pharmacological)
- Evaluate high-intensity, high-exposure approaches
- Work with industry partners for dissemination and incentives.