



School of Nursing

Understanding Cancer-Related Cognitive Impairment

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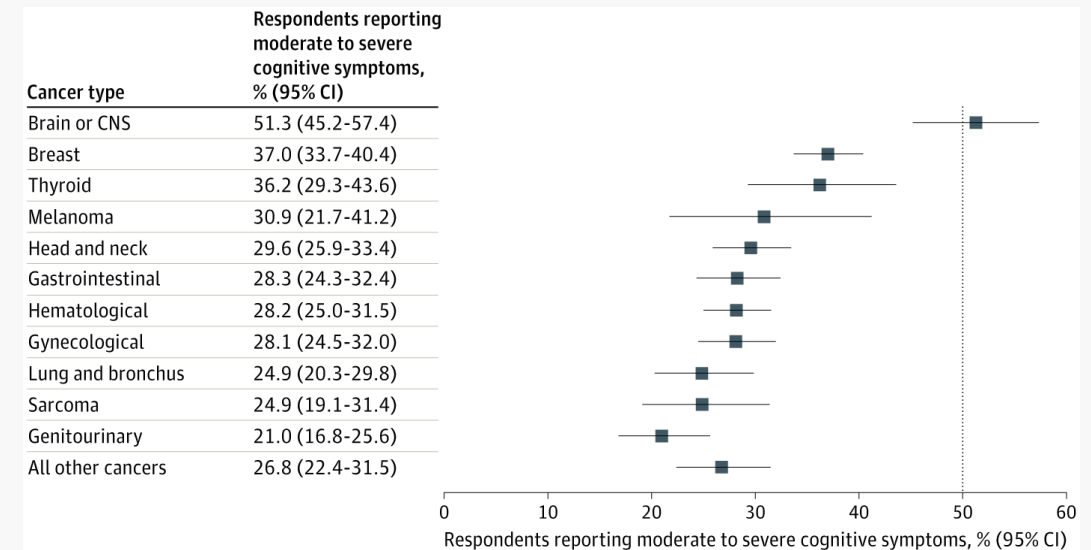
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About Me



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Chief Concern of Cancer Survivors



Mayo SJ, Edelstein K, Atenafu EG, Ajaj R, Li M, Bernstein LJ. Cognitive Symptoms Across Diverse Cancers. JAMA Netw Open. 2024 Aug 1;7(8):e2430833. doi: 10.1001/jamanetworkopen.2024.30833. PMID: 39196555; PMCID: PMC11358862.

<https://www.nytimes.com/2007/04/29/health/29chemo.html>



Cancer-Related Cognitive Impairment: A Practical Guide for Oncologists

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DOI <https://doi.org/10.1200/OP-24-00953>

TABLE 1. CRCI Common Symptoms/Complaints

Word-finding difficulty
Trouble forming thoughts and inability to clearly express oneself
More forgetful (Cannot remember where common things are placed, ie, wallet, keys. Walked into a room but forgot what I meant to do there.)
Struggling with retaining new information (Forgetting the name of someone I was just introduced to. Cannot remember new instructions.)
Inability to concentrate on or persist with tasks (It takes me much longer to complete tasks.)
Trouble with executive planning or decision making
Difficulty multitasking (Having trouble keeping track of what I was doing if I am interrupted, having difficulty switching between tasks.)

Zhang Y, Kesler SR, Dietrich J, Chao HH. Cancer-Related Cognitive Impairment: A Practical Guide for Oncologists. JCO Oncol Pract. 2025 Oct;21(10):1377-1381. doi: 10.1200/OP-24-00953. Epub 2025 Mar 5. PMID: 40043223; PMCID: PMC12353510.



ORIGINAL ARTICLE

“I couldn't connect the wires in my brain.” Young adult cancer survivors' experience with cognitive functioning

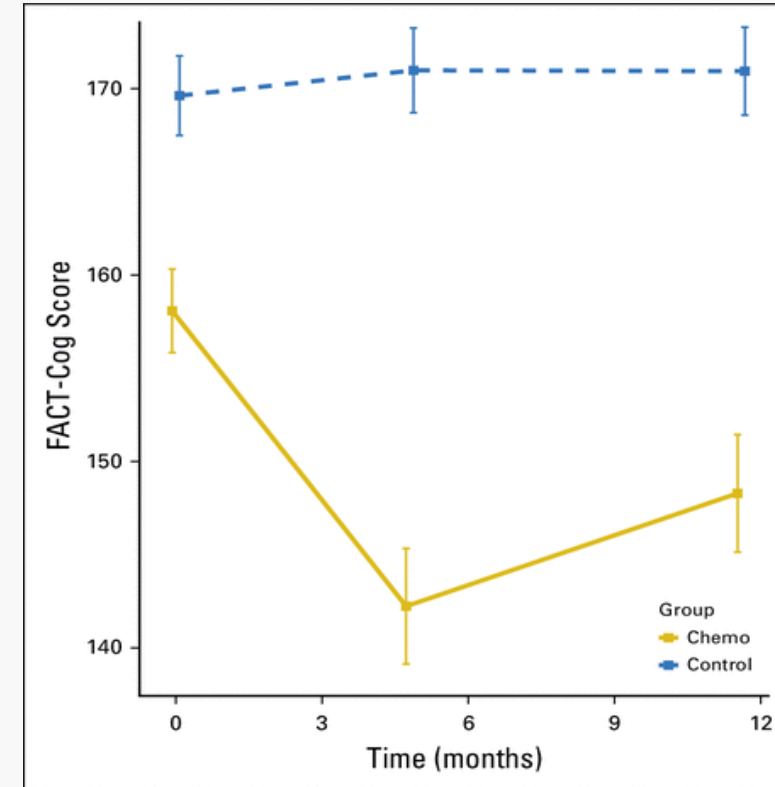
Danielle B. Tometich ✉, Taylor Welniak, Lisa Gudenkauf, Melinda L. Maconi, Hayden J. Fulton, Dinorah Martinez Tyson, Kellie Zambrano, Syed Hasan, Yvelise Rodriguez ... [See all authors](#) ▾

First published: 29 February 2024 | <https://doi.org/10.1002/pon.6309>

- “going to the grocery store, I will completely forget if I don’t write down a distinct list; I will absolutely forget what we need”
- “when I’m fatigued, I just don’t have the space to do anything... I just feel like I don’t have the bandwidth to do it.”
- One cancer survivor expressed frustration with remembering names of people that they just met and said “I can’t remember that we talked for an hour last week like they said. They’re erased to me, they’re gone.”

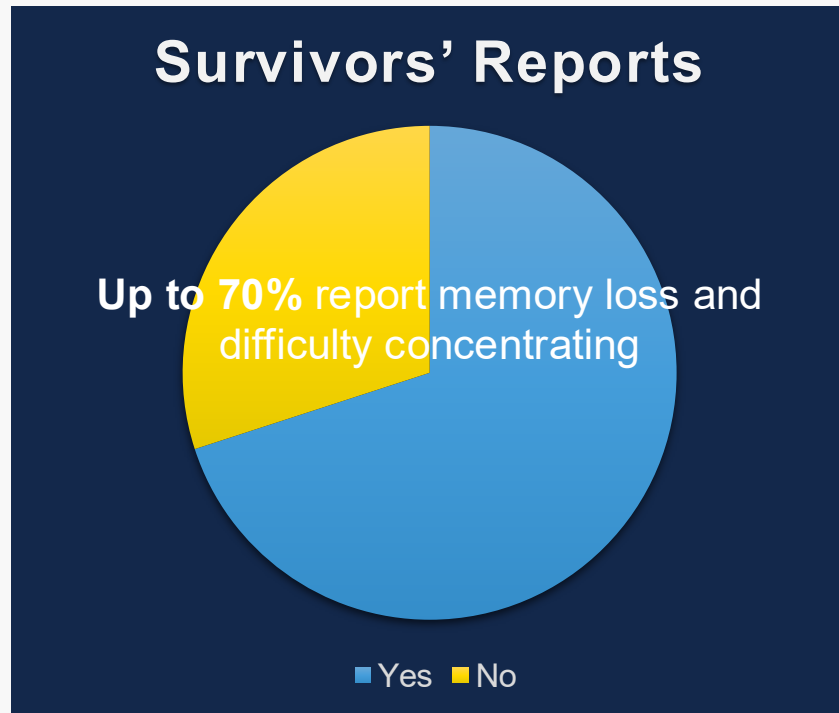
Course of CRCI Following Treatment

- Subjective cognition was evaluated pre-, post-, and 6-months following chemotherapy for breast cancer
- Initial differences, followed by declines and then improvements were observed

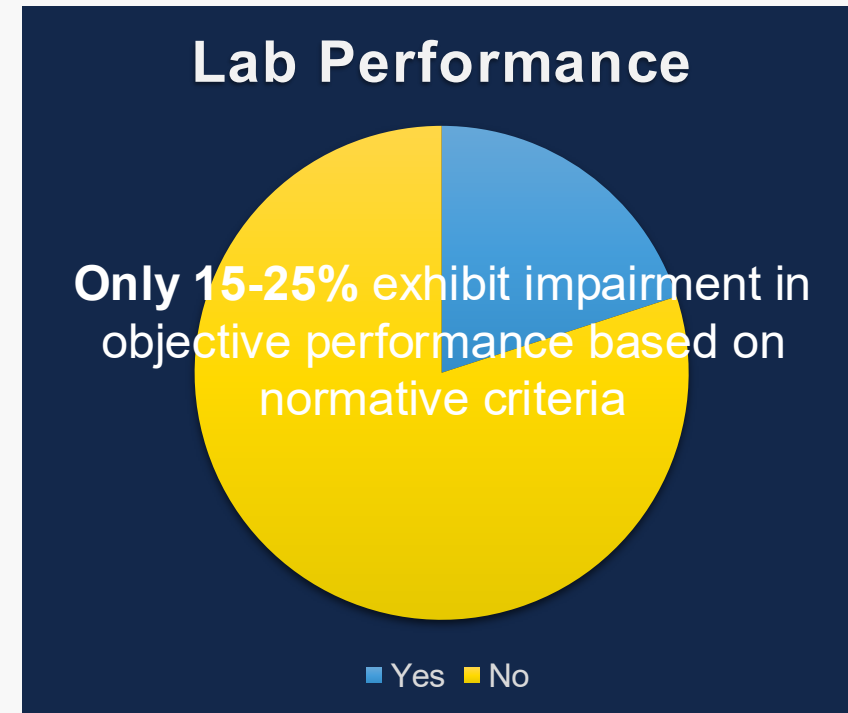


Janelains MC, Heckler CE, Peppone LJ, Kamen C, Mustian KM, Mohile SG, Magnuson A, Kleckner IR, Guido JJ, Young KL, Conlin AK, Weiselberg LR, Mitchell JW, Ambrosone CA, Ahles TA, Morrow GR. Cognitive Complaints in Survivors of Breast Cancer After Chemotherapy Compared With Age-Matched Controls: An Analysis From a Nationwide, Multicenter, Prospective Longitudinal Study. J Clin Oncol. 2017 Feb 10;35(5):506-514. doi: 10.1200/JCO.2016.68.5826. Epub 2016 Dec 28. PMID: PMC5455314.

Subjective vs. Objective Cognition



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Why this difference?

- **Sensitivity of Cognitive Assessments**

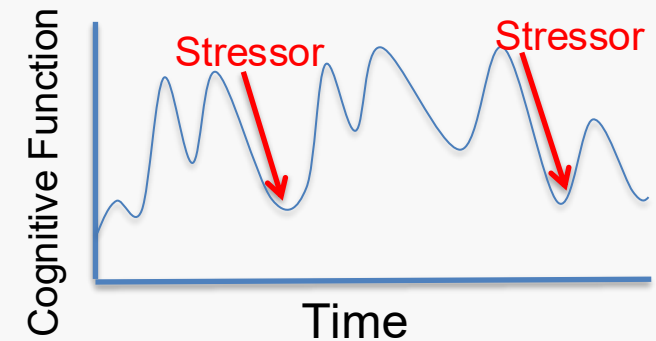
- Most neuropsychological instruments were designed to evaluate dementia or brain injuries
- Performance is assessed under optimal conditions

Subjective Measures May be Sensitive to Peak or End Effects

- Peak effects – reporting times when performance was the worst
- End effects – reporting most recent experiences

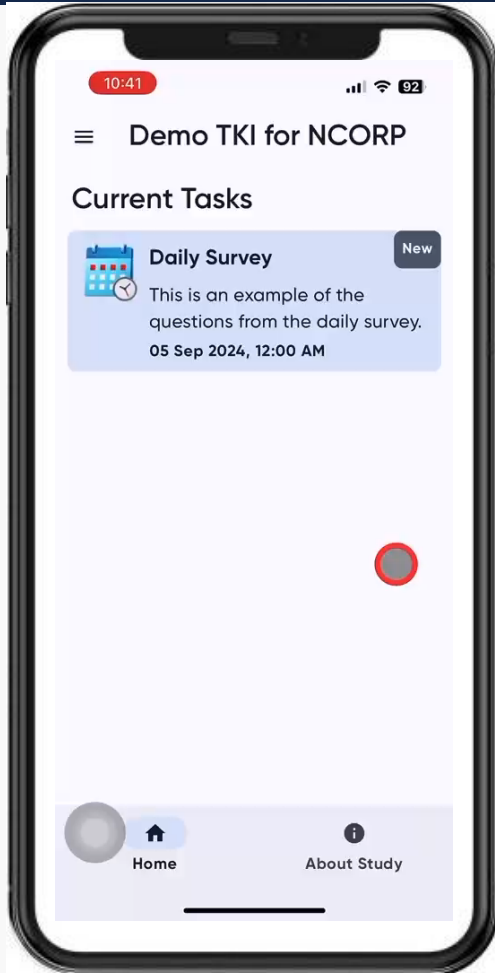
Using EMA to Assess CRCI

- Ecological Validity
 - Real-world environment and experiences
- Momentary
 - Real-time assessment of performance and risk factors

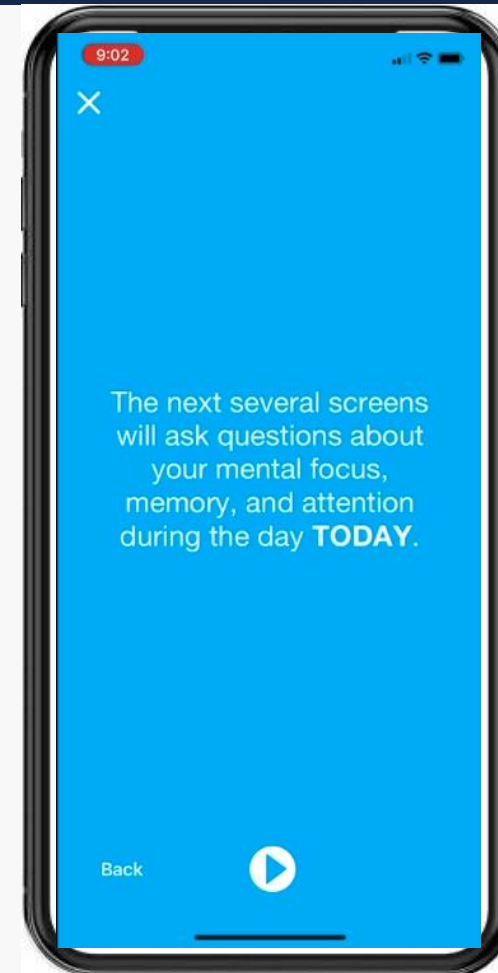


Stone AA, Shiffman S. Ecological Momentary Assessment (EMA) in Behavioral Medicine. *Annals of Behavioral Medicine*. 1994;16(3):199-202.

EMA Cognitive Performance



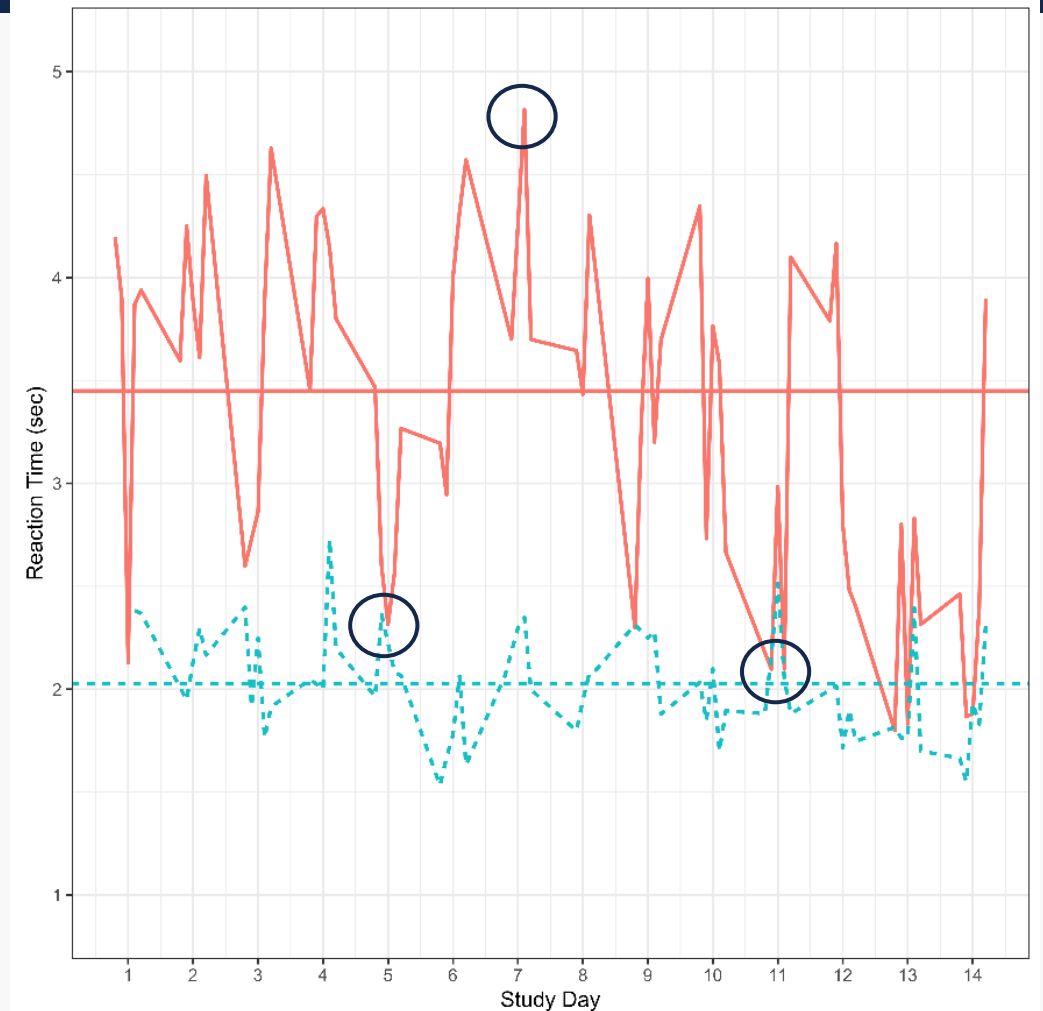
Daily Assessments



End-of-Day Assessment

EMA Cognitive Performance

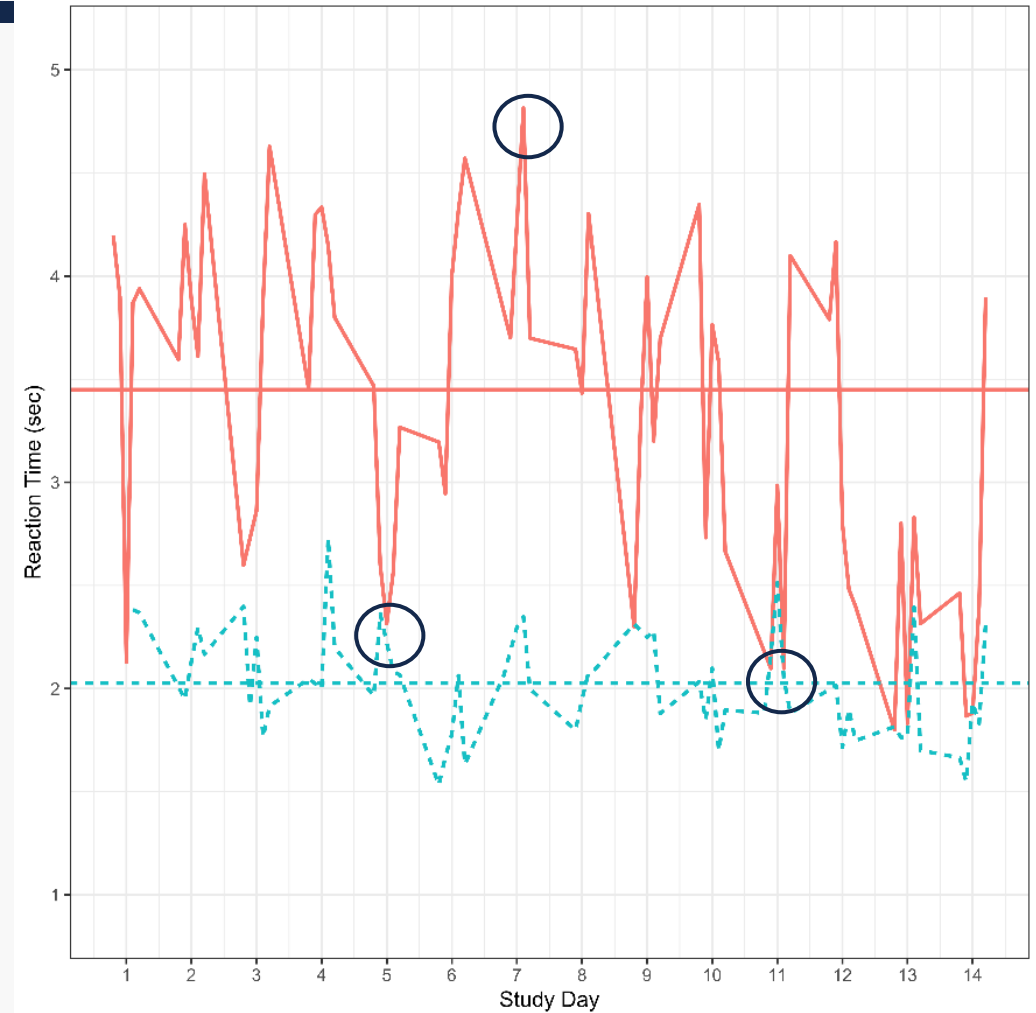
- Between Person
 - Compares differences between persons
 - Who is most vulnerable to CRCI?
- Within Person
 - Compares to other instances for the same persons
 - When are people most vulnerable to CRCI?





Fatigue and Cognitive Performance

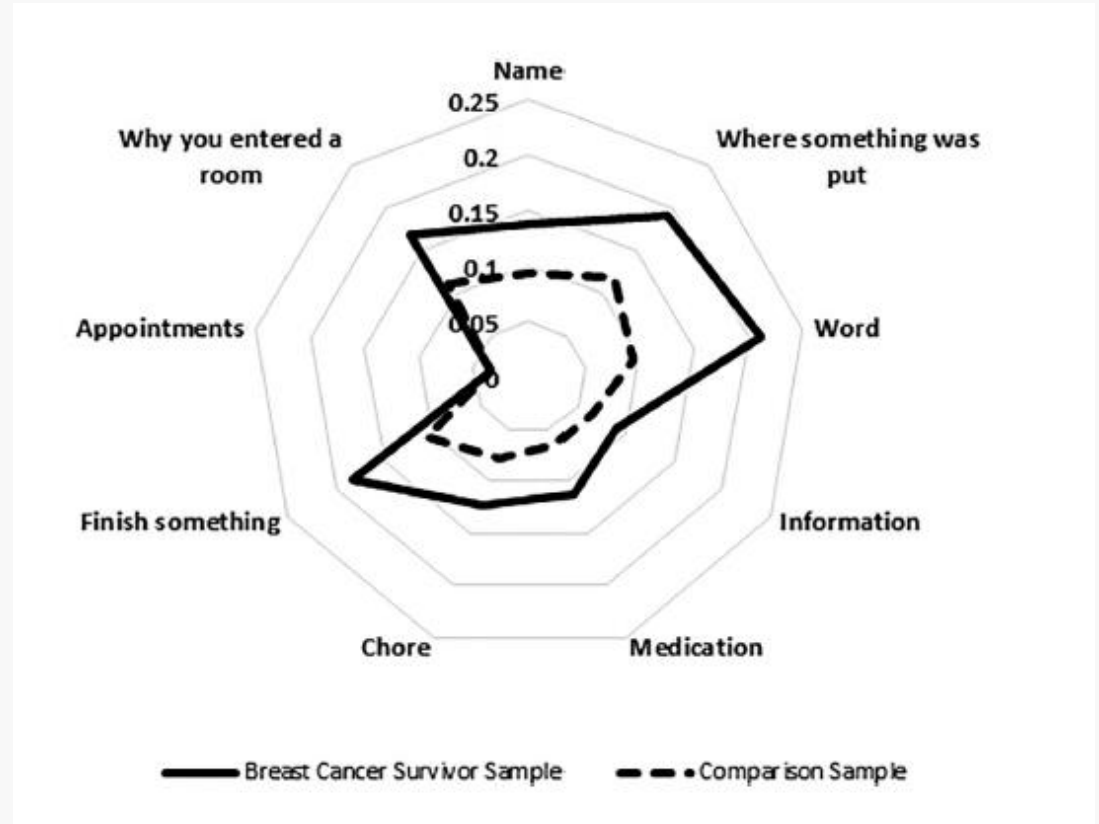
- Cognition did not differ between women who were more fatigued than others
- When a person's fatigue was worse than normal, their processing speed was slower



Differences in Memory Lapses



- Breast cancer survivors reported more memory lapses (e.g., forgetting a name)
- This was associated with poorer quality of life





CRCI Among AYA Survivors



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JOURNAL OF CLINICAL ONCOLOGY COMMENTS AND CONTROVERSIES

Cognition in Adolescent and Young Adults Diagnosed With Cancer: An Understudied Problem

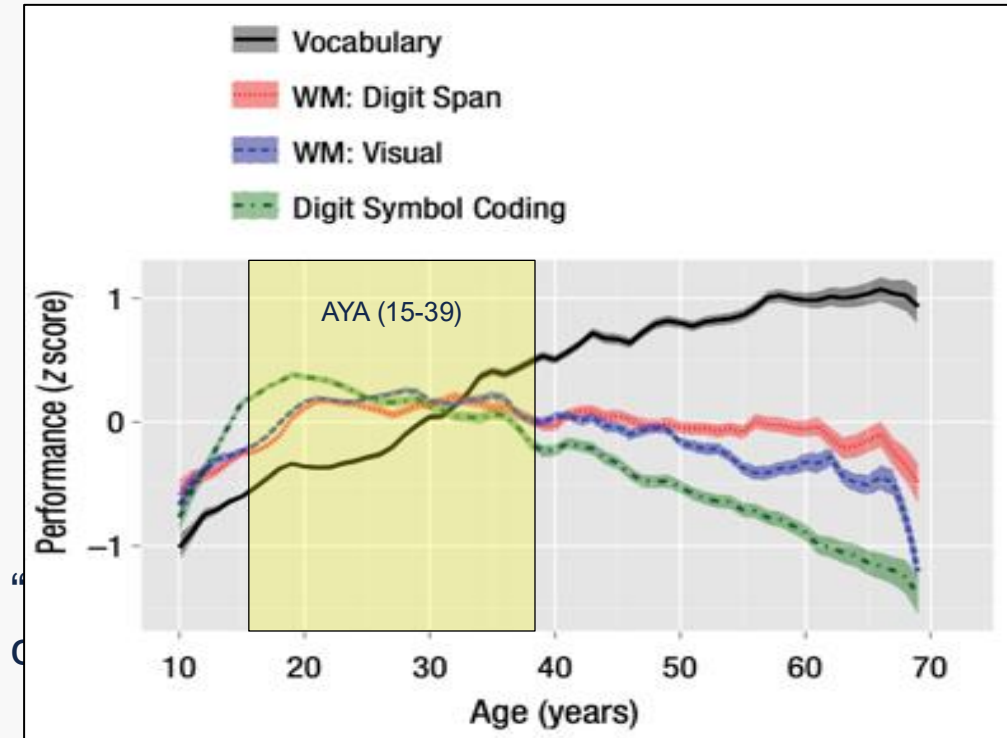
Heather S.L. Jim and Sarah L. Jennewein, *Moffitt Cancer Center, Tampa, FL*
Gwendolyn P. Quinn, *New York University, New York, NY*
Damon R. Reed, *Moffitt Cancer Center, Tampa, FL*
Brent J. Small, *University of South Florida, Tampa, FL*

Review Articles | Special Series: Adolescents and Young Adults with Cancer

Psychological Outcomes in Adolescent and Young Adult Cancer Survivors

Meghan E. McGrady, PhD^{1,2,3} ; Victoria W. Willard, PhD⁴ ; AnnaLynn M. Williams, PhD⁵ ; and Tara M. Brinkman, PhD^{4,6}

DOI <https://doi.org/10.1200/JCO.23.01465>



Peak of cognitive abilities and timing of AYA diagnosis (adapted from Hartshorne JK, Germine LT. When does cognitive functioning peak? The asynchronous rise and fall of different cognitive abilities across the life span. *Psychol Sci.* 2015;26(4):433-43)

Characterizing Cancer-Related Cognitive Impairment Among Adolescent and Young Adult Cancer Survivors: Comparison to Individuals Without Cancer

Brent J. Small^{1,2}  | Damon Reed³  | Danielle Tometich⁴  | Amarilis Nieves-Lopez⁵ | Nathaly Irizarry-Arroyo⁵ | Hannah Decosta⁵ | Laura B. Oswald⁵  | Heather S. L. Jim⁵ 

¹School of Nursing, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA | ²Cancer Prevention and Control Program, UNC Lineberger Comprehensive Cancer Center, Chapel Hill, North Carolina, USA | ³Division of Pediatric Solid Tumors, Memorial Sloan Kettering Cancer Center, New York, New York, USA | ⁴College of Nursing, University of South Florida, Tampa, Florida, USA | ⁵Department of Health Outcomes and Behavior, Moffitt Cancer Center, Tampa, Florida, USA



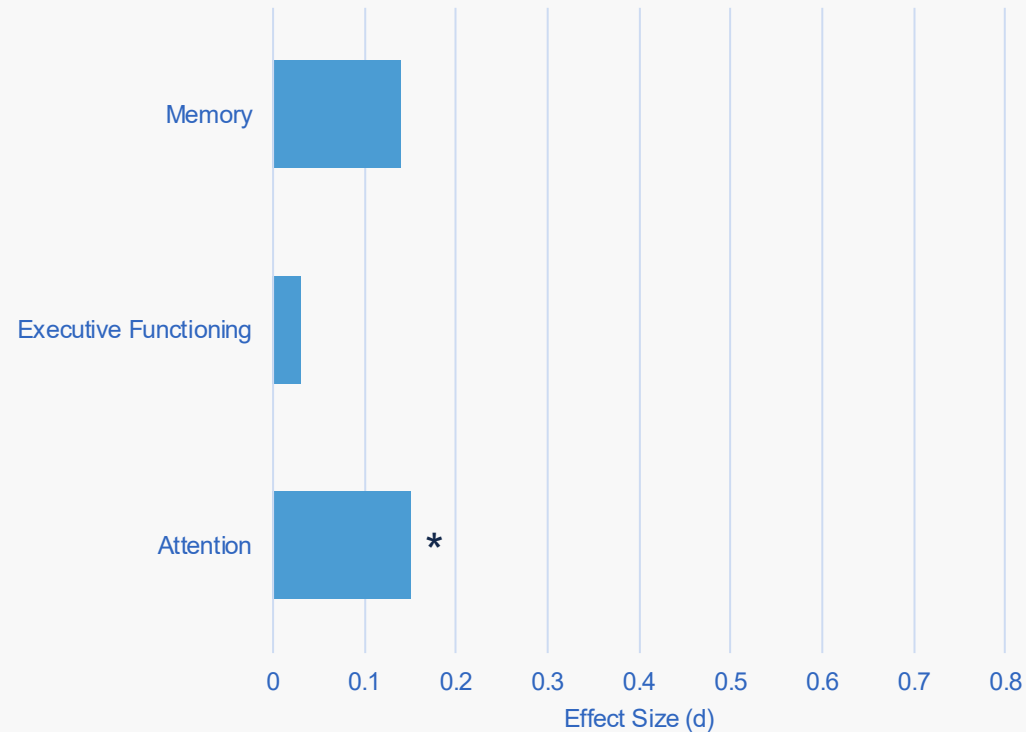
- AYA cancer survivors were identified through clinic databases
- Primary cancer diagnosis was leukemia/lymphoma, testicular, breast
- Participants completed
 - Objective cognitive tests using the Cantab battery
 - Subjective cognition and quality of life using PROMIS scales

	AYA	Non-cancer
n	88	96
Age	34.1 $\pm$ 6.0	28.8 $\pm$ 6.1*
Sex (% Female)	67.8	76.0
Education (% College)	67.0	79.2
Age at dx	30.3 $\pm$ 6.2	
Years since dx	3.8 $\pm$ 3.5	

CRCI Among AYA Survivors

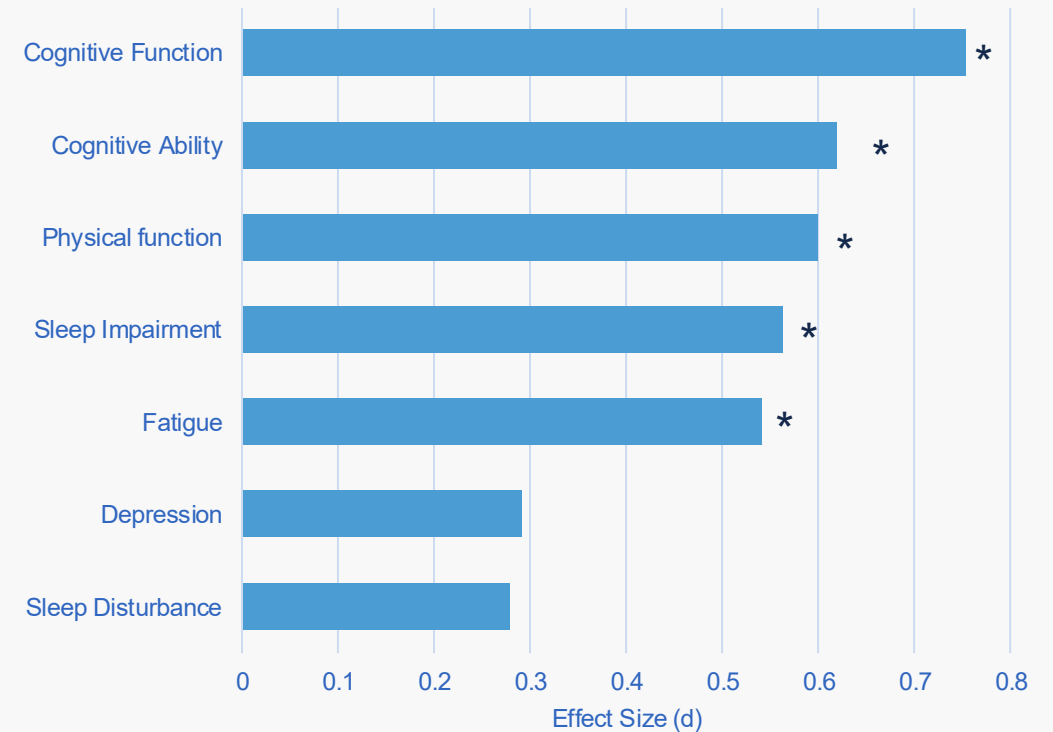
CANTAB Objective Cognitive Functioning

Effect sizes for worse functioning in AYA vs. NC



PROMIS Self-Report Measures

Effect sizes for worse functioning in AYA vs. NC



Impact of Quality of Life on Work Productivity Among Adolescent and Young Adult Cancer Survivors

Brent J. Small, PhD,^{1,2} Damon R. Reed, MD,³ Danielle B. Tometich, PhD,⁴ Amarilis Nieves-Lopez,⁵
Nathaly Irizarry-Arroyo,⁵ Hannah Decosta,⁵ Laura B. Oswald, PhD,⁵ and Heather S. L. Jim, PhD⁵



Employment Among AYA Survivors

- AYA survivors are less likely to be employed
- When employed, AYA survivors are more likely earn less
- **Presenteeism**
 - An individual may be at work, but are less productive and this may be due to health

Work Productivity and Activity Impairment Questionnaire: General Health

5) During the past seven days, how much did health problems affect your productivity while you were working?

Think about days you were limited in the amount or kind of work you could do, days you accomplished less than you would like, or days you could not do your work as carefully as usual. If health problems affected your work only a little, choose a low number. Choose a high number if health problems affected your work a great deal.

Consider only how much health problems affected productivity while you were working.

Health problems
had no effect on
my work

0 1 2 3 4 5 6 7 8 9 10

Health problems
completely prevented
me from working

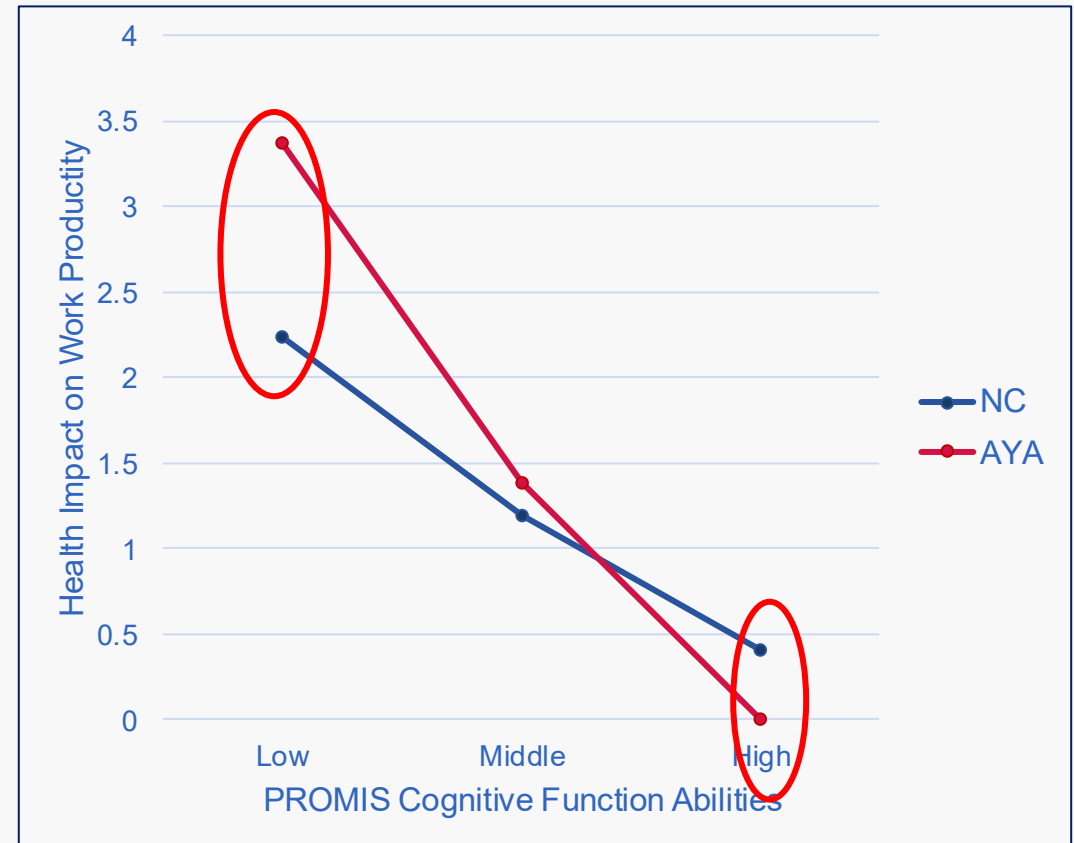
CIRCLE A NUMBER

Impact of Health on Work Productivity

WPAI

Variable	AYA	NC	p
Hours Worked	35.5	36.2	.751
Hours of work missed due to health	2.4	0.5	.018
Health impacting work productivity ^a	2.2	1.1	.003
Health impacting daily activities ^a	2.1	1.1	.008
^a (0=no impact to 10 = complete impairment)			

Cognitive functioning and work productivity





How can we improve cognition?

- Pharmacological Approaches
- Lifestyle (exercise and diet)
- Cognitive Rehabilitation and Memory aids

Pharmacological Approaches

RESEARCH ARTICLE

Cancer medicine
Open Access
WILEY

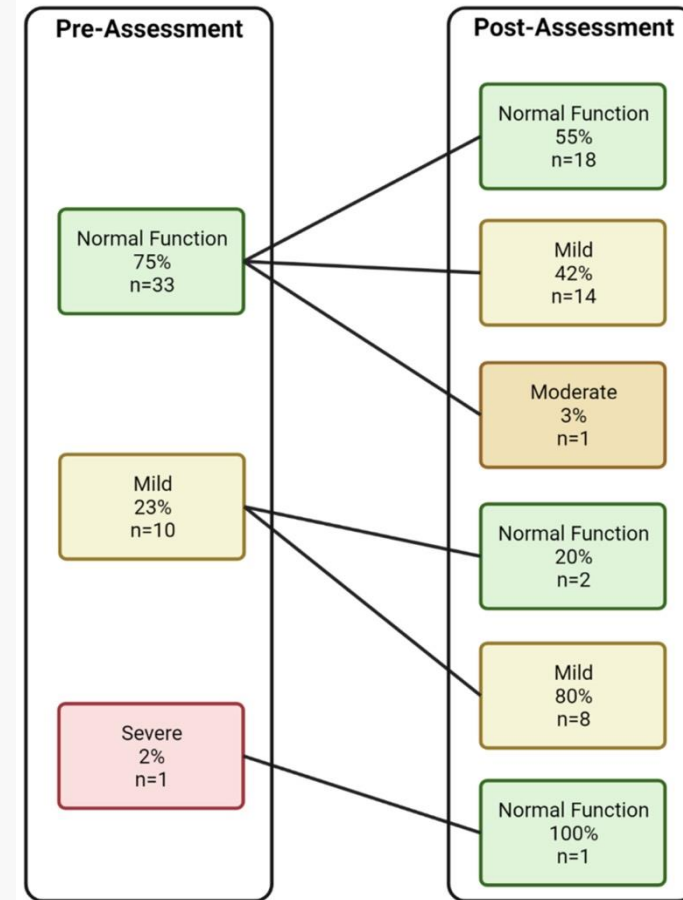
A phase II single-arm trial of memantine for prevention of cognitive decline during chemotherapy in patients with early breast cancer: Feasibility, tolerability, acceptability, and preliminary effects

Zev M. Nakamura^{1,2} | Allison M. Deal² | Eliza M. Park^{1,2,3} | Kate E. Stanton² |
Yesy E. Lopez¹ | Laura J. Quillen¹ | Erin O'Hare Kelly² | Hillary M. Heiling² |
Kirsten A. Nyrop^{2,3} | Emily M. Ray^{2,3} | E. Claire Dees^{2,3} |
Katherine E. Reeder-Hayes^{2,3} | Trevor A. Jolly^{2,3} | Lisa A. Carey^{2,3} |
Yara Abdou^{2,3} | Oludamilola A. Olajide⁴ | Julia K. Rauch⁴ | Ranjit Joseph⁴ |
Anureet Copeland⁴ | Megan A. McNamara⁴ | Tim A. Ahles⁵ | Hyman B. Muss^{2,3}

- Memantine is prescription medication used to treat moderate to severe cognitive loss in Alzheimer's disease
- Memantine is recommended for individuals undergoing brain irradiation and may benefit CRCI

Study Results

- Evaluated preliminary effects of memantine to prevent cognitive decline during chemotherapy for breast cancer
- Sixty-six percent self-reported stable or improved cognitive symptoms prior to and 4 weeks after completing chemotherapy.



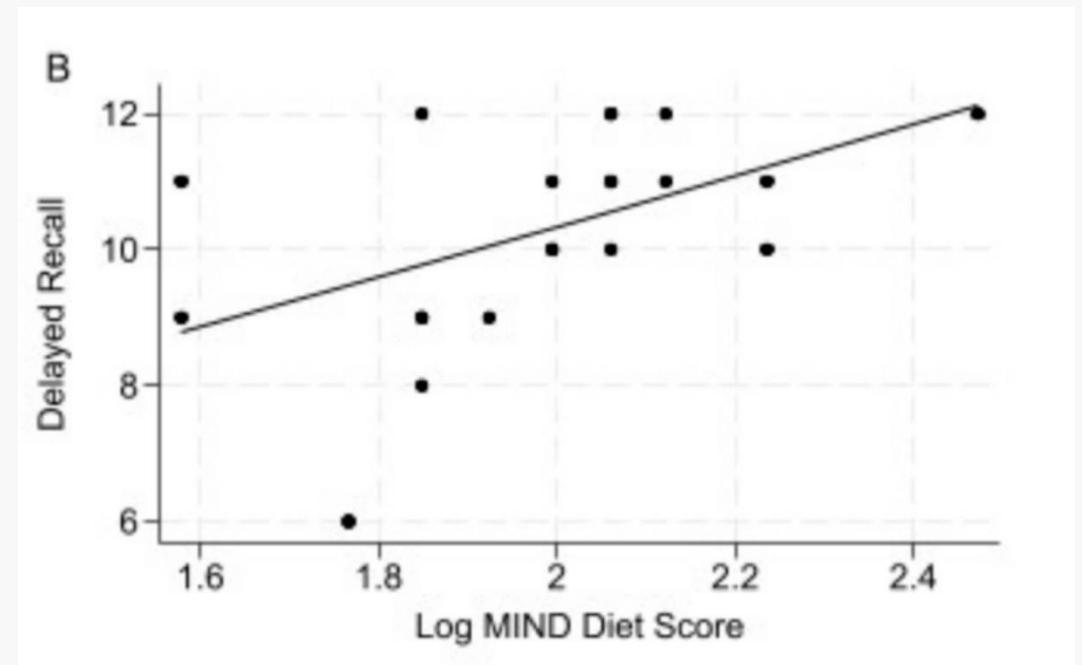
Dietary Interventions

- Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) Diet
 - Emphasizes consumption of high-nutrient, plant-based foods such as green leafy vegetables, nuts, berries, fish, and olive oil while limiting intake of foods high in saturated fat, pre-processed snacks, sugar, red and processed meat



MIND Diet – Preliminary Evidence

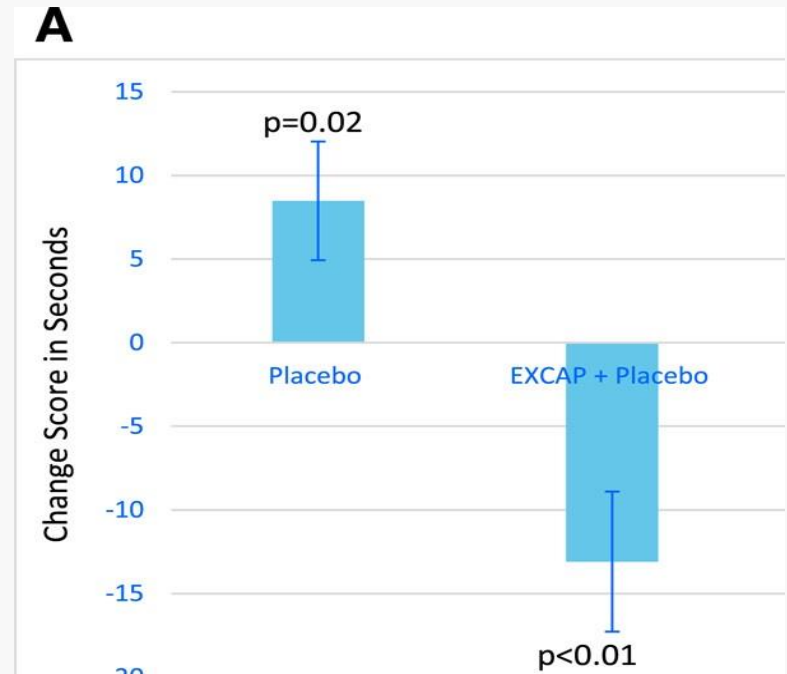
- MIND diet was evaluated with a food frequency questionnaire
- Cognition was measured with several objective measures.
- 30 postmenopausal breast cancer survivors



Winschel TR, Weinhold K, Schnell PM, Gorka S, Lustberg M, Aase D, Melink Z, Kopec R, Picino C, Li Z, Oppong B, Williams N, Orchard TS. The association of the MIND diet and its components with cognitive function in postmenopausal breast cancer survivors. Support Care Cancer. 2025 Jul 31;33(8):736. doi: 10.1007/s00520-025-09789-9. PMID: 40745246; PMCID: PMC12313734.

Exercise and CRCI

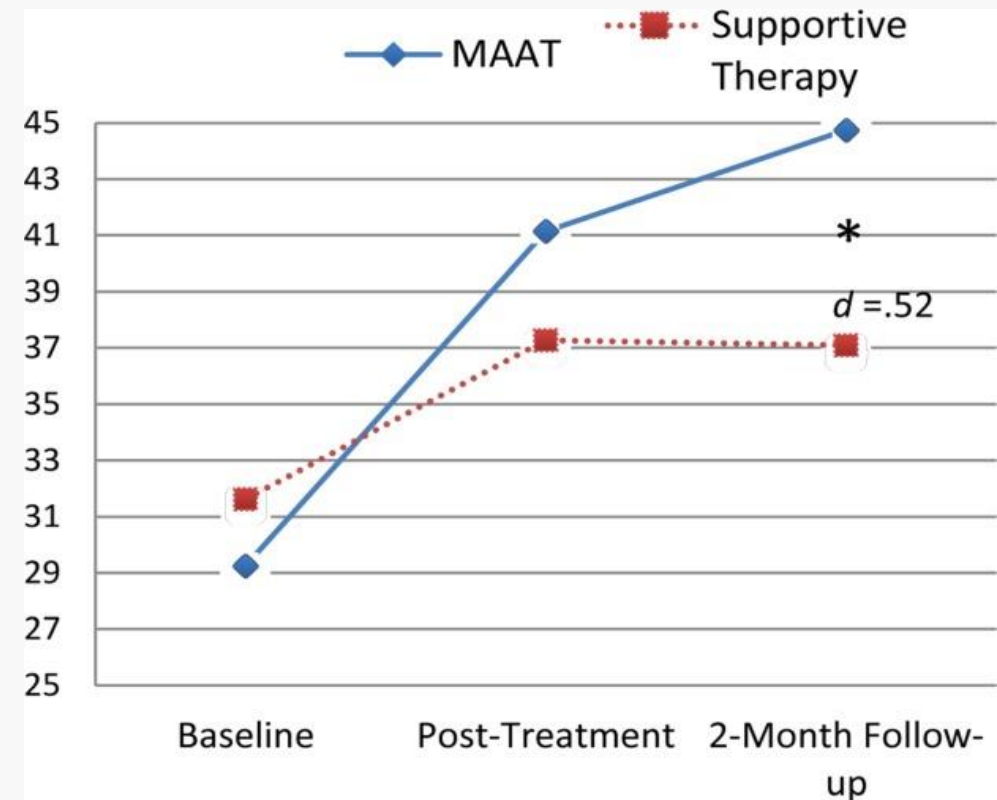
- Patients with cancer receiving chemotherapy were randomized to 6 weeks of exercise or a placebo.
- Exercise was a home-based, low to moderate-intensity, progressive walking and resistance exercise prescription.
- Placebo group cognition worsened, but the exercise group improved.



Janelains MC, Alieldin RA, Holler T, et al. *Phase 2 trial of exercise and low-dose ibuprofen for cancer-related cognitive impairment in patients receiving chemotherapy.* *Cancer.* 2026;e70323. doi:[10.1002/cncr.70323](https://doi.org/10.1002/cncr.70323)

Rehabilitation Approaches and CRCI

- Memory and Adaption Training (MAAT) consists of 8 weekly visits and includes
 - Education
 - Self-awareness
 - Stress management
 - Cognitive compensation
- Results showed greater improvement in the MAAT group



Ferguson RJ, Sigmon ST, Pritchard AJ, LaBrie SL, Goetze RE, Fink CM, Garrett AM. A randomized trial of videoconference-delivered cognitive behavioral therapy for survivors of breast cancer with self-reported cognitive dysfunction. *Cancer*. 2016 Jun 1;122(11):1782-91. doi: 10.1002/cncr.29891. Epub 2016 May 2. PMID: 27135464.



Conclusions

- CRCI is common among cancer survivors and can be disruptive to their daily lives.
- CRCI is highly variable and may differ between people, as well as times during the day and across the week.
- A number of potential interventions to address CRCI are available, but more information is needed.



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Questions

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