



# Purpose in life predicts brain health

Ajay Kumar Nair<sup>1</sup>, Nagesh Adluru<sup>2,3</sup>, Anna J. Finley<sup>1</sup>,  
Andrew L. Alexander<sup>2,4</sup>, Richard J. Davidson<sup>5</sup>, Carol D. Ryff<sup>1</sup>, Stacey M. Schaefer<sup>1</sup>  
<sup>1</sup> Institute on Aging, <sup>2</sup> Waisman Center, <sup>3</sup> Department of Radiology, <sup>4</sup> Department of Medical Physics, <sup>5</sup> Center for Healthy Minds  
University of Wisconsin-Madison

# MIDUS

## BACKGROUND

Feeling more purpose in life may confer protective effects on brain health as suggested by several studies:

- better cognitive function<sup>1</sup>
- reduced risk of mild cognitive impairment and Alzheimer's disease (AD)<sup>2</sup>
- weakened association between AD pathology (post-mortem) and cognitive decline<sup>3</sup>
- reduced all-cause mortality.<sup>4</sup>

Assessments of the effect of purpose in life on brain health are limited in living humans.

We address this gap using multiple diffusion imaging metrics in the whole brain and in the hippocampus, a region that undergoes age-associated changes. This approach aims to help improve confidence in interpreting the effects of purpose in life on brain health.

## METHODS

- Data from the Midlife in the United States (MIDUS3; <https://midus.wisc.edu>) neuroscience project third wave (2012-2016).  
Total = 138 participants, aged 48-95 years, 80 females, and 37 Black, Indigenous, and People of Color (BIPOC)
- Purpose in Life seven-item scale<sup>5</sup> was used.
- Microstructural indices were derived using
  1. diffusion kurtosis imaging
  2. diffusion tensor imaging
  3. white matter tract integrity<sup>6</sup> metrics
  4. neurite orientation dispersion and density imaging.<sup>7</sup>
- Examined associations between purpose in life and white matter microstructure metrics.<sup>8</sup>

## PURPOSE IN LIFE AND BRAIN HEALTH

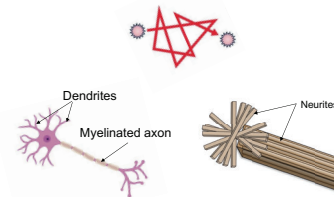
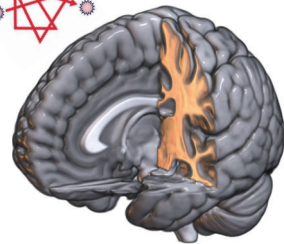
### Purpose in life: Having goals and a sense of directness in life



- ✓ I live life one day at a time and don't really think about the future.
- ✓ I have a sense of direction and purpose in life.
- ✓ I don't have a good sense of what it is I'm trying to accomplish in life.
- ✓ My daily activities often seem trivial and unimportant to me.
- ✓ I enjoy making plans for the future and working to make them a reality.
- ✓ Some people wander aimlessly through life, but I am not one of them.
- ✓ I sometimes feel as if I've done all there is to do in life.

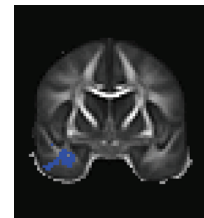
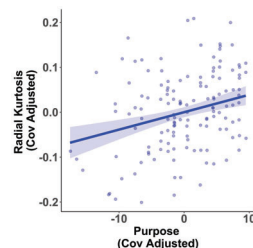
### Can purpose in life predict brain health?

1. We checked indices of brain health by looking at the diffusion of **water molecules** in brain tissue using **diffusion MRI**



2. We checked many models of brain **"microstructure"** – to find information about the tissues at the microscopic level

3. Then we assessed the relationship of purpose in life with indices of brain health and found **converging evidence** from the multiple models.



## FINDINGS

- Higher purpose was associated with increased higher radial kurtosis in the whole brain analyses; and higher mean and radial kurtosis, higher neurite density, and axonal water fraction in the right hippocampus.

## DISCUSSION

- Higher radial kurtosis is associated with reduced risk of cognitive decline.<sup>9</sup>
- We find converging evidence that higher purpose is associated with better preserved hippocampal microstructure<sup>10</sup> which is relevant as the hippocampus is known to be vulnerable to neurodegenerative disorders.
- Within the hippocampus, some of the relationships between purpose and diffusion measures were affected by race, sex and age. Gaining a better understanding of how the effects of purpose in life on brain health differ by sex, race, and age are future directions of research.

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