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INTRODUCTION

It is understood that physical activity has positive effects on the body, but research shows that there are also positive effects on memory. Support has grown of the idea that physical activity such as walking or running can prevent the decline of cognitive function with age. In this literature review, we analyzed the role of exercise with the growth of the hippocampus in the brain. Our goal was to determine whether positive growth was found compared to sedentary individuals.

OBJECTIVES

This literature review examined if physical activity had an effect on the hippocampus. Two case studies were reviewed to assess the impact that exercise has on neurological functions and the prevention of diseases.

METHODS

- Google Scholar and the Cleveland State Michael Schwartz library databases were used to identify relevant case studies.
- Key search terms included " exercise, hippocampus, brain function, prevention, and neurology".
- We narrowed our searches down to two case studies because they both obtained a strong correlation between physical activity and positive effects on the hippocampus.

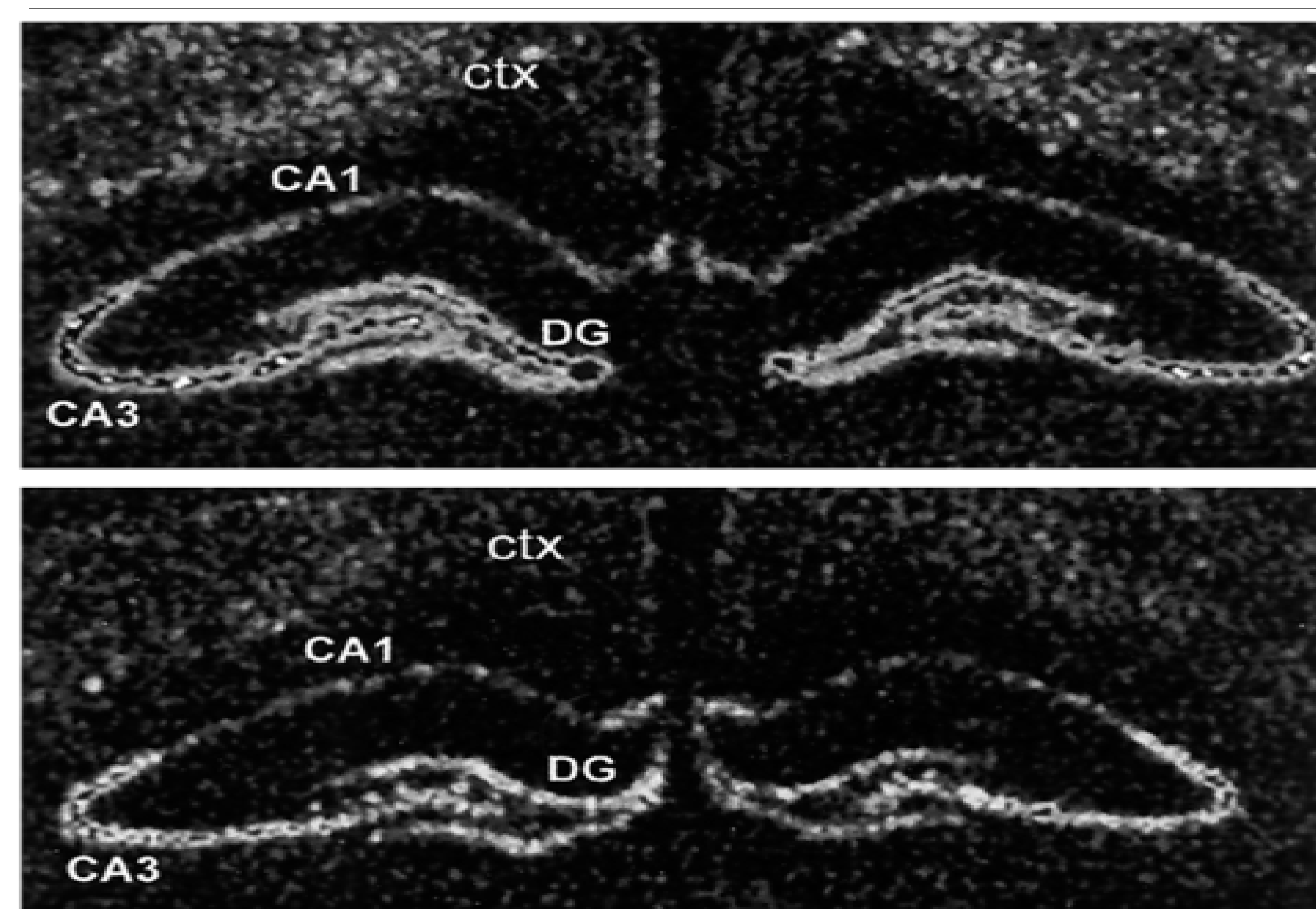


Figure 1. The top image shows an increased level of mRNA in the dentate gyrus after voluntary running for six days while the bottom figure shows lower levels of mRNA in sedentary individuals. (Cotman)

RESULTS

•Case study 1 was done with voluntary wheel running of rats. This was to simulate human choice in exercise as the rats choose when, how long, and for how far they would run. The greatest change in the brain from this exercise was in the hippocampus which showed upregulation in neurotrophic factors. Certain degenerative diseases like Alzheimer's attack the hippocampus giving motivation to strengthen this part of the brain as much as possible. (Cotman)

•Our review of case study 1 showed a 20% increase in mRNA (messenger RNA) in the hippocampus after 2-7 days. MRNA is extremely important in the process of protein synthesis. These increases in mRNA lasted up to 6 weeks after the volunteer running displaying a relatively long-term effect of exercise. (Cotman)

- Case study 2 examined the correlation with exercise and the brain. In this study, 120 participants with a ages ranging from 60-71 completed a computerized spatial memory task at baseline MRI data, after 6 months, and again after completion of the intervention. 60 were randomly assigned to aerobic fitness on a treadmill, while the other 60 were assigned to stretching. (Erickson)
- In our review, case study 2 showed the aerobic exercise group achieve increased brain-derived neurotrophic factor levels in the hippocampus after the intervention. The correlation between improvement in memory and hippocampal volume reached significance for left ($r = 0.23$; $P < 0.05$) and right ($r = 0.29$; $P < 0.02$) hemispheres. (Erickson)

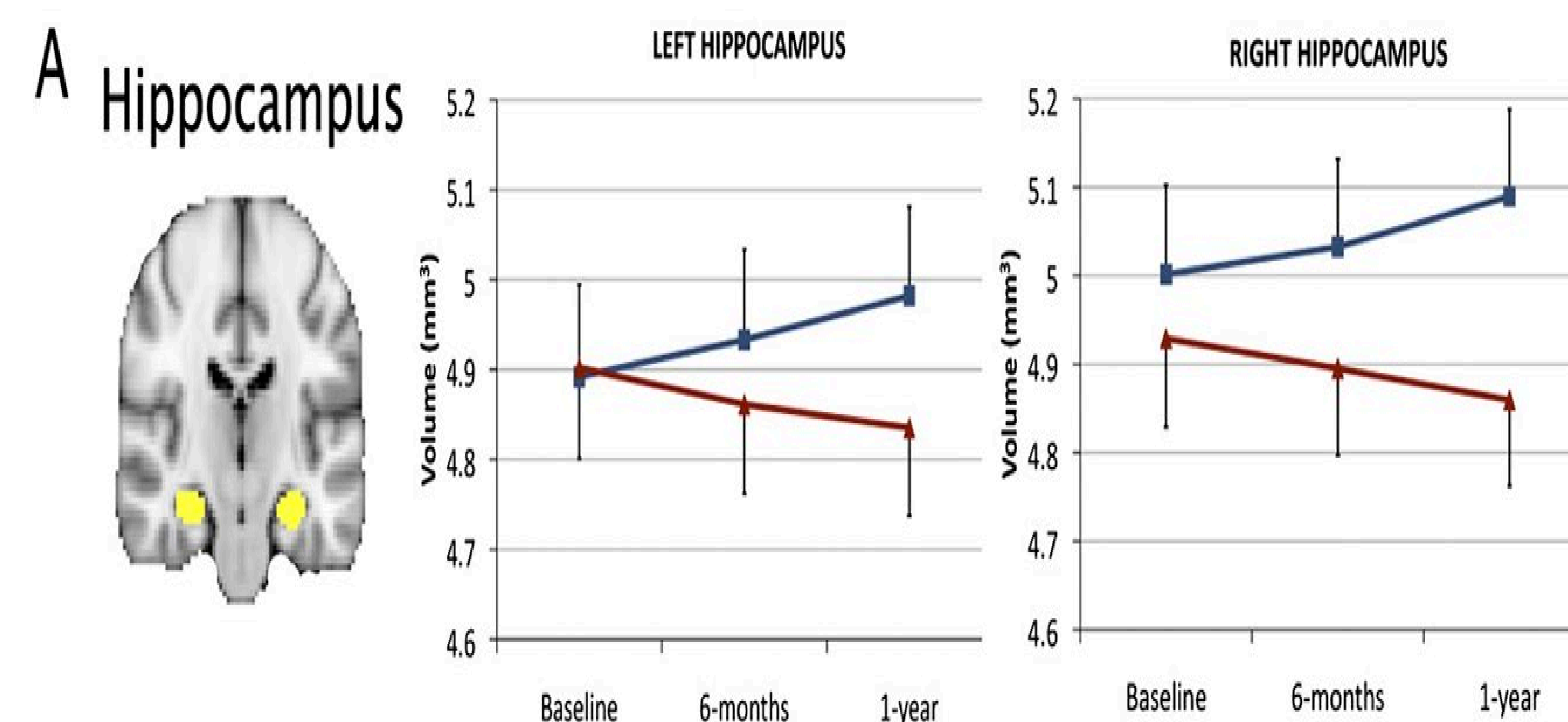


Figure 2. The aerobic exercise group demonstrated an increase in volume of the left and right hippocampus by 2.12% and 1.97%, respectively, over the 1-y period, whereas the stretching control group displayed a 1.40% and 1.43% decline over this same interval. (Erickson)

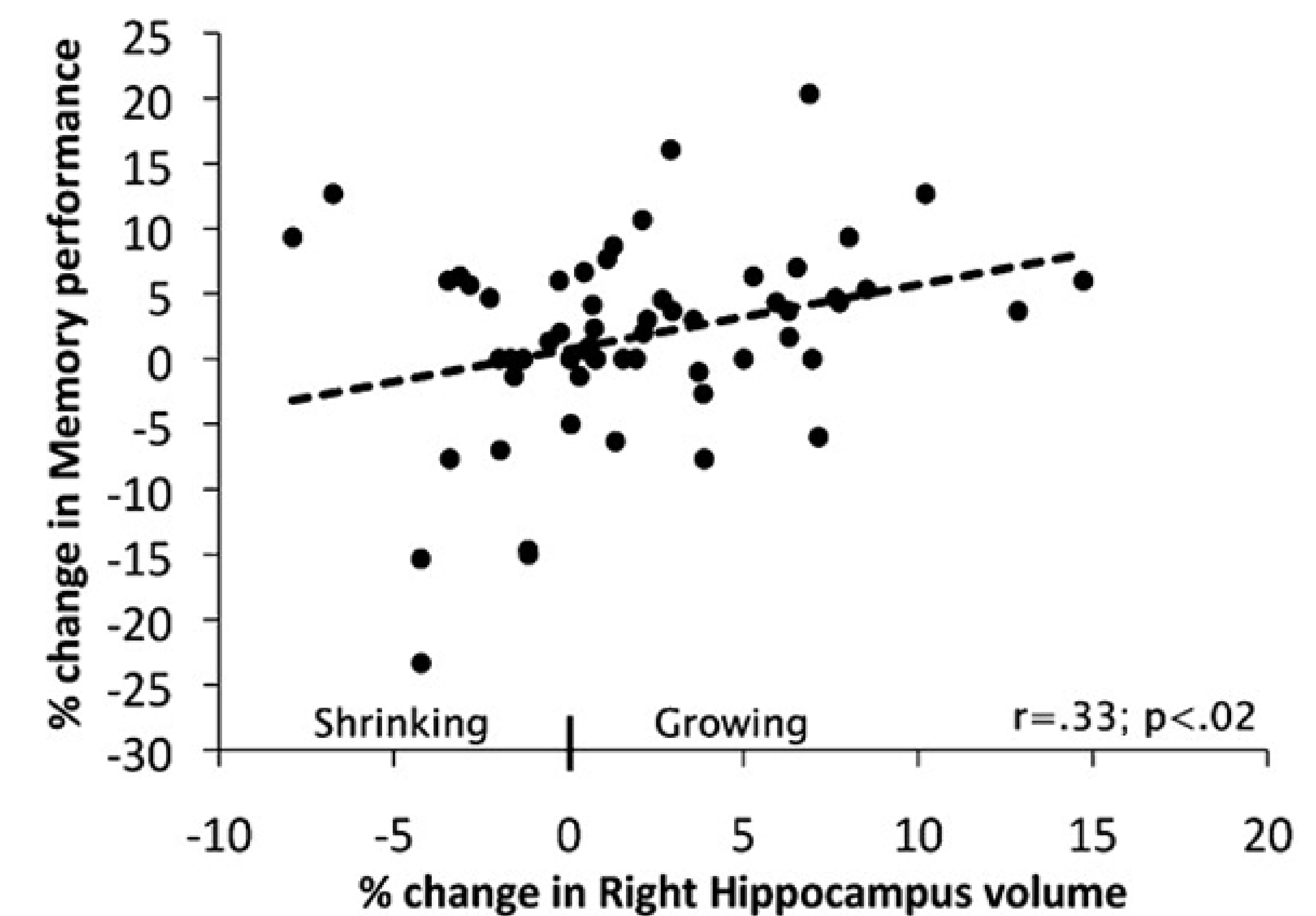


Figure 3. A positive correlation with an r value of .33 between right Hippocampus volume and memory performance. (Erickson)

CONCLUSIONS

There is certainly evidence that shows a positive effect of exercise on the hippocampus and thus cognitive function. The brain shows decreased function with age, so preventing this with exercise can be extremely beneficial. This poster concludes that exercise has a positive correlation with brain growth and neurological function.

FUTURE WORK

We would like to see a longitudinal study which compares the hippocampus size of a cohort of older individuals that exercised frequently to a cohort of individuals of the same age that did not exercise frequently. We would hope to see that the individuals that exercised daily would have a greater hippocampus volume than the individuals that did exercise frequently.

References

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