

Online Journal Club-Article Review

Background/Overview	
Article Citation	Cruickshank TM, Thompson JA, Dominguez JF, Reyes AP, Bynevelt M, Georgiou-Karistianis N, Barker RA, Ziman MR. The effect of multidisciplinary rehabilitation on brain structure and cognition in Huntington’s disease: an exploratory study. <i>Brain and Behavior</i> . 2015; 5(2): e00312. doi: 10.1002/brb3.312.
Study Objective/Purpose (hypothesis)	Objective: To evaluate the utility of multidisciplinary rehabilitation on disease-related brain changes and cognitive function in manifest Huntington’s disease (HD). Hypothesis: Multidisciplinary rehabilitation will increase grey matter volume in the dorsolateral prefrontal cortex (DLPFC), striatum, and hippocampus structures that are known to be functionally relevant to cognitive function.
Methods	
Study Design	9-month exploratory study.
Target Population	Adults (>18yo) with manifest HD
Interventions (if applicable):	Multidisciplinary Rehabilitation Intervention over 9 months: -Clinical Exercise Program: 1x/wk for 1 hour supervised aerobic and resistance exercises -Home-based Exercise Program: 3x/wk for 1 hour self-directed muscle strengthening and fine-motor exercises -Occupational Therapy: 1x/2wk for paper and pencil, verbal planning, memory, and problem solving exercises designed to enhance cognition and executive function.
Outcome Measures	Collected at baseline & 9 months Structural MRI: grey matter volume Cognitive Performance: Color Word Interference Test (CWIT), Trail Making Test, Symbol Digit Modalities Test (SDMT), Hopkins Verbal Learning Test-Revised (HVLt-R)
Results	
Summary of Primary and Secondary Outcomes: note results that were statistically significant	<ol style="list-style-type: none"> 1) Significant grey matter volumetric increases in the DLPFC bilaterally and in the tail of the right caudate nucleus following multidisciplinary rehabilitation. 2) Significant improvements on the delayed recall component of the HVLt-R.

	3) Increased grey matter volume in the DLPFC (bilaterally) was found to be significantly associated with the preserved performance on the delayed recall component of the HVLT-R.
Authors' Conclusions	
Authors' Conclusion	<p>Although limited by a lack of controls and a small sample size, the authors conclude that these findings provide the first evidence that multidisciplinary rehabilitation is effective in increasing regional grey matter volume in cortical and subcortical brain regions in HD. Results also show that multidisciplinary rehabilitation is capable of improving some aspects of cognition over a 9-month period.</p> <p>These findings collectively indicate that neuroplasticity may still be present in HD and amenable to multidisciplinary rehabilitation.</p>
Reviewer's Discussion and Conclusion	
Study Strengths	<p>-This study addresses an understudied population where declines in mobility and cognition are common over time.</p> <p>-Over nine months, a decline in some of the cognitive tasks could have realistically occurred in a control group (if present), indicating that stable findings in the SDMT or other tests would imply a BENEFIT of the rehab.</p>
Study Limitations and Potential for Bias	<p>-Small sample size (n=15) limits generalizability of these results</p> <p>-Lack of control group</p> <p>-Participants remained on medication throughout the study</p> <p>-ROIs were chosen based on studies of episodic memory performance; perhaps other regions may have shown greater improvement given the variety of cognitive tests administered covered other domains outside of episodic memory</p> <p>-It is possible that the OT activities may have been the only necessary intervention for achieving pencil/paper changes shown by these 15 participants and may be separate from a truly "multidisciplinary effect". An independent component analysis or even regression analysis to tease out what exactly is happening would have been helpful.</p>
<p>Applicability:</p> <ul style="list-style-type: none"> • Types of patients (dx) that results apply to • Types of settings or patient acuity that the results apply to • Can interventions be reproduced? Can 	<ul style="list-style-type: none"> • Individuals with manifest HD • Outpatient PT/OT and Home-based therapy • The mixture of outpatient and home-based therapy lends this program to reproduction; however

<p>results be applied to other pt populations?</p>	<p>1x/wk for 9 months would likely surpass allowable therapy visits for most insurance plans in the US. Thus, the program would likely require modifications.</p> <ul style="list-style-type: none"> • This program could be applied to other populations who would benefit from aerobic and cognitive training (i.e. dementia, Parkinson’s disease, brain injury, multiple sclerosis, etc).
<p>How will study results impact PT management of this patient population?; List suggestions for how to implement changes in your clinic/department to integrate study findings into patient care</p>	<ul style="list-style-type: none"> • This article supports multidisciplinary care for individuals with neurodegenerative diseases, including HD with elements of physical activity and cognitive training. • A mixture of supervised outpatient therapy and self-directed home-exercises can increase the frequency of exercise and training for individuals with HD. Involvement of the caregiver and goal-setting may increase the compliance rate with at-home training (See Khalil et al, 2012; PMID: 21960468 for details) of individuals with HD. • Physical and Occupational Therapists for individuals with Huntington’s disease should consider maintenance and/or improvement over time as a goal and benefit of therapy as the typical course would include declines.