

**A critical appraisal of “Can resistance training impact MRI  
outcomes in relapsing-remitting multiple sclerosis”**

**By**

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## **Abstract**

After seeing a patient get improve her multiple sclerosis symptoms, I researched the effects of exercise on managing the symptoms of multiple sclerosis. Using Pubmed, the article “Can resistance training impact MRI outcomes in relapsing-remitting multiple sclerosis” was selected to answer that question. The cross-over study looks at the effects of progressive resistance training on cortical thickness in the brain, muscle strength, functional capacity and their disability status. The authors do well at describing their methods, discussing their findings and using sources from credible journals. The article answers my research question and makes a good argument for using progressive resistance training in the treatment of multiple sclerosis. The data presented in the tables can be hard to interpret. Overall, this article seems to be reliable and based off a well thought out study design. The intervention seems effective and good to include in clinical practice.

## **Key words**

Multiple Sclerosis, Progressive Resistance Training, Critical Appraisal

## **Introduction**

Multiple sclerosis (MS) is an autoimmune disease that is estimated to affect nearly one million people in the United States alone. The main treatments used with MS include immunosuppressants and physical therapy. After seeing a physical therapist use exercise to help a patient who had MS I wanted to research the question: How effective is exercise in managing the symptoms of MS?

## **Methods**

I conducted a database search with Pubmed due to how comprehensive it is and the standards it uses for determining which journals will be listed. I searched using the key words “multiple sclerosis progression AND exercise treatment” to get 107 hits. After filtering for full text, peer reviewed and English language only and excluding any surveys, meta-analysis, or animal studies I got 9 hits. These criteria were used to get primary sources that focused on human treatment rather than on secondary sources.

The study that best fit my clinical question was: **Can resistance training impact MRI outcomes in relapsing-remitting multiple sclerosis?** It is a recent study that was published in 2018 written with Tue Kjolhede and Susanne Siemonsen. Kjolhede has published at least 10 articles on MS. The study was conducted in Denmark and was published in the Multiple Sclerosis Journal. I chose this article because it looked at multiple markers of MS such as cortical thickness, muscle functionality, and disability status. This study showed that progressive resistance training (PRT) should be used to treat all those markers except disability status. Knowing the improvements offered by PRT, current PTs can incorporate PRT into their treatment plans. It can also be used as encouragement for patients who have MS by showing

them there is hope for improvement of their symptoms. This was the only one I saw that talked about brain lesion size, which is an important thing to monitor while looking at the progression of MS. Overall, it felt like a more comprehensive study than some of the others I saw.

## **Results**

### Summary of the study

Multiple Sclerosis (MS) causes the brain to degenerate with exercise being a fundamental part of rehabilitation. This study looks at the effects of progressive resistance training (PRT) on the effects of MS by looking at both brain lesion size and clinical measures. Patients had training twice a week with four lower body and two upper body exercises each time. They measured brain lesion size with an MRI, disease severity, muscle strength and functional capacity. The MS functional composite score improved; most of the other measures didn't have a significant change. Despite this there were certain areas of the brain that had relative cortical thickening, or a decrease in lesion size. They did use the Expanded Disability Status Scale, which has been criticized for not being sensitive to change and may not have properly represented change in the patient's improvement. Overall with improved muscle strength, decreased lesion load there may be a correlation between PRT and a restoration of the brain. However, they admit the study duration and sample size was small so interpretations should be done cautiously.

### Appraisal of the study introduction

The introduction did a good job and introducing MS and why looking at MRIs could help determine how exercise slowed the brain degeneration. I also appreciated how it talked about the effects of exercise on different aspects such as cognition, mood, etc. The article is geared toward people who are

already familiar with MS. They don't talk about the relapsing-remitting part of MS and how relapsing-remitting is important to this study or why they included that in the title.

At the end of the introduction, there was no specific conclusion. However, the introduction does support that exercise decreases brain deterioration in patients with MS, but there are no studies that use an MRI to detect the effects of exercise in patients with MS.

### Appraisal of the study methods

Kjohlhede et al. used a crossover study design. They had a waitlist group they used as control, but after 24 weeks, which is the length of the intervention, the waitlist group undergoes the same program. The treatment group was treated from the beginning but from week 25-48 they didn't receive an intervention so they could look at the post-experiment effects as well as the immediate effects of PRT. The allocation and evaluation were done by a blinded assessor which helps eliminate bias. Overall the study is very replicable. They didn't give all the details of the experiment design in this paper, but they do reference the paper where it is explained, and it goes into enough detail for anyone to repeat this experiment if necessary. The functional measures are common measures which could be used clinically to help track the progress of patients.

One problem with the study methods is that the sample size was very small with 35 recruited participants. In addition, the study doesn't talk about the specificity or reliability of any of the clinical measures they used. They do talk about what they included in the MRI measures to make it more reliable, but they leave the data on the rest of the measurements out.

### Appraisal of the study results

The results seemed to be presented in an organized manner although it was a different order than the presented procedures. I liked the order in the results more because it started with the clinical significance and talked about all the categories that had clinical significance. It then talked about MRI results and lastly treated the disability score. The results did address the research question I inferred from the introduction. However, since there was no clear research question it is unclear if they hit all the points given from their perspective. It mentioned the short term and long-term effects on MRI results, as well as the clinical application of that information.

The placement of the graphs seemed poorly done since the graphs split paragraphs, sometimes by as much as a page. Also, since the control was only the first 24 weeks of the second group, it was hard to understand if the P-values were comparing the first group to the control or weeks 24-48 of the second group to the first 24 weeks. They showed the results for both the control time-period as well as the intervention period on the same line without distinguishing when they were comparing to the P-value.

#### Appraisal of the study discussion

For part of the discussion they just restate the results and mention how the lesion number decreases.

Kjohlhede et al. tie into existing literature where there was literature available. Part of the analysis claimed there wasn't other research about that subject and just discussed their own findings. However, once they got to fitness in general, they used other studies to enhance the discussion. Most of the citations were primary evidence from journals with an impact factor over 2 and had at least 20 issues.

The impact factor and issue number suggest the journals were reputable and well known.

They didn't talk much about the evidence that didn't have significant changes. They do mention how one of the measures, the Expanded Disability Status Scale (EDSS), is not very sensitive to change. They also cite that the non-significant change they found from the EDSS may be clinically significant.

Although it may be clinically significant, there is no statistical significance. To me this seemed a small attempt to bolster their findings, which is surprising since they seem to have enough statistically significant findings to be clinically relevant without trying to add this as well.

## **Discussion**

Since this is the first article to look at how exercise affects the size of lesions in the brain in people with MS it has important implications for practice in physical therapy. There was a significant finding of an increased cortical thickening in various regions of the brain due to PRT. In addition, they found that PRT improved most of the clinical measures they tested. Due to the potential for helping patients with MS, it is important that physical therapists include PRT as part of their treatment for MS. This study also answers my question about how effective exercise is in managing the symptoms of MS. In most of the clinical measure there will be an improvement and the lesion size will be decreased. In contrast to those positive benefits, they found that there will not be a significant increase of the disability scale. Overall, PRT will provide benefits for patients with MS although there might not be a complete reduction of their disability.

With the benefit of keeping the brain healthier and increasing muscle strength and functional capacity, it would make sense to apply this intervention in clinics. The only potential risk that I observed in the study was the high dropout rate. Of the 35 participants, 6 of the participants dropped out, which is a 17% attrition rate. 5 of the dropouts are insignificant (time restraints, logistical difficulties, and changing medication. However, 1 subject dropped out due to “pain reactions due to training”. This raises the concern of pushing the patient too hard in PRT can add additional complications to the patient who is already dealing with MS. If the study had included more participants or if it is replicated, the evidence for using this intervention would be

strengthened. As it is, we do not know if PRT causes extra pain in patients with MS. A larger sample size or replicated study would help determine if that actually is something to worry about, or if dropouts from pain is rare. Alternatively, if we find more people drop out due to pain that would reduce the argument for this intervention.

Personally, I feel confident in this research article enough to use with future clients. The methods are very well explained with reference to most important pieces of their study. The negative aspects of the paper that I found were only found after multiple readings and seem like minor details. The articles cited seem to indicate the authors put a lot of high-quality research into their literature reviews and the content of the study support that this is good and well thought out research. Before I do implement this intervention, I would like a little more knowledge on how to personalize exercises for others. I don't have much experience in assessing the patient's current abilities and creating a plan to address those. After I get that skill, I feel like I will be able to create a much more effective PRT plan.

Lastly, I do feel that I currently lack a complete ability to assess the validity and objectivity of the data presented on the cortical thickening. I have limited experience and knowledge in that area that may have affected my interpretations of the data.

In conclusion, this article is very well done. The introduction is written for those with a knowledge base in MS. The methods detail the procedure clearly, but a reader will need to reference another article to get the full details. Although there are some details they overlook in the results and discussion, they present and discuss all the major markers they were measure. It is a well done piece of literature that adds to our knowledge of how PRT affects patients with MS.