

**A critical appraisal of “Virtual Reality Reflection Therapy  
Improves Balance and Gait in Patients with Chronic Stroke:  
Randomized Controlled Trials”**

**By**

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## **Abstract**

Physical therapy is a growing field and the importance of evidence-based practice cannot be overstated. This paper was an assignment to learn how to clinically appraise articles and develop an importance for evidence-based practice in physical therapy. The question searched for in pubmed was in patients with stroke, is the assistance of virtual reality effective achieving a normal gait? The article of “Virtual Reality Reflection Therapy Improves Balance and Gait in Patients with Chronic Stroke: Randomized Controlled Trials” was selected for this purpose. This article based in South Korea used participants who had suffered a stroke and implemented conventional therapy, and virtual reality reflection therapy. The results are concise but in need of more information to strengthen the quality of the article, and the study. A positive result of this virtual reality reflection therapy (VRRT) treatment indicated this treatment should be considered in physical therapy clinics. The methods are outlined well, but no access to the virtual reality treatment is provided. This limits the ability of implementing this treatment in clinics, and weakens the quality of the study.

**Key words: Virtual Reality, Mirror therapy, gait, balance, stroke**

## **Introduction**

To help me gain the ability to critically appraise research and learn the importance of evidence-based practice, I was given the assignment to choose a study I was interested in and appraise its quality. This is an important skill for me to develop to implement into my future career as a physical therapist. The question I had was, in patients with stroke, is the assistance of

virtual reality effective achieving a normal gait? My critique of this study is important to analyze the validity of incorporating virtual reality into rehabilitation of people who have had a stroke.

## **Methods**

The first thing I needed to do was find a study that matched my question. I used the Pubmed search engine, and searched using the keywords: virtual reality, stroke, gait, and balance. The limitations of the search used were the results needed to be published within the last five years, a free full text available, and had to be either a clinical trial, clinical study, or a randomized controlled trial. I put these limitations into my search to ensure I found the most current research to have been done, and I would be able to view it. I included all studies that worked with people with stroke and worked on their gait. I excluded any responses that included additional factors such as environment or treadmill to ensure the focus of the article be on the patient's growth rather than on the exercise equipment or other factors. I narrowed the search results down to 50 articles before I started the selection process.

After carefully looking at the different I studies I chose an article published by the Medical Science Monitor journal. This article was published in 2016. The authors are In Taesung, Lee Keyongjin, and Song Changho; and the study was conducted in South Korea. The title of the study is "Virtual Reality Reflection Therapy Improves Balance and Gait in Patients with Chronic Stroke: Randomized Controlled Trials". I chose this study because it was similar to my original question, it randomly assigned the subject into groups, and the methods were well done.

## **Results**

### Summary of the study

Virtual reality reflection therapy (VRRT) is a type of mirroring therapy where the patient tries to get the affected limb to mirror the movement of the unaffected limb. This study uses the mirroring technique to observe if this type of therapy can improve balance and gait in chronic patients with stroke. The participants were divided into either a control or treatment group. Both groups participated in conventional rehabilitation, and the virtual reality group also performed a virtual reality program for an additional 30 minutes, five times a week for four weeks. They tested improvement of the participants gait through different tests such as the Berg Balance Scale, Timed Up and Go, and 10 meter walking velocity. This particular study did see an improvement of the virtual reality group compared to the control group. Virtual reality can be effective when combined with traditional rehabilitation. More research should be done on the length and intensity of virtual reality programs to improve gait and balance.

### Appraisal of the study introduction

The introduction is comprehensive and well written. It mentions treatments performed on patients with stroke, and the need for research on a less expensive and demanding treatment. The introduction mentions how this mirror VRRT will overcome obstacles from other treatments like asymmetry of the trunk, and how VRRT can alleviate these problems. The goal of the study is clearly stated in the last sentence “The aim of the present study was to explore the effect of VRRT on gait and balance in people with stroke.”

A weakness to the introduction of the article are the references provided for the credibility of their claims. Some date back into the early 1990's making these articles over 20

years old. Another weakness is a keyword the authors provided for this article is “mirror neurons”. However, neurons are only mentioned once in this article, and have no real bearing in the study.

#### Appraisal of the study methods

The methods of this article that were done well is the assessors were both trained and blinded to the participants groups, the treatment and control groups were treated the same. Having the assessors blinded helps diminish any bias that could be put into the findings of the study. The treatment for each participant was performed the same. Both the VRRT group and control group were given mirror therapy, only the control group was given a placebo. This is done well because the control group can believe they are in the treatment group because they are still receiving some rehabilitation treatment. This will reduce the possibility of receiving a false positive.

Some weaknesses of the methods are the article never states whether the participants were blinded to which group they were put in, and the method used in each group is not explained enough. If the participants were not blinded to the group they were assigned to then they could influence the results of the article by their motivation to do well or lack motivation in the control group. The authors provide a picture, and explain the study. However, the explanation is confusing, and the picture is not labeled enough to make certain how the study was conducted. If an assumption is made and is incorrect than the study cannot be replicated.

#### Appraisal of the study results

The results section, while small, contains much of the information needed to decipher the effectiveness of this VRRT technique. All of the data needed is put into a table, and the authors outline

the results of their finding. The significant results of this trial are both groups improved improved in the Functional Reach Test, and the Timed Up and Go test. There is also meaningful improvement shown in the 10-meter walking velocity for the VRRT group, but not in the control group. These tests also showed more improvement in the VRRT group compared to the control group. All postural sway conditions with eyes open and the medial-lateral sway with eyes closed were notable in the VRRT group, but not in the control group. Finally, the anterior-posterior and medial-lateral sway distance with eyes open were improved significantly more in the VRRT group compared to the control group.

The results section needed to have more information overall. The authors never determined the minimal clinically important difference, or the number needed to treat. Without these the study may not have had enough participants to make any statistical claims. Another problem is the p-values are not given. They are stated as not significant or not given at all. The p-values would have added more credibility to the finding of this article.

#### Appraisal of the study discussion

The authors did well to conclude their research and how it helped the participants in the study. They provided references for their findings and most are current and published in credible journals. They stated the limitations to their study are reorganization of the brain could not be proven since functional magnetic resonance imaging were not done. Also, this study focused on chronic stroke patients, the authors state additional research should be done on acute patients to confirm this treatment for patients with acute stroke.

While the authors state they did this research to find a cost effective and less demanding for treatment for patients with stroke, they state nothing in the discussion on how this treatment will improve on these points.

## **Discussion**

This study is significant in physical therapy today because stroke is a common problem. This study showed that this virtual reality reflection therapy can help provide mobility to those affected by stroke. It can be done in a cost-effective way, because no real equipment is needed except for a camera and a laptop. My question was in patients with stroke, is the assistance of virtual reality effective achieving a normal gait? This study does show improvement in balance, and improved walking speed in patients with stroke.

Implementing this study into physical therapy clinics would be beneficial if done correctly. It can be done inexpensively, and improvement was shown in all balance categories. Improved balance will help patients reduce the occurrence of falls which are a big risk factor after a stroke. Using VRRT in physical therapy clinics could be a risk because patients may feel they did not receive a treatment because they worked more with a screen than they did with a person. This study would have a stronger argument to be implemented if it included the p-values in its results, and outlined how to access the treatment program. Without the VRRT program, replicating this study would be impossible. If therapists try to use this treatment without the VRRT program and the patients do not see positive results the therapist would most likely stop using this treatment in the future.

While the results speak for themselves on how this can help. Without knowledge of how to use the VRRT program or how to create my own, it would be impossible to replicate this study exactly. If I had the time to create a program then I would use this treatment in my clinic, but if time did not permit than I would search for alternative methods of treatment.

Overall the study was conducted well, and the authors were thorough in their explanation of the study. This study makes a good argument for virtual reality therapy in the treatment of people with stroke and should be considered in their treatment.