

**A critical appraisal of “Effects of two exercise protocols on postural  
balance of elderly women: a randomized controlled trial”**

**By**

**Rachel Davis, SPT**

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**Department of Physical Therapy**

**Angelo State University**

**Member, Texas Tech University System**

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## **Abstract**

This study compares the effects of Pilates and PNF in enhancing balance in an elderly female population. Elderly women (60-80 years of age) from a church in Teresina were randomly placed into a group of either PNF, Pilates, or no activity to assess the potential benefits of these types of activity in increasing balance. Activity involved 4 weeks of 50 minutes sessions of either Pilates, PNF, or no activity that occurred 3x/week. The women were tested using a stabilometry measurement, Berg Balance scale, functional reach test, and TUG test. Of the 63 participants selected due to their sedentary but not otherwise impaired lifestyle, 58 participants finished the study. The PNF group (PNFG) had greater static balance than the other groups. The PNFG and Pilates group (PG) both had greater dynamic balance than the control group. There were no notable differences in balancing abilities between the PNFG and PG.

**Key words: Pilates, PNF, low back pain, women, elderly**

## **Introduction**

The research article is important because declining postural control that occurs naturally with age can limit daily activities due to pain, delayed motor response, or fear of falling. PNF or Pilates can easily be integrated into treatment programs and this may prolong independence in the elderly female population. This critical appraisal is necessary because the article will be assessed for limitations to indicate if the results can be believed and what changes could be made if the experiment is performed a second time. Several other studies have suggested that low back pain may be correlated with balance<sup>1-3</sup>. By analyzing this article, decreasing incidences of low back pain within an elderly female population can also be considered. Therefore this article can be a step toward understanding whether Pilates is more effective than PNF for reducing low back pain in elderly women.

## **Methods**

The main database used to find this article was NCBI. The search terms included: Pilates, PNF, low back pain, women, elderly, rehabilitation. The search was limited to papers in the English language and papers that were published more recently than 2005. The main inclusion criteria was postmenopausal females, because this group is often at risk for low back pain due to disc degeneration caused by age and gender (by hormonal changes).<sup>4</sup> The search yielded 10 hits before this article was selected.

Based on the background, the study appears to be reputable. The journal that published the article, *BMC Geriatrics*, has an impact factor of 2.611, which is only slightly lower than the notable *Physical Therapy Journal* (2.764).<sup>5</sup> The article is relatively recent (from 2015), suggesting that the information is still relevant and has not been disproved. Although the authors do not appear to be physical therapists, they come from a group of universities and scientific institutions, which may indicate that their methods are sound. There are so few articles that have compared PNF to Pilates, particularly with an elderly female population. Although this article does not fully explain whether PNF or Pilates can assist in limiting low back pain, it does explore how each of these methods contributes to balance in the same population.

## **Results**

### **Summary of the study**

The study suggests that PNF improved stability, while PNF and Pilates had similar positive effects on functional tasks. The Pilates group did not improve in stability over the control group. For the functional tasks (functional reach test, Berg Balance scale, TUG test), there were significant improvements for the Pilates group and the PNF group. The control group did not see any changes in functional abilities.

## **Appraisal of the study introduction**

### **Strengths:**

The introduction includes information on the importance of balance in the elderly, explanation on PNF and Pilates movement patterns, and a stated hypothesis of what will be explored in the article. The flow of the introduction makes this section easy to read and includes multiple references to other studies. The authors used recent sources (all after 2000 except for reference 18 and 19). They are primary sources. The sources were from scientific journals, rather than websites. The articles were from later volumes so the journals were well established and could be selective about their article choices. The introduction wraps up with a summary of what the reader should expect in the article and why the experiment is clinically relevant.

### **Weaknesses:**

The introduction could have been improved by providing more information on why falls are detrimental (why they limit activity and participation) and differences between static or dynamic balancing. The article could mention the ways that these different types of balancing could be assessed and why it is important to test dynamic balance (because it is more similar to ADLs). This article does explain how sensory and motor deficits occur with age and might decrease balance abilities, but the introduction would benefit from including injuries that might occur because of balance deficits. This would show the importance of the experiment being performed and could be useful for other clinical questions like the effects of PNF and Pilates on low back pain because other articles explain that postural control is decreased in people with low back pain.<sup>1-3</sup>

## **Appraisal of the study methods**

### **Strengths:**

There was group equality since all of the women came from the same church group, the same 60+ age group, and same activity level (sedentary---with no other impairments). The number of interventions and length of interventions was consistent between PNFG and PG. The same room was kept at the same temperature for both groups so the groups were treated the same as much as possible. The types of exercises were explained (what body part/movement) and the number of repetitions and sets performed as the weeks progressed. The specific exercises are described in Table 1. These details allow the experiment to be repeated. The tests were reliable and valid (stabilometry, Berg Balance Scale, TUG, functional reach test).<sup>6-9</sup> The abilities of the outcome assessors are unknown, but the Shapiro-Wilkes test ensured that the variables considered were evaluated consistently. The Shapiro-Wilk test was used to determine which tests should be used and how to calculate normal values between the groups. When the tests were not normal distributions, the Wilcoxon test or the Tukey's test was used. This experiment could be conducted again since the outcome measurements can be normalized with the statistical tests listed.

### **Weaknesses:**

Neither the participants nor the therapists (with PNF/Pilates certifications) were blinded to the group assignments so bias could occur. The individuals enrolled knew which fitness class that they would be attending so they could not be masked. The physical therapists who were certified

in PNF and Pilates respectively were not masked. Table 2 also indicates that the women in each group were not significantly randomized ( $p$  was  $>.05$ ). Before the conclusion of the experiment, attrition of five people of the 63 occurred, which may have skewed the results. Five individuals were absent from 2+ exercise sessions. Out of these 5 absent participants, one was from the Pilates group, one was from the PNF group, and three were from the control group. The control group was slightly underrepresented after the attrition of the 5 women overall, but little attrition occurred overall. The investigators could enhance their study by expanding the experiment to longer than a month to test if these interventions continued to increase balance.

### **Appraisal of the study results**

#### **Strengths:**

The results section was presented very clearly. Each test assessed (stabilometry, TUG, functional reach test, Berg Balance Scale) were all listed in the same order as in the methods, which made the results easy to follow. The result list a high confidence interval of 95% so the numbers listed are likely to be reproducible. The functional tests for between-group comparisons were significant values ( $p<.05$ ). Table 3 suggested that Pilates and PNF were equally effective at correcting balance for these tests, which is clinically (as well as statistically) significant.

#### **Weaknesses:**

Although the stabilometry measurements for within-group comparisons state that PNF activity correlated with improved balance more than Pilates, the results were not statistically significant (Table 4). These results may still be clinically significant, because, at a slightly lower confidence interval, the results may be upheld. The results given indicate that PNF is greater for increasing stability for balance than Pilates. The results would be stronger if the results for stabilometry were more statistically significant. The results would also be improved by more description of what is being measured in the tables (Table 3,4, and 5). The tables could also be converted to graphical representations of the Pilates group changes against the PNF group changes and control group changes, which would make it easier to visualize the relative results between groups.

### **Appraisal of the study discussion**

#### **Strengths:**

The conclusion concisely explained the results, defended the study with other literature, and stated potential limitations of the study. The authors described other articles that looked at improvements in balance due to Pilates or due to PNF, but showed the importance of their study within the literature as the only study that compares the two treatment protocols with the given population. Previous literature referenced in this article had similar results to what the authors found.

#### **Weaknesses:**

This article pointed out previous studies that showed limitations to the COPsway as a variable used to quantify stabilometry. If another test had been used, the results may have been more significant, particularly for within-group Pilates results. The discussion also did not explain why certain tests were chosen (stabilometry, functional tests) rather than other tests. The discussion could have explained that these tests were a good indicator of functional tasks and that was why they were chosen over other assessment variables. The authors also stated that a greater number

of sessions may be necessary to adequately determine if Pilates is useful, because more than 4 weeks may be required to make gains in postural stability. A longer time period would be beneficial to this study.

## **Discussion**

Poor balance and postural control limits a great number of activities required to participate in domestic and community tasks. Understanding how to implement treatments that would reduce fall risks for a population at high risk (elderly women) is essential for the physical therapy profession. Since balance and low back pain are closely associated in this population, the analysis of the best type of treatment (Pilates or PNF) to reduce falls may also aid in the understanding of how to best decrease low back pain.

The interventions explored in this article would be highly beneficial in the clinic. Both Pilates and PNF have low risk of injury if correctly implemented by a certified professional. As this article---and other sources referenced in this article---explains, there is great potential benefit in adding either Pilates or PNF into a treatment program. More studies comparing one or both of these interventions to a control group would show the importance of integrating these programs into treatment. Conducting this study again or expanding the study to a longer duration could also help prove that these interventions would be useful in the clinic. Assessing a different population could also give an indication of whether Pilates or PNF are good interventions.

The experiment in this article was well conducted and the results suggest that there were significant changes when either intervention was implemented. The results of the study appear to be valid since there was limited likelihood of bias in the article since the study was as randomized as possible and little attrition occurred. PNF would be the best treatment to implement for promoting balance based on the article since both stabilometry and functional tests showed significant improvements. More research on the effects of Pilates training for balance is necessary before implementing that type of treatment.

Overall, this article demonstrates that PNF is more effective than Pilates for measuring stability, but that PNF and Pilates are equally effective at enhancing balance for functional tasks. The introduction described the background of these interventions and why balance is important in daily life. The methods could be better managed to remove any bias (blind the participants if possible and reduce attrition), but the selected measurement variables have good validity and reliability. The exact exercise programs are also listed so the experiment could be performed again. The explanation of result was easy to understand, but could be improved by graphs or by greater interpretation of results. The discussion shows that the results could be backed up by several other studies, and the limitations of this study are assessed. More experiments should be performed to determine the reliability of the results in this article, but the methods to achieve the results were well executed. By understanding the relative effects of PNF against Pilates for balance, it could help to determine the effects of incorporating PNF or Pilates into treatment for low back pain.