

# Correlation between Hyperkyphosis and Balance of Elderly Who Join Osteoporosis Gymnastics at Royal Taruma Hospital, West Jakarta

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**Keywords:** Hyper Kyphosis, Balance, Osteoporosis Gymnastics.

**Abstract:** **Objective:** Determine the correlation between hyperkyphosis and balance of elderly who join osteoporosis gymnastic at Royal Taruma Hospital. **Samples:** This study consisted of 25 elderly who participated in osteoporosis gymnastic at Royal Taruma Hospital, which was selected based on purposive sampling. The samples aged ranges from 55-80 years with a gymnastic frequency >4 weeks. The sample examined the thoracic hyperkyphosis curve with flexicurve-ruler and balance with Berg Balance Scale. **Method:** This study was a cross-sectional with observational study and was a correlation study. **Results:** Average and standard deviation of the hyperkyphosis curve in elderly who participated in osteoporosis gymnastic was  $50.63 \pm 5.42$  while the balance was  $49.96 \pm 2.55$ . Pearson test obtained the value of  $p=0.183$  ( $p > 0.05$ ), meaning that there is no correlation between the degree of the hyperkyphosis curve and balance in elderly who participated in osteoporosis gymnastic at Royal Taruma Hospital. Whereas the value of  $r$  (correlation strength) =  $-0.276$ , it's mean that there is a negative correlation between hyperkyphosis and balance of the elderly. **Conclusion:** There is no correlation between hyperkyphosis and balance of elderly who join osteoporosis gymnastic, however, there is a negative correlation between hyperkyphosis and balance, so the higher hyperkyphosis curve, the lower balance of elderly.

## 1 INTRODUCTION

Elderly is the final stage in the development cycle of human life and is characterized by the failure of an equilibrium for maintain health and physiological stress conditions. Elderly also associated with a decrease in the ability to live and sensitivity individually. (Hawari, 2001).

As we get older, our body systems also decrease. The decrease occurred in all systems of the body such as sematosensori, visual, vestibular and musculoskeletal. The decrease in the musculoskeletal system is the most commonly experienced by the elderly, characterized by decreased muscle mass and increased fat mass (sarcopenia), as well as the decrease to loss of bone mass (osteopenia and osteoporosis). The decreased of bone mass may increase the degree of kyphosis in thorakal.

One of the physical changes that almost all elderly experience is changes in body posture (bones, muscles and joints) which physiologically cause changes in spinal curvature. The changes in postural

alignment of the body that often can cause thoracal hyper kyphosis, experienced by 20-40% of elderly in worldwide. (Fernandes et al, 2018).

Thoracal hyper kyphosis is a term that refers to an abnormal curvature of thoracal. Normally thoracal angle is 10-20 degrees. As we get older, the thoracic angle increases, around 44-48 degrees. Most researchers who have investigated hyper kyphosis, assume that the main cause of hyper kyphosis are fractures, arthritis and osteoporosis (Kado, 2009).

Thoracal hyper kyphosis can affect daily activities. Adverse effects arising from these conditions are difficult to bend, climb, walk, down to the basic daily activities like bathing. The increased of thoracic kyphosis angle, can directly cause impaired balance and increased risk of falling in the elderly. The posture changes cause a decrease in the ability to maintain postural balance in elderly due to decreased muscle strength and bone mass.

When the elderly experiencing thoracal hyper kyphosis, there is a changes in the center of gravity (center of gravity) or the body's center of mass (center of mass), which became one of the factors that affect

the balance. The center of gravity is the main point on the body that will evenly distribute body mass. COG humans at normal (upright) located just above the waist between the front and back of the vertebra of the sacrum to two. When the center of gravity moves (from normal), then the distribution of body mass changes. Body burden becomes more leaning forward so it is difficult to maintain the balance of the body.

One of treatment that can be given to the elderly who have thoracic hyper kyphosis and balance disorders is with Physiotherapy. According to PMK no. 65, 2015 Physiotherapy is a form of health care which is form of health service aimed at individuals and/or groups to develop, maintain and restore motion and bodily functions throughout the life span using manual, increased motion, modalities (physical, electrotherapeutic and mechanical) functional training, communication. Therefore physiotherapy as health workers should have the ability and skills to optimize the potential of motion associated with developing, prevent, improve, and restore motion and function of a person's body.

In the case of hyper kyphosis, Sports Physiotherapy plays an important role in posture correction. the goal of sports physiotherapy is to improve skeletal stability, substantial remineralization, relieve pain, and prevent the risk of falls. (Lange et al, 2005) In addition to preventing the risk of falling, exercise conducted by the elderly also can improve muscle strength, coordination and balance. According to Cosman (2013), the more movement and exercise, the muscles will help the bones to form new bone mass. Old bones and fractured bones will be reshaped. This means that rarely exercising can inhibit the process of osteoblasts or new bone formation, thus accelerating bone loss.

One of the exercises that can be done to improve posture and balance Osteoporosis Gymnastics. Osteoporosis Gymnastics is a bone health exercise that serves to increase bone density and prevent bone loss early. This exercise focuses on muscle strength without an increase in bone strength (improve balance and flexibility in the elderly) are performed safely, without movement of high impact and movement of spinal flexion, not on the mat slippery, not with abduksi and adduction motion of the foot to the load, and done step by step (foot, isotonic abdominal, back extension).

## 2 SAMPLES

The samples in this study consisted of 25 elderly people who follow osteoporosis gymnastics in Royal

Taruma Hospital, West Jakarta with age  $\geq 55$  years. The study lasted 5 days with samples obtained through the administration of questionnaires, and the samples are given an explanation of the purpose and intent of the study and fill out the informed consent. Then the researchers take measurements: hyperkyphosis curve with flexicurve ruler and balance with the Berg Balance Scale (BBS).

The sampling criteria (inclusive criteria): (1) consists of elderly who follow gymnastics Osteoporosis in Royal Taruma Hospital, West Jakarta, (2) aged  $\geq 55$  years, (3) kyphosis curves  $>40$  degrees and, (4) the subject is still actively participating in training exercises conducted by Hospital at least 4 weeks, while the rejection criteria (exclusive criteria): (1) consists of elderly who have acute or chronic illness, (2) use a walker, (3) subject uncooperative and unable to follow the study.

## 3 METHODS

The study was conducted with a quantitative approach that was included in the research analysis. Quantitative research is research that emphasize the analysis of numerical data is processed using statistical tests.

The type of the research is observational research/surveys. This is a descriptive study with the type of correlation studies to determine the correlation between variables using a cross sectional study design in the same time, by describing the results of the thoracic kyphosis curve measurement with the flexi curve ruler and the measurement results of the balance with the Berg Balance Scale (BBS).

The measurement is used to determine the correlation of hyper kyphosis and balance in elderly who follow Osteoporosis gymnastic in Royal Taruma Hospital, West Jakarta. In this study, it is expected there is a lack of compatibility between the methods used by the objectives to be achieved by the researchers.

## 4 RESULT

Based on research carried out on 25 samples, the sample's characteristics of the study consisted of gender, age, blood pressure, pulse rate, respiration rate, body mass index. Characteristics of the sample by gender is composed of men and women, where the elderly who follow Osteoporosis gymnastic in Royal Taruma Hospital, West Jakarta are mostly women

with a number of 22 people (88%), while men were 3 people (12%) with the most elderly age who follow osteoporosis gymnastics is 66-70 years (9 elderly). The average blood pressure of elderly people who follow osteoporosis gymnastics is 132/85 mmHg. The highest pulse rate in the elderly, ranges from 91-100 times per minute, while the lowest is around 51-60 times per minute, where the average pulse rate is around 61-70 times per minute, which consists of 13 people. The respiration rate of the elderly who follow osteoporosis gymnastics ranges from 16-35 times per minute, where the highest respiration rate ranges from 21-25 times per minute, which consists of 12 people. Based on weight and height obtained the value of the lowest BMI in elderly who follow gymnastics osteoporosis range 16-20 kg/m<sup>2</sup> and the highest score is 31-35 kg/m<sup>2</sup>, in which the highest value is 21-25 kg/m<sup>2</sup>, which is 12 people.

The mean and standard deviation of the hyper kyphosis curve in the elderly who following the osteoporosis gymnastic is 50.63±5.42 while mean and standard deviation of balance is 49.96±2.55.

Table 1: Normality Test Results Hyper kyphosis Curve and Balance.

Variables	p-value	Information
Hyper kyphosis Curve	0.195	Normal
Balance	0.126	Normal

Because the number of samples used in research is less than 30, the researchers conducted a normality test using the Saphiro Wilk Test, where data distribution can be said to be normal if the p value > 0.05 and the data is said to be not normally distributed if the p value < 0.05.

After the normality test, it can be concluded that the data are normally distributed in the Hypercyphosis and Balance Curves, where the hyper kyphosis curve (p=0.195) is normally distributed and the balance (p=0.126) is also normally distributed which can be seen in Table 1.

Correlation between hiper kyphosis and balance in the elderly who follow osteoporosis gymnastics statistically tested with Pearson Product Moment Correlation. This is because the data were normally distributed, provided the results of testing the hypothesis Ho is rejected when p < 0.05 and Ho received when the value of p > 0.05. The results of hypothesis testing found that p > 0.05. This can be seen in Table 2.

Table 2: Correlation Hiperkifosis and Balance in the Elderly with Pearson Test.

	Balance
Hiperkifosis	r = -0.276 p = 0.183 n = 25

Based on the results Hiperkifosis Correlation Test and Balance in the Elderly with Pearson Test p value = 0.183 (p > 0.05) means insignificant. While the value of r (correlation strength) = - 0.276, that is to say there is a negative correlation between the curves and balance hiperkifosis elderly who follow gymnastics osteoporosis in Taruma Royal Hospital, West Jakarta

## 5 DISCUSSION

The results of hypothesis testing with Pearson Product Moment Correlation test found that p > 0.05 (0.183). This shows that there is no correlation between the degree of the hyperkyphosis curve and balance in the elderly who follow osteoporosis gymnastics in Royal Taruma Hospital, West Jakarta. Hiper kyphosis will change the balance of the whole body in both lower limbs and affects mobility inhibits spinal vertebrae each of the joints to move at maximum ROM (Briggs et al., 2007).

But that is not found in the elderly who have hiper kyphosis and follow osteoporosis gymnastic in Royal Taruma Hospital, West Jakarta. Almost all elderly who follow gymnastics and experience hyperkyphosis do not notice any decrease in balance as measured by the Berg Balance Scale (BBS). That is, hyper kyphosis is not a major factor in the decreased in balance in the elderly.

Hyper kyphosis can be affected by many things, such as a decrease in bone mass and decreased muscle strength. In this study, the sample used is the elderly who follow osteoporosis gymnastics routinely. So that despite experiencing hyper kyphosis due to decreased bone mass, muscle strength can be one of the good factors in the balance value in the elderly who follow osteoporosis gymnastic at the Royal Taruma Hospital, because these exercises are principally aimed at increasing muscle strength. It can be said that the exercises were able to improve balance in the elderly, because in a short interview conducted by the researchers, almost all elderly impaired balance (often falling) before doing osteoporosis gymnastic routinely.

The statement was supported in the journal study conducted by Lange, et al., Entitled "Exercise and

Physiotherapeutic Strategies for Preventing and Treating Osteoporosis" in 2005, which states that physical exercise (sports) has several benefits for the elderly among other things, to stabilize circulation and improve the ability of the elderly to avoid the risk of tripping or falling, reducing the risk of fracture as well. However, the intrinsic factor fall risk (blood pressure, pulse, and cerebral ischemia) as well as related to environmental factors must also be reduced. For example, exercise (cardio-exercise therapy) can improve the balance of which is quite large and reduce the risk of falls by improving muscle strength and coordination.

In addition, the frequency of exercise also affect the value of the balance (BBS) was very good in the elderly who follow gymnastics osteoporosis in Taruma Royal Hospital, West Jakarta. All samples in this study average gymnastics osteoporosis have followed for more than 2 years. This is according to research conducted by Lange, et al. (2005) that ideally done during gymnastic exercise 2-3 times per week. Powered by prior research on "Exercise Frequency, Health Risk Factors, and Diseases of the Elderly" (Kemmler and Stengel, 2013) that the average frequency of exercise more than 18 months can affect bone repair dam muscle mass in the elderly.

There is no correlation between hyper kyphosis and balance in elderly who follow osteoporosis gymnastic at the Royal Taruma Hospital can also be caused due to the use of measuring instruments that are not appropriate balance. Measuring instrument used in this study is the Berg Balance Scale which is basically a measurement tool shown in the elderly with balance disorders such as stroke and Parkinson's, while the samples are elderly people who follow gymnastics osteoporosis is a healthy elderly without specific health problems. According to Stephen Downs in the journal "The Berg Balance Scale" in 2015 said that the Berg Balance Scale measuring tool is not a good screening for someone with no particular health problems that affect balance.

These test results show the value of the correlation (r) -0.276. This means that there is a negative correlation between hiperkifosis and balance, which indicates that there is a relationship which is inversely between hyper kyphosis and balance in the elderly who follow osteoporosis gymnastics in Royal Taruma Hospital. This is supported by the theory of Briggs et al. in 2007 the higher the hyper kyphosis curve, the lower the balance in the elderly. This is because the body is leaning forward, making it difficult to maintain balance.

## 6 CONCLUSION

Based on the results of research and discussion, the conclusions that can be drawn are as follows:

There is no correlation between hyper kyphosis and balance in the elderly who follow osteoporosis gymnastics in Royal Taruma Hospital, West Jakarta.

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