Relationship between kyphosis index toward balance level in elderly adult

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Abstract. The balance control and ability to integrate balance into a movement that occurs continuously in static balance and dynamic is the postural control result. The elderly adult who have experienced a change in posture will very difficult to control the balance because centre of gravity (COG) is always changing. The study aim to determine relationship between kyphosis index toward balance level in the elderly adults. The study design was cross-sectional study which conducted on 27th March until 3rd April 2017. The study population was all population of Tresna Wardha Gau Mabaji Gowa Nursing Home. The sample were 40 elderly adults by using purposive sampling technique that met the inclusion criteria included elderly adult aged between 60 years old and 99 years old, cooperative in this study and willing to be respondents. The result showed there was significant relationship between kyphosis index and static balance with open eyes in the elderly adult, \( p = 0.009 < 0.05 \). The Fisher’s test showed there was significant relationship between kyphosis index and static balance with closed eyes in the elderly adult, \( p = 0.004 < 0.05 \). In additions, there was insignificant relationship between kyphosis index and dynamic balance in the elderly adult.

1. Introduction

According to United Nations Social Policy Development Division on Ageing stated that approximately 810 million people aged 60 years and above and increase to more than 2 billion in global [1]. Meanwhile, there were 14% of Taiwan population is elderly adult by 2018 and increases to 20% for elderly adult population by 2025 [2]. In Malaysia, estimation 15% of population are 60 years and above population and achieved old country status by 2030 [3]. The nursing home is another alternative for elderly adult on residence which care and assistance are offered by the professionals [4]. There are increased from 1.1 million to 1.4 million of nursing home number in the United States between 1977 and 2013 [5]. The moving to nursing home is correlated with overload among the family caregivers and important that elderly adult need to adapt with new environment [6].

The kyphosis also influence the functional ability and capability in daily activities performance in elderly adult [7]. Kyphosis is occurred due to spinal fractures caused by muscle weakness, degenerative disc disease and osteoporosis [8]. Kyphosis angle begins to increase from 43° in women aged 55 years to 60 years to means of 53° in women aged 76 years to 80 years old [9]. In additions, the kyphosis also affected pulmonary functions, back pain, digestive problem and decreased the balance control level since the body centre of mass is forward shifted [10].
Furthermore, falling has been determined as contributing factors to mortality and morbidity among the elderly adult [11]. The balance or ability to control postural sway is decline with age and increased fall risk [7]. Balance is main component in many daily activities such as quiet standing, and walking while talking or changing the direction [12]. The exercise has been introduced to improve joint flexibility, muscle strength and balance for elderly adult. In additions, previous studies also focused on balance improvement through exercise programs in elderly adult [7, 13,14, 15, 16]. Hojjati et al. (2013) found seated exercise therapy contributed in significant changes on the balance of elder women with hyperkyphotic after 12 weeks intervention [7]. In additions, Mokhtari et al. (2013) also found the balance level was improved among the female elderly after 12-weeks pilate exercises [13]. The study aim to determine relationship between kyphosis index toward balance level in the elderly adults.

2. Methodology
The study was used descriptive method with cross-sectional design. The study was conducted at Tresna Werdha Gau Mabaji Gowa Nursing Home, Makassar on 27th March until 3rd April 2017. The study population was all elderly adult who living in Tresna Wrdha Gau Mabaji Gowa Nursing Home. The samples were 40 elderly adult who met the inclusion criteria such as elderly adult aged between 60 years and 99 years old, cooperative and willing to be respondents.

The data was collected through measuring tool and interview. Meanwhile, kyphosis index, static and dynamic balance levels are obtained through direct measurement in the elderly adult. The kyphosis index is measured by measure length and breadth by using flex curve tool. The static balance level is measured by One-Legg Stance Test (OLST) test and dynamic balance level with Time Up and Go Test (TUG). The data was analysed using chi-square test and Fisher’s test with SPSS program. The data was presented in the tables and narratives form.

3. Result and Discussion

3.1. Result
Table 1 shows that there were 3 respondents (7.5%) had normal kyphosis index with good static balance with open eyes and 21 respondents (52.5%) had kyphosis index with good in static balance with open eyes. Meanwhile, 8 respondents (20.0%) was normal in kyphosis index with poor static balance with open eyes and 8 respondents (20.0%) was score kyphosis index with poor static balance with open eyes. The chi square test showed there was significant relationship between kyphosis index and static balance with open eyes in the elderly adult, p= 0.009<0.05.

| Kyphosis index | Good | Poor | Total |
|----------------|------|------|-------|
| Normal         | 3    | 7.5  | 8     | 20.0 | 11 | 27.5 |
| Kyphosis       | 21   | 52.5 | 8     | 20.0 | 29 | 72.5 |
| Total          | 24   | 60.0 | 16    | 40.0 | 40 | 100.0 |

Meanwhile, there were 14 respondents (35.0%) had kyphosis with good static balance with closed eyes. Besides, 11 respondents (27.5%) had normal kyphosis index with poor static balance with closed eyes and 15 respondents (37.5%) had kyphosis with poor static balance with closed eyes. The Fisher’s test showed there was significant relationship between kyphosis index and static balance with closed eyes in the elderly adult, p=0.004< 0.05.
Table 2. Cross sectional of kyphosis index with static balance of closed eyes

| Kyphosis index | Good | Poor | Total | p-value |
|---------------|------|------|-------|---------|
|               | n    | %    | n     | %      |         |
| Normal        | 0    | 0    | 11    | 27.5   | 0.004   |
| Kyphosis      | 14   | 35.0 | 15    | 37.5   | 29      |
| Total         | 14   | 35.0 | 26    | 65.0   | 40      |

Table 3 shows that 11 respondents (27.5%) was in normal kyphosis index had good dynamic balance level and 26 respondents (65.0%) were in kyphosis category had good dynamic balance level. Meanwhile, 3 respondents (7.5%) were in kyphosis which depended on the tool. The Fisher’s test showed there was no significant relationship between kyphosis index and dynamic balance level in the elderly adult.

Table 3. Cross sectional of kyphosis index with dynamic balance level.

| Kyphosis index | Good | Tool dependence | Total |
|---------------|------|-----------------|-------|
|               | n    | %               | n    | %  |         |
| Normal        | 11   | 27.5            | 0    | 0  | 11      |
| Kyphosis      | 26   | 65.0            | 3    | 7.5| 29      |
| Total         | 37   | 92.5            | 3    | 7.5| 40      |

3.2. Discussion
The result found most of elderly adult aged 70 years old who are experienced static balance disturbances due to decreased in muscle strength, muscle atrophy and postural changes. The muscle mass changes occur due to interference in protein synthesis and degradation. Muscle weakness and sensory deficits due to stroke which leads to instability. The lack of muscle strength due to inactivity, unused muscles and deconditioning play a roles in the disruption in walking as well as ability to improve the position after losing balance.

In this study, the respondents were residents of Tresna Werdha Gau Mabaji Gowa Nursing Home which had kyphosis index in normal and kyphosis category. The person with change in kyphosis index had poor static balance. Kado et al. (2013) stated the kyphosis development could be determined with common fractures and vertebral incidents, low bone mineral density, loss of bone density, low weight and decline in the height [17].

The statistical test showed there was significant relationship between kyphosis index and static balance with opened and closed eyes. Furthermore, there was no significant relationship between kyphosis index and dynamic balance level. Physiological changes in the elderly adult due to changes in neurological, sensory and musculoskeletal function that play a role in the balance process. The age increases caused this three system function declined which disrupted signal delivery in the balance phase such as transduction, transition and modulation. Meanwhile, neurological system changes in the brain affected the body balance as nerves motor leads to reflexes changes. The musculoskeletal system changes due to reduce in mass, strength and flexibility of the muscles, bone mass and strength and reduced vibration sensation on the bottom edge.

The balance disorder is an important factor of falling in the elderly adult. The lack of physical activity affected degradation of organ function or physiological changes that occurred in the elderly adult. The exercise is recommended to improve the balance level and increase the lower limb muscle strength.
4. Conclusion
In conclusion, there was significant relationship between kyphosis index and static balance with opened and closed eyes. Besides, there was no significant relationship between kyphosis index and dynamic balance level. In future, this study is expected to using other method and factors in determining the relationship between kyphosis index and balance level among elderly adult.

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