Comparison of dynamic balance before and after core stability exercise in new member of Art and Cultural UKM, Muhammadiyah University Makassar

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Abstract. Dynamic balance is physical component which affected dancer performance especially when using overweight traditional property. The postural muscle strength may enhance dynamic balance which is reinforced by doing regular core stability exercise. The study aim was to determine the differences of dynamic stability before and after core stability exercise in new member of Art and Cultural UKM in Muhammadiyah University, Makassar. The study was used quasi experimental with pretest-posttest group design. The study samples were 21 respondents whose met the inclusion criterial. The measuring tools was one foot standing balance test. The samples were given core stability exercise triple a week for 6 weeks duration with four kinds of exercise included plank, oblique plank, static leg and back, dynamic leg and back. The result showed there was difference of dynamic balance between pre-test and post test data indeed exist (p= 0.001). This result proved there was different of dynamic balance before and after core stability exercise in new member of Art and Cultural UKM of Muhammadiyah University, Makassar.

1. Introduction

Dancing is demanding physical activity with correlated to lower extremity and back injury [1]. The difference dance styles have different physical requirement for the dancers which basic style is classical ballet [2]. In dancing, the dynamic balance should be developed besides flexibility. The dynamic balance is ability to remain stability while in motion or in body part movement or body part from one point to another and in maintain stability [3]. Many influences of dynamic balance such as physical activities and environmental. The different types of physical and environment activities will change the biomechanics and require information processing to control dynamic balance.

The exercise which impact on the dynamic balance is core stability exercise. The core stability exercise is becoming popular concept in sport medicine since this exercise have playing important role in prevention and rehabilitation of injuries [4]. The core stability exercise is practice aimed at core muscles, abdominal and lumbopelvic muscles in which the muscles served as active stability in the core area (lumbopelvic- hip complex). The strong core muscle could improve balance and stability. Meanwhile, weak core muscles will increase risk in low back pain [5].
The physiotherapy has an important role in providing input, suggestion, and giving core stability exercise design that can be applied in exercise sessions after recruitment for full dancing member preparation in Art and Cultural UKM Muhammadiyah University Makassar, which the dancers should have good dynamic balance levels before performance. In addition, the problem experienced by new dancer members is difficulty in maintaining balance during their walking with using various clothing properties and local accessories that depend on the dance performance. The study aim was to determine the differences of dynamic stability before and after core stability exercise in new members of Art and Cultural UKM in Muhammadiyah University, Makassar.

2. Methodology
The study was an experimental quasi research which used pre-test and post-test design group. The study was conducted at Iqra Building, 2nd floor of Muhammadiyah University Makassar on March until April 2017. The study population was all new members of Art and Culture UKM Muhammadiyah University Makassar. The sample sizes were 21 respondents who gave core stability exercise. All samples had met the inclusion criteria who followed the pre-test and achieved the attendance frequency for 18 times.

The data was collected by using one foot standing balance test and interview. The information such as general characteristics was using interview and measuring tools such as scales and microtoise. The body mass index (BMI) is measured by taking weight and height measurement data. The dynamic balance measurement data is obtained by direct measurement to new members of Art and Culture UKM Muhammadiyah University Makassar by using one foot standing balance test performed before and after treatment.

The treatments were four types of core stability exercises with improved exercise dose. In 1st week and 2nd week, the dose was 18 seconds/ 2 sets for static movements such as plank, oblique plank and static leg and back, and 8 reps/ 2 sets for dynamic leg and back with break time for each movement for 20 seconds. Meanwhile, 3rd week and 4th week, the dose was increased to 25 seconds/2 sets for static movement such as plank, oblique plank and static leg and back and 10 reps/ 2 sets for dynamic leg and back with break time interval for every movement for 20 seconds. Furthermore, 5th week and 6th week, the dose was raised to 35 seconds/2 sets for static movement such as plank, oblique plank and static leg and back and 15 reps/2 sets for dynamic leg and back with break of each movement for 20 seconds.

The data was analyzed using SPSS program with Paired Sample T-test to determine the difference in dynamic balance between pre-test and post-test.

3. Result and Discussion
3.1. Result
Table 1 shows that there were 16 female respondents (76.2%) and 6 male respondents (23.8%) involved in this study. Meanwhile, half of respondents (52.4%) were aged 19 years old and 10 respondents (47.6%) were aged 20 years old. For BMI, 13 respondents (61.9%) were in normal level and 8 respondents (38.1%) were thin.

| Table 1. Respondent characteristics. |
|--------------------------------------|
| Characteristics | Frequency (N) | Percentage (%) |
|-----------------|---------------|----------------|
| Gender          |               |                |
| Female          | 16            | 76.2           |
| Male            | 5             | 23.8           |
| Total           | 21            | 100            |
| Age             |               |                |
| 19 years old    | 11            | 52.4           |
Table 2. Sample distribution by one foot standing balance test.

|       | 1 (Worse) | 2 (Less) | 3 (Medium) | 4 (Good) | 5 (Super good) | Total |
|-------|-----------|----------|------------|----------|----------------|-------|
| N     | N         | N        | N          | N        | N              | N     |
| %     | %         | %        | %          | %        | %              | %     |
| Pre test | 0  | 0  | 4  | 19 | 11  | 52.3 | 6  | 28.5 | 0  | 0  | 21  | 100 |
| Post test | 0  | 0  | 0  | 0  | 8   | 38   | 10  | 47.6 | 3  | 14.2 | 21  | 100 |

Source: Primary data, 2017

Table 3 shows the mean for pre-test and post-test were 7.9 and 11.14. The statistical test showed significant differences before and after core stability exercise (p=0.001). This result meant there was significant difference in the dynamic balance level between before and after core stability exercise.

Table 3. Comparison of pre-test and post-test result at dynamic balance level.

| Dynamic balance | Mean ±SD | Difference | p-value |
|-----------------|----------|------------|---------|
| Pre-test        | 7.9±3.793 | 3.24       | 0.00    |
| Post-test       | 11.14±4.708 |

Source: Primary data, 2017

3.2. Discussion

In this study, there was significant difference between before and after exercise meant there was significant changes in the dynamic balance level after given core stability exercise. The body had positive response toward the exercise in form of adaptation reactions. The core stability exercise is depending on difficulty level to improve the core stamina and dynamic balance [6]. The core stability also improved the control of center of mass, there is potential for biomechanical deviations to occur in the lower extremity when mass center move away from support base [3]. Besides, several previous studies had proved the core stability exercise had significant improvement toward the dynamic balance level. Razieh et al. (2016) also found core stability exercises on balance of multiple sclerosis which significant different between pre-test and post-test static and dynamic balance [7]. Besides, Hassan (2017) found dynamic balance was significant different in the training group with core stability
exercise 2 times per week and no significant improvement in the control group after their traditional training [8]. In additions, Modi et al. (2017) found significant improvement in experimental group who following core stability training program in dynamic balance and lower extremity performance [9].

The difference in dynamic balance level between before and after the core stability exercise completion due to 6 weeks of exercise with three times per week. The 6 week exercises resulted in the body adapting to the exercise and significant improvement. The regular physical exercise will lead to the muscle hypertrophy due to myofibril amount and size, capillary blood vessel density, tendon nerve and ligament and total contractile especially myosin contractile proteins which increased proportionately. The changes in muscle fibers did not occurred at the same rate which greater increase in white muscle fibers (fast twitch) resulted increment in speed of muscle contraction.

The ankle strategy exercise had same improvement as core stability exercise and combination of core stability exercise and ankle strategy exercise. The ankle strategy exercise can cause the muscle contraction especially ankle joint. The ankle strategy exercise is an exercise to control the postural swelling of ankle joint, flexural plantar foot and flexion. During head and pelvis exercise moves in the same direction with other body movement on the feet. In response toward flexion plantar, normal muscular synergistic response to this exercise activated gastrocnemius, hamstring muscles and trunk extensor muscles. Meanwhile, activate anterior tibialis muscle, quadriceps muscle followed by abdominal muscle in response to swaying flexion dorsal. During the core exercise, ankle contraction was occurred causing the ankle to be more readily received by the muscle, core muscle so ankle strategy exercise become part of the strengthening process of postural muscles that work together before walking, sitting and running.

The core stability exercises can form strength in postural muscles increased stability in trunk and posture and improving the balance. The core stability is essential for maintain proper posture of lumbar and pelvic region during physical activities [10]. In additions, increase in the core will be follow by hip extension, knee and increased ankle muscle strength and improve nerve conductivity. The core stability exercise has connection between core stability with hip, knee and ankle because all body part are connected to each other either directly or indirectly. In the core muscles are strong, then the muscles on the hip, knee and ankle will become stronger and increase speed.

In principle, the core stability exercise is a reinforcing and starter movement aimed at enabling the muscles in the abdominal area and inner back. The flexi movement of agonist muscular trunk will experience strengthening while antagonist is starving.

Abdominal muscle contractions will increase bracing of the lumbar spine M. rectus abdominis and M. oblique abdominal activated the pattern on the movement of lower limbs as well as provided postural support before body move. Therefore, contractions increased intra-abdominal pressure occurred before large segmental movement in upper limb members. Besides, muscle strength increased leads to increment in flexibility. The core stability exercise can increase muscle strength, balance, speed, flexibility and neuromuscular coordination so that enhance agility ability.

4. Conclusion
In conclusion, the core stability exercise provided difference between before and after the dynamic balance level. This result are expected to be useful inputs to the member of Art and Cultural Muhammadiyah University Makassar for the training. Besides, the similar study will conduct which control the factors that can affect the dynamic balance level such as other exercises provided by the relevant parties to the study samples.

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