



Effect of k-tapping and foot exercises on strength and mobility in mild to moderate Hallux Valgus patients

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Abstract

Purpose: Hallux valgus is relatively common condition, occurring when the hallux deviates laterally towards the other toes, and the first metatarsal head becomes prominent medially.^[1] While development of hallux valgus is multifactorial, causes are hereditary factor, wearing tight footwears, rheumatoid arthritis or obesity. Women tend to be affected more than male with sex ratio as high as 9:1 with predominance of Hallux valgus, increases steadily with age. Muscle imbalance in adductor and abductor of toe muscle was cited as major factor of production of Hallux valgus. Inappropriate or constricting footwear appears to be primary extrinsic cause, therefore school children and office individuals have chances of having hallux valgus. Other intrinsic factors play a role as well, it is reported that pesplanus has some influence on bunion formation also pronation of hindfoot is a major cause of this condition. The study was carried out to find effect of K-tapping and foot exercises on strength and angle with mild to moderate hallux valgus patients.

Methods: An experimental study comprising of 20 samples, the subjects were divided into 2 groups. The samples were assessed with the goniometer to check the angle of hallux valgus and strength by MMT before applying tape and after completion of the study. The samples were treated with kinesiotape and foot exercises for 3 weeks.

Results: At the end of the 3-week treatment period, a significant decrease was found in hallux valgus angle in both groups ($P < 0.000$), and also the strength of the hallucis muscle has been increased in both the groups ($P < 0.003$). When the post-treatment results between the 2 groups were compared, the results were significantly different in favour of the study group with regard to decreased hallux valgus angle.

Conclusion: It was concluded that k-taping with foot exercises is more effective in correcting mild to moderate hallux valgus and also in increasing the strength of abductor hallucis muscle at the end of 3-week period.

Keywords: Foot exercises, hallux valgus angle, k-taping, strength.



Introduction:

Hallux valgus is relatively common condition, occurring when the hallux deviates laterally towards the other toes, and the first metatarsal head becomes prominent medially.¹ The condition is frequently associated with a painful soft tissue and osseous prominence commonly referred to as a “bunion” on the medial side of hallux base.

While development of hallux valgus is multifactorial, causes are hereditary factor, wearing tight footwears, rheumatoid arthritis or obesity. Women tend to be affected more than male with sex ratio as high as 9:1 with predominance of Hallux valgus, increases steadily with age.⁶ Inappropriate or constricting footwear appears to be primary extrinsic cause, therefore school children and office individuals have chances of having hallux valgus. Other intrinsic factors play a role as well, it is reported that pesplanus has some influence on bunion formation also pronation of hindfoot is a major cause of this condition. Hallux valgus includes muscle imbalance in abductor and adductor muscles.

Complications of hallux valgus can further lead to hallux rigidus/hallux limitus, hammer toe, subluxation or dislocation of proximal phalanges on the metatarsal head, functional limitation. Individual with mild to moderate hallux valgus are found to exhibit significantly reduced velocity and step length on both walking surfaces and less rhythmic acceleration pattern in vertical plane when walking on irregular surface compared to subjects with no or mild Hallux valgus. Muscle imbalance in adductor and abductor of toe muscle was cited as major factor of production of Hallux valgus.⁴

Hallux valgus causes symptoms in three stages. First, is the pain in the bunion which hurt to wear a shoe. Second, the valgus deviation of the big toe results in less space for the other toes. Third, the valgus deformity overload the metatarsal heads from 2 to 4 and this results in transfer metatarsalgia.²

Hallux valgus angle of subjects were measured with help of Single joint goniometer⁸

1. Grade-1: 5-15 degree deviation
2. Grade-2: 16-25 degree
3. Grade-3: 26 degrees and above.

Conservative treatment is generally proposed for patients with mild to moderate HV. Many patients may find permanent relief with nonsurgical measures. A conservative approach should include evaluation of patients footwear and patient education regarding appropriate footwear.²

Recently, there has been an increasing trend for the use of taping technique in the conservative management of HV, the number of studies concerning taping for HV is limited. A newly adhesive elastic tape in different colours is called kinesiotape, it enhances muscular, joint, lymphatic drainage and circulatory function via the elastic pull effect that reaches the deeper tissues. Kinesiologicial tape is 100% hypoallergenic, latex free, non restrictive elastic adhesive 100% acrylic tape designed to have the same amount of stretch as human skin. It can be applied 24 hrs a day for 3-5 days. It is activated by body heat and will become more adherent, the longer it is worn.



Also specific foot exercises can be important in maintaining the mobility of the joint, stretching soft tissue around the joint and improving muscle strength. Several researchers have suggested that exercise is necessary during the early stages of HV, to prevent further increases in the HV angle. Exercise should be done 2-3 times a day with 10 repetitions. We hypothesized taping in conjunction with performing foot exercises, would decrease the HV angle, and the HV angle during active abduction.¹

Methods: Twenty subjects between the ages of 15 to 55 years with a diagnosis of hallux valgus were included in the study. Inclusion criteria of at least 15° and maintaining regular attendance for the follow-ups. Exclusion criteria were limitation in the abduction movement of the hallux, any skin ulceration or allergy, a history of any foot surgery or diagnosis of rheumatoid arthritis. All subjects had bilateral hallux valgus. The subjects were randomly divided into 2 groups each containing 10 samples using purposive study method. The subjects in the group A were treated with k-tapping with foot exercises and the group B were treated with only foot exercises.

The hallux valgus was measured using joint goniometer. The fixed arm of the goniometer was placed on the longitudinal line of the first metatarsal bone, fulcrum medially to the MTP joint and the movable arm was placed on the longitudinal line of the great toe. The value of the hallux angle between these 2 lines was recorded.

Strength of Abductor hallucis muscle were assessed by evaluating MMT of first toe. MTP joint was stabilize with one hand and with other hand patients had told to do abductor and adductor movements. First reading of MMT was taken on first day of assessment n second reading was taken on the last day of assessment. Both the first and second readings of bilateral Abductor hallucis muscles were recorded. Subjects were asked to describe their shoes that they most frequently wore during daytime and ergonomic advice were given about footwears. Following the initial evaluations, both groups were given information about appropriate shoe wear and hallux valgus. The same foot exercises were given as a home program for both groups.

The subjects were asked to do the exercises 2-3 times a day with 10 repetitions for 3 weeks. The exercises consisted of:

1. Active abduction and adduction of the hallux.
2. Toe curls.
3. Heel raise on soft cushion.

The group A was treated with k-taping in addition to the exercise program. Tape measured from lateral surface of foot just 2cm away lateral malleolus and covering whole heel portion till the 1st MTP joint and apply a 50 % stretch to the tape which will go across the big toe overlapping it, after application rub it well to activate the adhesive. Tape were kept for 24hrs a day for 1-2 days. Taping was done once after the exercise is done. Total 10 sessions were done of k-tapping as per the patients skin sensitivity during the entire treatment period. All subjects were re- evaluate at the end of 3rd week period, to check for pre and post effects of treatment and Group B was treated only with foot exercises. On the remaining days, exercise was carried out with the tape on. Patients were told that if



any sort of skin irritation or itching occurs, safely remove the tape immediately and how to safely remove tape from skin at home was taught to the patient.

Data Analysis: The Mann-Whitney test was used to investigate the difference between the groups and Wilcoxon test was used to determine the pre and post treatment within the groups. The Data was analyzed using “Primer” statistical package software.

Results: The demographic characteristics of the subjects including gender ratio are shown in Table 1, Age groups are shown in Table 2 and types of footwears shown in Table 3.

At the end of the 3-week treatment program there was a significant difference in the group A pre and post treatment hallux valgus angles, indicating a decrease in angle ($P < 0.000$) (Table 4). Although there was no difference in group B pre and post treatment of hallux valgus. There was significant difference in increasing strength of hallucis muscles of both groups A and B, where group B is more effective than group A. ($P < 0.003$).

Discussion: The Objectives of the study was to find the effectiveness of k-tapping with foot exercises versus foot exercises for mild to moderate hallux valgus individuals. This study shows that group A is more effective than Group B i.e K-tapping with foot exercises is more effective than only foot exercises in reducing angle of degree of mild and moderate hallux valgus pre and post intervention.

The main purpose of conservative method of treatment should be to decrease the hallux valgus angle or to prevent the deformity from becoming worse. The abductor hallucis muscle originates in the medial process of the calcaneal tuberosity, flexor retinaculum, plantar aponeurosis, and adjacent intermuscular septum, and connects to the medial side of the base of the proximal phalanx of the big toe. Active abduction adduction exercises increases strength and decreases hallux valgus angle.

Christian Klein et al (2009) stated that there is significant relationship between the hallux angle in children and footwear that is too short in length. As school children and office going individuals have more chances of developing hallux valgus as they wore shoes for more than continuous 8 to 9 hours. Hallux valgus includes muscle imbalance in abductor and adductor muscles which can affect while walking on irregular surface. In recent years there has been an increasing trend for the use of taping techniques in the conservative management of hallux valgus. Banu BAYAR et al(2011) stated that simultaneous utilization of exercise with taping result in decreased hallux valgus angle and pain, and increased walking ability.

Nadia LotfyRadwan et al(2017) stated that production of hallux valgus causes muscle imbalance in abductor and adductor muscles. Hallux valgus be corrected by K-tape or Conventional tape application when combined with the foot exercises training program.



As k-tape application may be attributed to the reflex mechanism of the nervous system on muscles. Recent researchers have stated that constant application of tape over the skin stimulates the cutaneous mechanoreceptors, so this allows for more sensory signals to the central nervous system for integration of the information. Also motor neuron threshold reduction caused by cutaneous stimulation may affect the motor unit recruitment, which can facilitate muscle contraction, and hence improve muscle strength and contraction of inactive muscles. Moreover, the k-tape technique maintains a functional correction without limiting the active range of motion or inhibiting the circulation. When the tape is on the tissue, it acts as if the manipulative correction effect was still effective. K-tape application results in a small immediate increase in muscle strength by inducing a concentric pull on the fascia, which may increase muscle contraction.

Sun Min Lee et al(2016) says that even if the hallux were to deviate towards the second toe, the tension used during application produces a recoil effect of the kinesiology tape, which may have acted to abduct the hallux and gradually reduce the hallux valgus. MOON-HWAN KIM et al(2015) stated that the toe spread out exercises reduces the hallux valgus angle and hallux valgus angle during active abduction and increases cross-sectional area of abductor hallucis muscle. Our study shows statistically significant difference in both group A and Group B. Both groups A and B shows effect on increasing strength of Abductor hallucis muscle. Muscle imbalance in abductor and adductor muscles is cited as a major factor in production of hallux valgus. Thus in order to increase muscle strength and attain joint mobility, all subjects were given active abduction exercises to perform. The aim of hallux taping was to reduce the stress on the big toe by pulling the toe outwards and correct the position of the hallux.

When the group were compared it was noted that the additional taping application in the study group had increased the effectiveness of the treatment program. The use of ill-fitting shoe is agreed to be the main factor in most forefoot deformities, especially in women. Because of societal pressures and fashion trends, some women wear shoes that are narrower than their feet and have narrow toe boxes. High heels shift the forefoot forward into the toe box, causing crowding of the toes. As Sun-Min Lee et al stated if the study continued for repeatedly for 3 or 4 months there will be a huge difference in angle of hallux valgus in pre and post reading. These results indicate that combined exercise and taping approaches introduced for facilitating the correct positioning of hallux, stretching the soft tissues, and strengthening the abductor hallucis muscle are more effective than exercise alone.

Conclusion: The study concludes that K-taping with foot exercises is more effective in treating mild to moderate hallux valgus and also in increasing the strength of abductor hallucis muscle at the end of 3-weeks. Thus it can be used clinically to improve degree of angle of hallux valgus.

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References:

1. Sheeree E Nix et al, " Gait parameters associated with hallux valgus" Journal of foot and Ankle Research 2013,6:9
2. Nadia LotfyRadwan et al, " Conventional Tape versus Kinesiotape for hallux valgus corection" International journal of medical research & health sciences, 2017,6(1): 71-78
3. Moon Hwan Kim et al, " Effect of toe spread out exercises on hallux valgus angle and cross sectional area of abductor hallucis muscle in subjects with hallux valgus" The society of physical therapy science, 2015; 27:1019-1022
4. Banu BAYAR et al, "The Effects of taping and foot exercises on patients with hallux valgus: a preliminary study" Turk J Med Sci 2011;41(3):403-409
5. Sun-Min Lee et al, " Effects of balance taping using kinesiology tape in a patient with moderate hallux valgus, Medicine 2016, 95:46
6. Christian Klein et al, " Increased hallux valgus in children and its association with insufficient length of footwear" BMC Musculoskeletal disorders 2009,10:159
7. Hylton B. Menz et al, "Impact of hallux valgus severity on general and foot specific health related quality of life" Arthritis care & Research 2011, Vol.63, no.3, pg:396-404
8. I.B Shine , "Incidence of hallux valgus in partially shoe wearing community" British Medical Journal 1965,1,1648-1650.
9. N.H. CHO, "The prevalence of hallux valgus and its association with foot pain and function in a rural Korean community" Journal of Bone and Joint structure (Br),2009,91-B:494-8.
10. Michelle Smith et al, " Prevalence of hallux valgus in general population" Journal of Foot and Ankle Research 2010,3:21.



Tables:

Table no 1: Data of gender distribution

| GENDER | NO. OF INDIVIDUALS |
|--------|--------------------|
| MALE | 2 |
| FEMALE | 18 |

Table no 2: Difference between age groups having hallux valgus.

| AGE GROUPS | NO. OF SAMPLES |
|------------|----------------|
| 15-25 | 14 |
| 26-35 | 0 |
| 36-45 | 3 |
| 46-55 | 3 |

Table no 3: Types of footwears used most commonly

| TYPES OF FOOTWEARS | NO. OF PERCENT |
|--------------------|----------------|
| Shoes | 12 |
| Sandals | 6 |
| Belles | 1 |
| Slippers | 1 |

Table no 4: Comparison of group a right and left pre post rom

| GROUP | RIGHT | LEFT | P-VALUE | INFERENCE |
|-------|-----------|-----------|---------|-------------|
| PRE | 17.8±2.39 | 17.2±4.66 | 0.000 | SIGNIFICANT |
| POST | 15.5±2.27 | 15.4±4.45 | 0.000 | SIGNIFICANT |

Table no 5: Comparison of group b right and left pre post rom

| GROUP | RIGHT | LEFT | P-VALUE | INFERENCE |
|-------|-----------|-----------|---------|-----------------|
| PRE | 15.9±5.97 | 12.6±4.64 | 0.104 | NOT SIGNIFICANT |
| POST | 15.5±5.72 | 12.4±4.62 | 0.168 | NOT SIGNIFICANT |



Table no 6: Comparison of group a right and left pre post mmt

| GROUP | RIGHT | LEFT | P-VALUE | INFERENCE |
|-------|-------|------|---------|-------------|
| PRE | 4 | 3.9 | 0.001 | SIGNIFICANT |
| POST | 4.7 | 4.7 | 0.000 | SIGNIFICANT |

Table no 7: Comparison of group b left and right pre post mmt.

| GROUP | RIGHT | LEFT | P-VALUE | INFERENCE |
|-------|-------|------|---------|-------------|
| PRE | 4.1 | 4.2 | 0.000 | SIGNIFICANT |
| POST | 5 | 4.9 | 0.003 | SIGNIFICANT |

Table no 8: Comparison of group a and b right & left rom.

| GROUP | RIGHT | LEFT | P-VALUE | INFERENCE |
|-------|-------|------|---------|-------------|
| A | 2.3 | 1.8 | 0.002 | SIGNIFICANT |
| B | 0.9 | 0.2 | 0.000 | SIGNIFICANT |

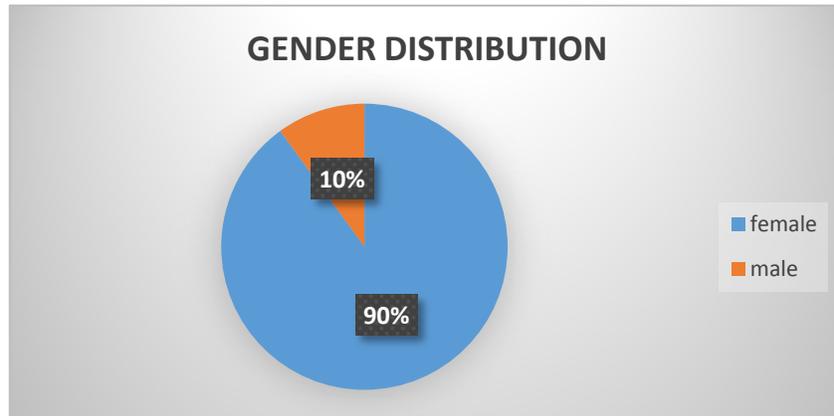
Table no 9: Comparison of group a and group b right & left mmt.

| GROUP | RIGHT | LEFT | P-VALUE | INFERENCE |
|-------|-------|------|---------|-----------------|
| A | 0.7 | 0.8 | 0.467 | NOT SIGNIFICANT |
| B | 0.9 | 0.9 | 0.345 | NOT SIGNIFICANT |

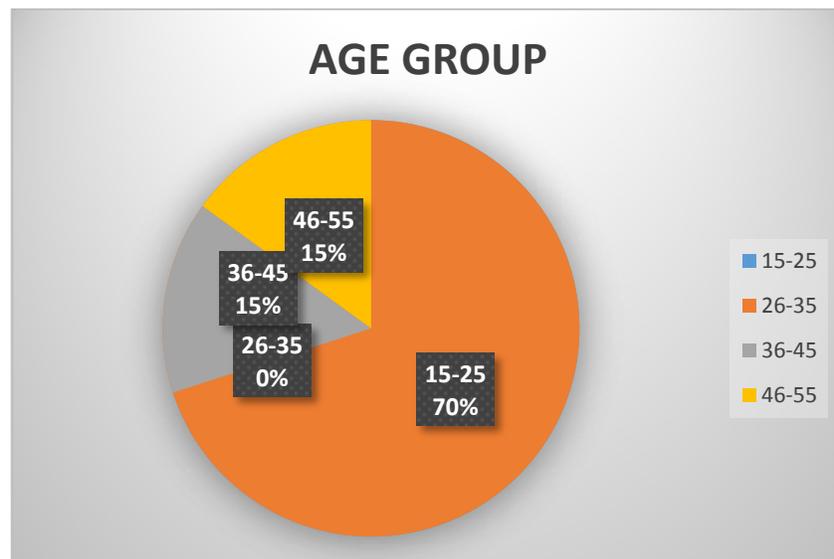


GRAPHS:

Graph no 1:

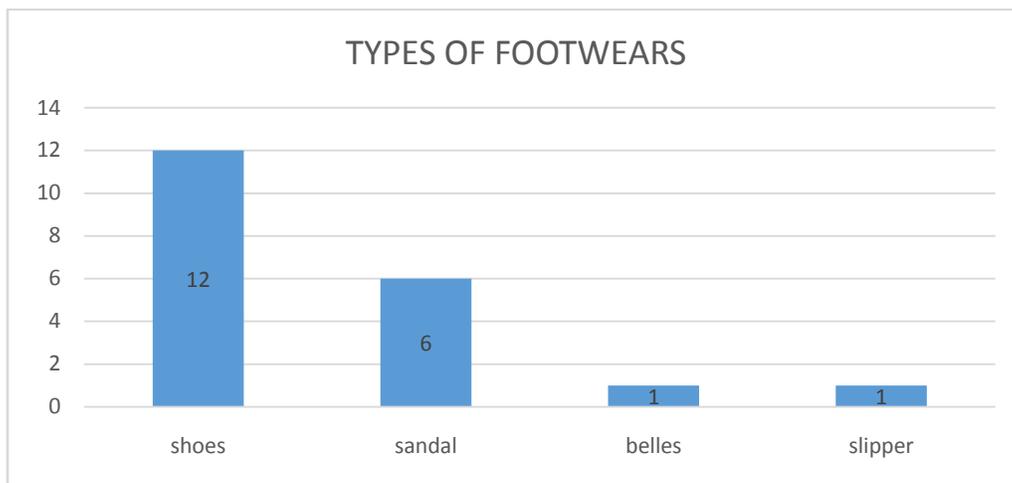


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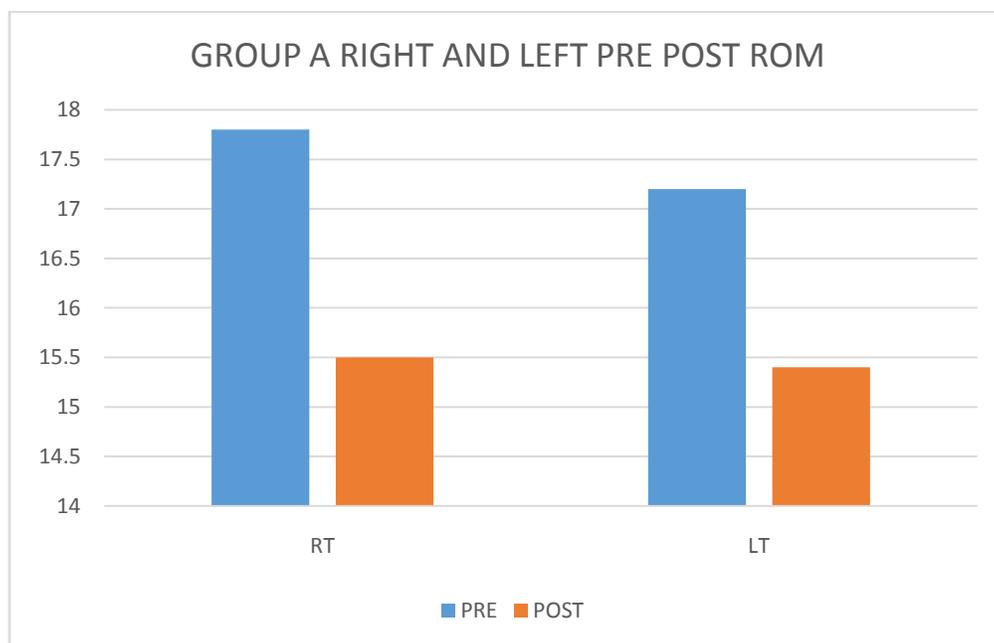




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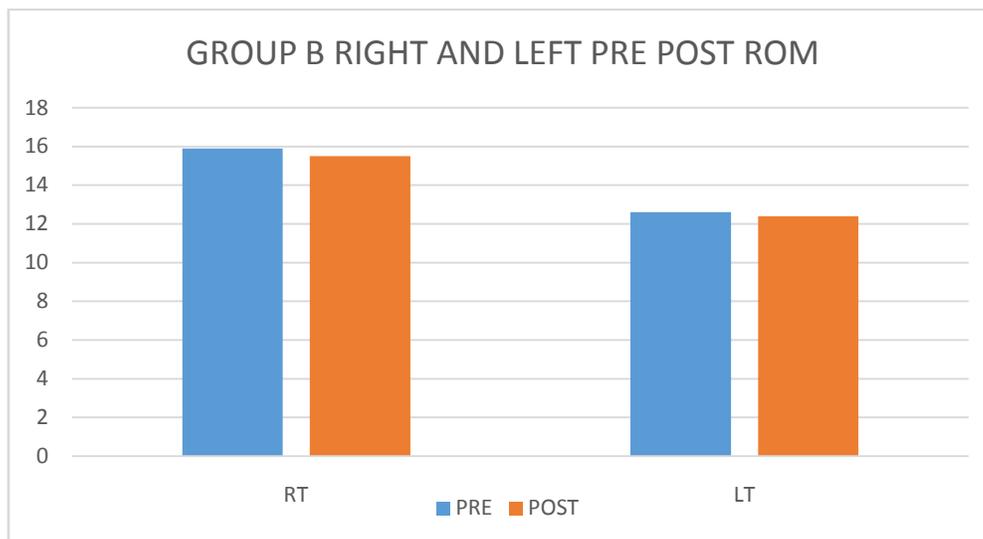


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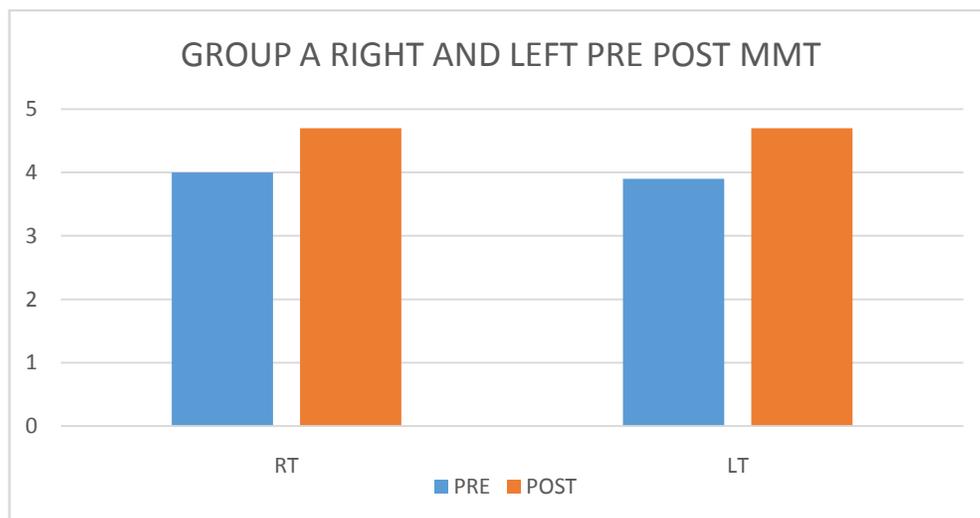




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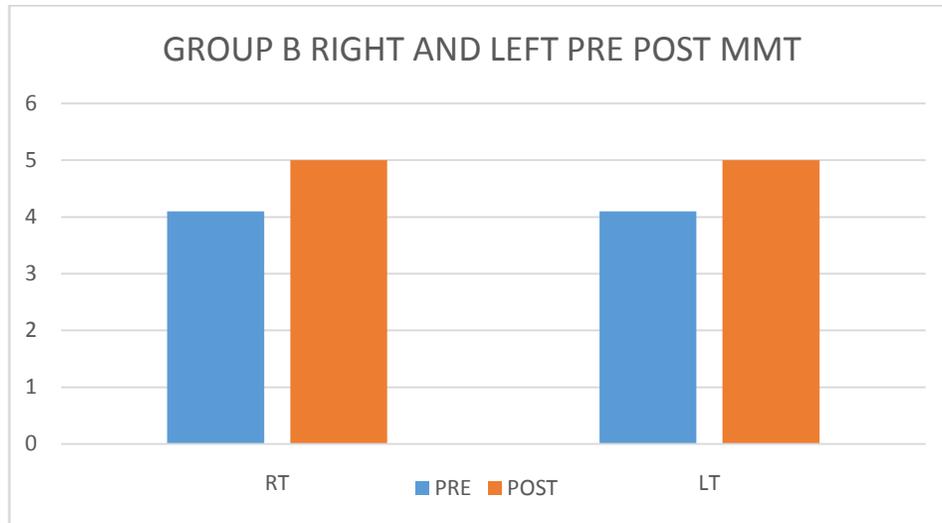


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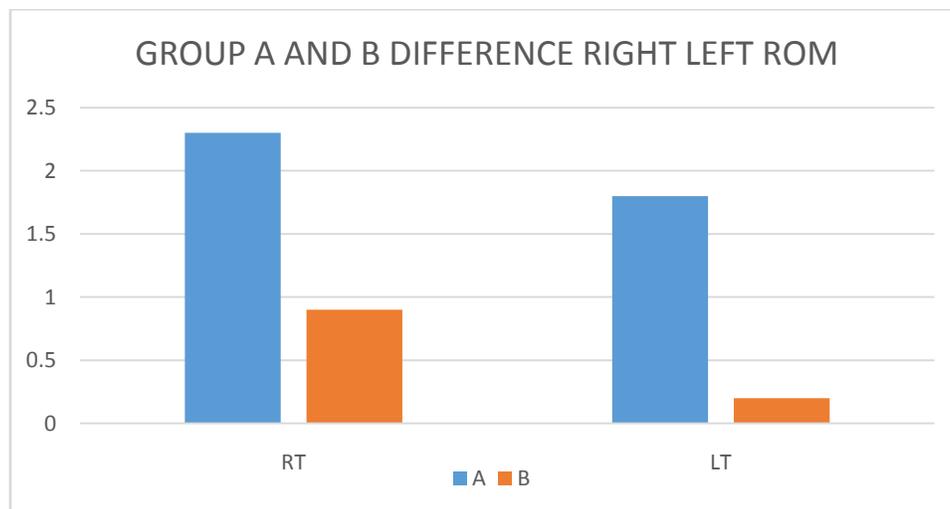




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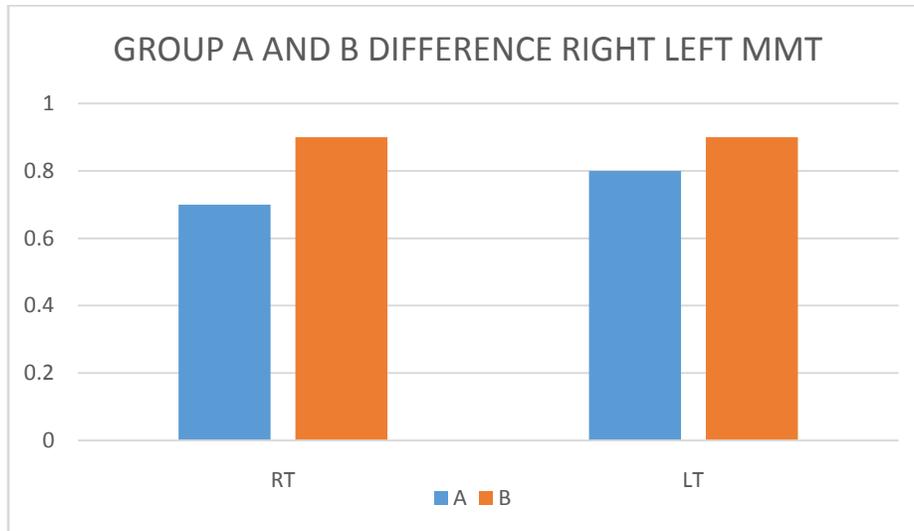


Graph no 8:





Graph no 9:



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