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Review Article

Effectiveness of Therapeutic Taping Techniques for the Treatment of Pes Planus - A Review of Literature

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Abstract

Flat foot is also called as Pes Planus is a condition or foot defect which is very common foot deformity. In this deformity medial longitudinal arch of the foot collapse. There will be flattening of the medial longitudinal arch of the foot on weight bearing or the entire sole of the foot will come in contact with the ground or near to the ground surface. In population the prevalence of Pes Planus is about 20%to 37% [1]. There are two types of Pes Planus congenital flatfoot and acquired flatfoot. The most common cause of the Pes Planus is obesity, congenital, posterior tibialis tendon dysfunction etc [1]. Individual suffering from Pes Planus most commonly complain of pain during walking in midfoot, hindfoot, heel, fatigue, pain in knee and hip joint, weakness, restricted mobility and in severe case gait alteration. The aim of this study to evaluate the evidence of effectiveness of taping therapy, type of taping technique, type of therapeutic tape used in the treatment for pes planus.

Keywords: Pes Planus, Flat Foot, Kinesio Taping, Taping Techniques, Posterior Tibialis Tendon Dysfunction, Arch Deformation, Obesity, Medial Arch Support

Abbreviations

ALD: Augmented Low Dye; MLD: Modified Low Dye; MFPI: Modified Foot Posture Index; KT: Kinematic Taping; N DT: Navicular Drop Test; RCSP: Resting Calcaneus Stance Position; VAS: Visual Analogue Scale; EMG: Electromyography

Introduction

Flat foot is also referred as Pes Planus is a condition where the arches of the foot collapse. It is a deformity of the foot where the medial longitudinal arches of the foot collapse or there is a flattening of the medial longitudinal arch of the foot on weight bearing and the entire sole of the foot will come in contact with the ground or near to the ground surface. According to previous study 20% to 37% of the population had pes planus[1]. According to another study flexible flatfoot is very common and it accounts for 95% of the cases[2]. Previous studies showed flatfoot is more common in females above 40years than males[3]. The most common cause of the flatfoot is obesity, posterior tibialis tendon dysfunction, prolonged stress on the foot, calcaneonavicular ligament, talonavicular capsule, and deltoid ligament dysfunction, plantar fascia or spring ligament injury, neuromuscular lesion [1-3]. This will lead to progressive degeneration of medial longitudinal arch resulting in loss of elasticity in the tendon and thereby it is a causative factor for adult-acquired flatfoot deformity (AAFD) [2,3]. Pes planus is of two types congenital or pediatric flatfoot and acquired flatfoot. Congenital pes planus is subdivided into two types of deformity flexible flatfoot and Rigid flatfoot [2]. The symptoms of the flat foot usually are foot pain while walking, weakness, and restricted mobility/stiffness, fatigue, in severe cases alteration in gait, pain in the knee joint, pain in the hip joint, altered muscle activity. The aim of this study to evaluate the evidence of effectiveness of taping therapy, type of taping technique, type of therapeutic tape used in the treatment for pes planus.

Need of the study

- Pes Planus is one of the most common condition worldwide. Most commonly patient complain of pain, alteration in gait biomechanics, structural deformity, loss of range of motion, stiffness, alteration in muscle activity.
- To know the problem list of a individual due to the pes planus.
- To improve the outcome measures, pain, structural deformity, improve the altered gait biomechanics, muscle activity, to improve the overall functional activities and individual's performance with the help of therapeutic taping techniques.
- To evaluate the effectiveness of taping therapy in the patients having pes planus/flatfoot.

Aim and objectives.

- Taping is used to treat flatfoot. This study aimed to conduct literature review to evaluate the below following features.
- To evaluate the evidence for the effectiveness of therapeutic taping therapy in the individual suffering from the pes planus.
- To analyse the effective taping method.
- To analyse which type of therapeutic tape is more effective.

Materials and Method

Study design: Review of literature.

Methodology

Pes Planus/flatfoot, taping techniques were the keywords to search the full text articles of last 10years. The database used in this study was Google Scholar, Pubmed, Cochrane library, Medline, Science Direct, scopus, physical therapy korea, Research Gate, science.gov. All the articles were in English language. A total of 99 studies were searched, identified from the databases, and they all were reviewed thoroughly. 15 studies met the inclusion criteria of this study and they were included in this review. This study included experimental study, randomized clinical trials, cross- sectional study, meta- analysis, observational study, quasi- experimental study, comparative study. Other studies were excluded from this study, the reason for the exclusion were 34 articles were not full text articles. 12 were in different language. 14 studies were done on children related with cerebral palsy, Spastic Diplegic, Down Syndrome etc, 2 studies were not been peer reviewed, 6 studies were old was not coming under 10years inclusion category, 1 related with cadaveric flatfoot, 2 studies were pilot studies, 2 studies were related with external appliances/orthosis, 4 studies were related with other diseases, injuries, fractures, 4 were thesis and dissertations hence excluded from this study. Another 2 study had been excluded because conclusion was not matching with methodology. 1 study excluded because after publishing literature was removed by the author.

Inclusion criteria

- Last 10years of full text articles
- Age group between 18years to 70years.
- Both males and females
- Articles should be in English language.
- Bilateral or unilateral pes planus either flexible flatfoot, rigid flatfoot, adult-acquired flatfoot

Exclusion criteria

- Articles which are not full text
- Articles which are not gone through peer review process
- Articles which were written in different languages
- Articles which included assessment, any external orthotic/appliances, used or any electrical modalities.
- Age groups less than 18years.
- Cadaveric flatfoot
- Flatfoot associated with any ligament injuries or another lower limb injuries or related to patella femoral pain syndrome, any disease, fractures.
- Pilot studies
- Thesis and dissertations
- Old articles more than 10years.

Review of literature

J. Karthikeyan., *et al.* (2020) conducted a experimental study on "To compare the effectiveness of taping and arch support on the flexible flat foot on a random population". A experimental study which included 30 participants of both the genders, 12 males and 18 females between the age of 18-30 years were taken. The participants were divided into two groups according to convenient sampling. The treatment intervention given in Group A was foot muscles strengthening exercises along with non allergic taping and for group B participants received strengthening exercise for foot muscles along with medial arch support. Both the groups took 30minutes of treatment in which there was 5minutes of warm up followed by 20 minutes of strengthening exercises. Group A received taping technique at the end of the treatment while group B received medial arch support. The data was analysed by using

IBM SPSS Statistics 23. To interpret the results between the groups Mann- whitney U test was used. Range of motion, VAS scale, and Staheli Arch Index was used as a outcome measures. The study concluded that kinesio taping was effective for the participants of group A thereby it showed increased in range of motion, comfort, decrease pain, also helps in decreasing the abnormally increased foot pressure, tone, stiffness in the muscles of the lower limbs [4].

Joong-San Wang., *et al.* (2016) conducted a study entitled on "Immediate effects of kinematic taping on lower extremity muscle tone and stiffness in flexible flat feet". There were 30 participants. The subjects divided randomly into 2 groups,15 participants in sham group (STgroup) and 15 participants in KT group. This study used highly reliable Myoton®PRO device (Myoton AS, Estonia) for measuring the muscles tone and the stiffness in rectus femoris, tibialis anterior, medial gastrocnemius, long head of the biceps femoris of both the legs. For Kt group subjects received kt taping and for ST group participants received sham taping for 24 hours only one time. In this study the encoded data were analysed with the help of WIN program (ver. 21). To interpret the results this study used independent t-test to evaluate the difference in the stiffness and tone in the muscles of the lower limb, secondly they used paired t test to interpret the effectiveness of treatment between the 2 groups. The study concluded that kinematic taping was a effective treatment in decreasing the abnormally increased foot pressure, muscle tone and stiffness in the lower limb muscles. On the contrary sham taping showed incorrect taping method can increase tone and stiffness in the muscles [5].

Jinteak Kim., *et al.* (2023) did the cross sectional study in entitled "Preliminary Study on the Comparison of Calcaneus Taping and Arch Taping Methods for Flexible Flatfoot Subjects". In this study they took 6 young Participants between the age of 19years to 30 years who were having the flexible flatfoot and was ready to participate in the study design and gave informed consent were the inclusion criteria of this study. The exclusion criteria was surgery, static flatfoot or any skin rashes due to any other tape. In this study navicular drop test had been used to assess flatfoot in both the feet. In this study they applied both taping methods arch taping and calcaneal taping to interpret the pressure distribution and gait sequence. This study used The GaitRite® system to evaluate pressure distribution and gait sequence. This study showed that Mechanotape which works as a Sports tape is more effective than kinesio taping. It is having 310% of the tensile strength, this tape is having strong tension and strong sweat absorption capacity hence this tape is used as a sports tape for foot correction in 2 ways arch taping and calcaneal taping method. The data was analysed by IBM SPSS Statistics window ver. 25.0 (IBM Co.), general features was interpreted by chi square test. To measure the difference between each taping method data was analysed by Kruskal-Wallis H test, a rank-based nonparametric test. This study concluded that without giving any stimulation to the longitudinal arch and navicular bone and if support has been given to inside of the heel through calcaneal taping then it is a effective intervention [6].

Seung-Min Lee., *et al*. (2015) did a study entitled "The Effect of Elastic and Non-Elastic Tape on Flat Foot" 14 individuals became participants for this study. The inclusion criteria included no neurological history, perfect static stance, gait and increase pronation of the foot which was assessed by navicular drop test, also right foot should be dominant. The outcome measures of this study was navicular height and foot print during pre-taping, elastic taping and non-elastic taping when subjects were in barefoot static standing position. The data was analysed by SPSS ver18.0. To interpret the differences in a footprint and navicular height one way repeated ANOVA test was used. This study concluded that non elastic taping method is more effective for the flatfoot treatment than elastic taping method as navicular height and length were decreased after the application of non-elastic taping method [7].

Alireza Tahmasbi., *et al.* (2022) conducted a single blind, parallel-design, randomized clinical trial study on "Comparison between the effects of tibialis posterior versus fibularis longus kinesio taping on foot pressure, physical performance, and dynamic balance in young women with flexible flatfoot" this study enrolled 24 females by using G*Power software to estimate the sample size. The participants were then allocated into two groups A and B, both the groups carried 12 participants. In this study kinesio taping was applied for 30 minutes on the respective muscles in both the groups A and B re-assessed afterwards. In Group A kinesio tape applied on tibialis posterior and in Group B kinesio tape applied on fibularis longus. The inclusion criteria were subject age should be in between 18-40years of age, navicular drop test ≥10mm, foot posture index ≥ +6, positive jack test and body mass index ≤ 25kg/m^2. The exclusion criteria were ankle surgery, in last six months any ankle injury, patient having problems in standing or walking, foot pain during the study, pregnancy, if subjects are sensitive to taping, or refuse to participate in the study, foot deformity like hallux valgus, hammer toe, and claw toe, due to infectious or systemic, inflammatory diseases or any foot injury. The outcome measures were navicular drop (NDT) test, foot posture index (FPI), timed up and go test

(TUG), Y balance test. In this study statistical analysis was done by SPSS statistics version 24. For the intergroup comparison independent T test and Mann- whitney test was done for parametric and non parametric statistics. T test and Wilcoxon test was done for parametric and nonparametric statistics in the case of intragroup comparison. This study concluded that young females having flexible flatfoot showed improved foot posture, physical performance, dynamic balance by applying kinesio taping on tibialis posterior and on fibularis longus. Also this study showed taping on fibularis longus became a therapeutic goal in the treatment of flexible flatfoot [8].

Paramjeet kaur., *et al*. (2018) conducted an observational study on "Effect of taping on flexible flat foot". According to convenient sampling 50 participants had been taken for the study purpose both males and females those who have met with the inclusion criteria that all participants had either unilateral or bilateral flatfoot. Before intervention toe standing test, Staheli arch index examination was done for the participants. All the participants were between the age of 18 years to 28years. The exclusion criteria in this study included fractures/traumatic injury in foot, soft tissue injury, surgery, medical or conservative treatment received for arch, pathology related to lower limb, neurological deficits. All the subjects got taping application intervention for 24hours and assessment was done before and after 24hours of intervention. The outcome measures of this study were foot print study, Staheli's Arch index. By using SPSS 20.0 statistical analysis of the data were made. For intergroup comparison of independent variable this study used student's t test and for intragroup variables for time dependent changes, study used paired t test. The study concluded that taping is effective in the treatment of flexible flat foot for 24hours and is found to be effective in improving medial longitudinal arch [9].

Jong-Gun Lim., *et al*. (2022) conducted study entitled on "Effects of elastic taping and non-elastic taping on static balance control ability, dynamic balance control ability and navicular bone drop in young adults". In this study by using G-power program 3.1.9.7 version they selected the 31subjects both genders males and females between the age of 18 to 28years. The inclusion criteria in this study was within 3months period no surgery had happened, no orthopaedic medical history, no health problems. This study was designed for comparison under 3conditions barefoot, kinesio taping (elastic taping) and non elastic taping. For this study foot scanner equipment, Y balance kit, TETRAX for assessing the foot pressure, static balance and dynamic balance of the subjects being used. For statistical analysis SPSS/PC ver.20.0 for windows program was used. To interpret the differences between before and after intervention repeated ANOVA test was used. In between the groups to elucidate the differences in the results independent t test was used. This study concluded that in case of static balance ability there was no difference between non elastic tape and kinesio tape. Non elastic tape is more effective than kinesio taping in case of dynamic balance. Also this study showed that non elastic tape method is effective for foot arch function [10].

Sung-Shin Kim*., et al.* (2016) conducted a study entitled "Immediate effects of low dye taping on the ankle motion and ground reaction forces in the pronated rear- foot during gait." In this study 24 subjects were selected by using G power software ver.3.1. The inclusion criteria was no neuromuscular disease, no biomechanical or gait abnormalities. To assess the excessive pronation of the foot navicular drop test was done. During the intervention the subjects were made to walk first with barefoot then all the subjects were asked to walk after the application of low dye taping as to evaluate the immediate effects of low dye taping method on ground reaction force and different ankle motions. The outcome measures was ankle motion and ground reaction force, and the results were assessed during gait before and after application of low dye tape on the pronated rear foot. To interpret the immediate effect of applied low dye tape this study used paired t- test. This study concluded that after applying the low dye tape it is effective in increasing ankle inversion in case of pronated rear-foot and also low dye tape helps to decrease ankle angle of foot pronation [11].

Meihua Tang*., et al.* (2021) conducted a meta-analysis entitled "Effects of taping techniques on arch deformation in adults with pes planus: A meta- analysis". In this study updated literature was searched upto march 2020 on web of science, pubmed, EBSCO, CNKI, Cochrane Library. The inclusion criteria of this study were quasi- randomised or clinical controlled trials, both gender males and females age should be in between 18years to 40years and who have arch collapse or pronated foot or navicular drop distance greater than 8mm, availability of a full text in English or chinese language, studied who had measured the foot arch collapse during walking or jogging/running, studied who had chosen outcome measures like foot arch collapse, navicular height, navicular drop distance, foot posture index, pronation angle and resting calcaneal stance position, studies where researcher compared the taping method with baseline or studies where they did sham taping

in control group. The exclusion criteria of this studies were case report or review article, subjects having neurological disease or ankle/foot injury or pathology, this study excluded those studies where they did not compare immediate effects of taping or after a period of exercise with baseline. The outcome measurements of this study was change in navicular height, navicular drop distance, foot pressure index, resting calcaneal stance position and pronation angle. In this study 93 studies were examined out of these 16 studies met inclusion criteria. In this study total number of participants involved were 486. In this study quality of all studies/research was assessed by Cochrane scale by 2 independent reviewers, the heterogeneity of the included studies was evaluated by I2 index and bias funnel plots. Egger's regression intercept using comprehensive meta-analysis version 2 was used to examined the publication bias. The conclusion of the study was augmented low dye (ALD) taping is very much effective in controlling foot arch collapse immediately when compared with baseline than modified low dye (MLD). MLD was found better than ALD in maintaining the navicular height immediately when subjects walks for 10 minutes [12].

Lin wang (2023) conducted a study entitled "Acute effects of athletic taping techniques on calcaneus frontal motion in young females adults with flexible flatfoot". In this study G-power 3.1.9.6 was used for sample size calculation and total 20 college females students who were having flatfoot were recruited for this study and data were taken from both the lower limbs of the participants. For this study the inclusion criteria were females aged between 18years to 28 years with navicular drop test value ≥8mm. The exclusion criteria of this study was if subjects were having musculoskeletal issues in lower limb, operations, nervous system disorders, metabolic disease, allergic to athletic tape. In this study through coin toss participants were allocated in two groups. Group 1 subjects received augmented low dye taping and participants of Group 2 received modified low dye taping. The outcome measures of this study were calcaneus frontal motion and resting calcaneus stance position (RCSP). The measurement of intervention was taken at the baseline, after application of ALD and MLD taping and afterwards in uniform shoes walking for 20minutes. In this study the statistical analysis was performed by IBM SPSS version 20.0. To interpret the difference between MLD and ALD taping method at baseline and to evaluate the post effect of both the taping methods and again after 20 minutes of walking this study used two factor repeated measures ANOVA test. The study concluded that ALD tape showed higher RCSP during walking time as compared to MLD taping [13].

Hui Li Alvina Koh., *et al.* (2020) conducted a study on "Comfort and Ground Reaction Forces in Flat-Footed Female Runners: Comparison of Low-Dye Taping versus Sham Taping". This study was a single blind, randomized cross over study, in this study 15females participants were taken with the help of a-priori power analysis. Assessment of foot for all the participants was done on the basis of arch index AI, navicular drop test, resting calcaneal stance position (RCSP). The outcome measures of this study was comfort and ground reaction force. Through 150-mm visual analog scale comfort level was examined and through instrumented treadmill ground reaction force was assessed. The sham taping was used as a placebo effect and low dye taping was used to decrease foot pronation. Participants received two different taping and the outcome measurements were evaluated when participants were asked to run on a treadmill at 3 different speed under 2 taping conditions. In this study the statistical analyses was done by IBM™, SPSS™ Statistics (Version 24.0, SPSS Inc., Chicago, IL, USA). The normality of the VAS data for the comfort level was estimated by Shapiro-Wilk test. To compare the VAS scoring between low dye taping and sham taping paired t test was used. Here as compared to sham taping the VAS score in low dye taping was significantly reduced. In this study they took 8 biomechanical variables and to interpret the results the statistical analyses for all 8 variables, 3 speed, difference between the taping effects were evaluated by analysis of variance (ANOVA) with repeated measure. The study concluded that subject with low dye taping was less comfortable as compared to sham taping it is due to the tension of the tape which led to the restricted range of motion of the joint. Secondly low dye taping did not alter any ground reaction forces during running [14].

Ramin Beyranvand., *et al.* (2019) did quasi-experimental study on "The Effect of Ankle Kinesio Taping on the Explosive Power of Lower Limbs in Flat-Footed Volleyball Players". In this study they selected 60 male volleyball players based on the previous study, having a mean age of 20.1 ± 1.3 years. All the participants were randomly allocated into 2 groups, 30 subjects in both the groups. Real KT group was the experimental group where the KT tape was applied with the tension and Sham KT group was the control group, where tape was applied on the players without any tension. The inclusion criteria of this study was players who were having flatfoot, no history of fractures/surgery or major traumas in the lower limb, players with no history of neurological, joint or musculoskeletal problem also players were instructed not to involve in extreme physical activity with the lower limbs day before the test. In this study all the players were assessed through observation method,

Podoscope, navicular drop test was conducted to assess the flatfoot in all the players, also the player's lower limb explosive power was measured by Sargent Vertical Jump Test. All the parameters were assessed before taping, soon after application of kinesio taping in both the groups and another measurement was taken after 30 minutes of taping application. In this study obtained data was analysed by SPSS-20. To interpret the results between the experimental group and the control group mixed repeated measures ANOVA test was used. This study concluded that in the volleyball players presented with the flat footed lower limb KT taping method significantly increased the explosive power in the experiment group. Also the vertical jump test scores was also increased in KT taping group [15].

Dabie Wu., *et al.* (2014) conducted a experimental study in entitled "A Comparative Study between Taping and Medial Arch Support on EMG Activity of Selected Foot Muscles in Individuals with Flexible Flat Foot". In this experimental study they have selected the 30 subjects through random sampling method who were having flatfoot. The inclusion criteria was age of the participants between 18years to 26 years, both males and females should have flatfoot, more than 10mm of navicular drop should be present in the person. The exclusion criteria was subjects who were having any history of lower limb fractures, surgery or traumas, mental impairment, usage of lower limb orthosis, those who were allergic to rigid tape and complain of rashes, redness or discomfort. In this study, EMG activity for tibialis anterior and Peroneus Longus took as a outcome measure and analysed in four positions like single limb stance, relaxed bilateral stance, single limb stance after applying the modified low dye tape, this study used leuko sports tape, application of medial arch support in single limb stance and then in all positions EMG readings in both the muscles were taken. To interpret the results ANOVA test was used to analysis the EMG activity in both the muscles and to compare the results between modified low dye tape and medial arch support Bonferroni test for the pair wise comparison in EMG activity in both the muscles was used and Independent t-test was used. This study suggested that for controlling the muscles activity and anti pronation effect, both treatment modified low dye taping and medial arch support were found to be effective. But according to this study modified low dye taping was more effective in controlling muscular activity than medial arch support in case of excessive pronation [16].

So-jung Lee*., et al.* (2017) conducted a study entitled " Effect of taping therapy and inner arch support on plantar lower body alignment and gait" this study was done to investigate the effect of inner arch support and taping therapy on gait and lower limb alignment in the subjects presented with pes planus. This study took 13 females who were having flat foot in their's 20s. Secondly no injuries should be there in the lower limb or anywhere in the body. Here the experiment was conducted for 2 days. S1 and S2 were independent variable where S1 group of subject wore socks without any treatment and in another S2 subjects wore socks along with taping therapy and inner arch support. The dependent variable for this study were resting calcaneal stance position, maximum pressure in foot area, contact area, contact time, lower limb alignment angle, calcaneal pitch angle, Meary's angle. The data was analysed by using SPSS 23.0. This study did nonparametric test as the sample size was small. Study did Wilcoxon test to compare and to evaluate the alternation in RCSP, leg alignment, foot angle, plantar pressure distribution during wearing socks and during wearing test socks. The study concluded that after application of taping therapy and inner arch support there was a structural improvement and also during gait the pressure and the force were evenly distributed on the sole of the foot [17].

One-bin Lim., *et al.* (2020) conducted a study on "Comparison of the Effects of Barefoot, Kinesio Tape, and Dynamic Tape on Static and Dynamic Balance in Subjects With Asymptomatic Flexible". In this study 22 participants, both genders 9females and 13males were selected for the study purpose by using A priori power analysis with G*Power ver. 3.1.9.4. The inclusion criteria was asymptomatic flexible flatfoot, navicular drop test should be > 10 mm, leg length difference should be of < 5 mm. The exclusion criteria of the study was subjects allergic to tape, lower limb surgeries, referred or local plantar foot pain. The aim of this study was to examine the flexible flatfoot in three conditions when subjects was barefoot, kinesio tape, dynamic tape and to evaluate their effects by using Y-balance test for dynamic balance, 30 seconds of Static balance during standing to measures the center of pressure path length, Walking test by measuring the comparison of composite reach score, antero posterior and lateral variability. The statistical analysis was done by One-way repeated measures analysis of variance. The study concluded that dynamic tape and kinesio tape was effective in increasing the composite reach score in Y-balance test and dynamic taping during walking was found to be effective decreasing the antero-posterior and lateral variability [18].

Conclusion

All the 15 studies gave positive effects for the usage of different types of taping techniques/methods. None of the study reported

the negative impact of the taping method. From the above reviews we concluded that taping is a effective method to treat flatfoot and improved the outcome measures. Either it was a mechanotape, ALD, MLD taping, kinesio taping, kinematic taping, non-elastic taping, or low dye taping all these kinds of tape improved the outcome measures.

Bibliography

1. Marc A Raj., *et al*. "Pes Planus (2023).

2. Chamnanni Rungprai and Parinya Maneeprasopchoke. "A Clinical Approach to Diagnose Flatfoot Deformity". *Journal of Foot and Ankle Surgery (Asia Pacific)* 8.2 (2017): 48-54.

3. Zongyu Yang., *et al*. "Adult rigid flatfoot Triple arthrodesis and osteotomy". *Medicine (Baltimore)* 99.7 (2017): 18826.

4. J Karthikeyan., *et al*. "To Compare the Effectiveness of Taping and Arch Support on the Flexible Flat Foot on a Random Population". Indian Journal of Forensic Medicine and Toxicology 20.4 (2020): 7825-7832.

5. Joong-San Wang., *et al*. "Immediate effects of kinematic taping on lower extremity muscle tone and stiffness in flexible flat feet". *The Journal of Physical Therapy Science* 28.4 (2016): 1339-1342.

6. Jinteak Kim., *et al*. "Preliminary Study on the Comparison of Calcaneus Taping and Arch Taping Methods for Flexible Flatfoot Subjects". *Physical Therapy Korea 3*0.4 (2023): 281-287.

7. Seung-Min Lee., *et al*. "The Effect of Elastic and Non-Elastic Tape on Flat Foot". *Indian Journal of Science and Technology* 8.26 (2015): 1-5.

8. Alireza Tahmasbi., *et al*. "Comparison between the effects of tibialis posterior versus fibularis longus Kinesio taping on foot posture, physical performance, and dynamic balance in young women with flexible flatfoot". *Sport Sciences for Health* 19.1 (2023): 147-154.

9. Paramjeet Kaur and Ninderpreet Kaur. "Effect of Taping on Flexible Flat Foot - An Observational Study". *International Journal of Healthcare Science*s 6.1 (2018): 16-20.

10. Jong-Gun Lim., *et al*. "Effects of Elastic Taping and Non-elastic Taping on Static Balance Control Ability, Dynamic Balance Control Ability, and Navicular bone Drop in Young Adults". *Journal of The Korean Society of Physical Medicine* 17.2 (2022): 1-10.

11. Sung-shin Kim., *et al*. "Immediate Effects of Low-Dye Taping on the Ankle Motion and Ground Reaction Forces in the Pronated Rear-Foot During Gait". *Physical Therapy Korea* 23.1 (2016): 72-79.

12. Meihua Tang., *et al*. "Effects of taping techniques on arch deformation in adults with pes planus: A meta-analysis". *PLOS ONE* 16.7 (2021): e0253567.

13. Lin Wang. "Acute Effects of Athletic Taping Techniques on Calcaneus Frontal Motion in Young Female Adults with Flexible Flatfoot". *Biomedical Journal of Scientific and Technical Research* 54.1 (2023).

14. Hui Li Alvina Koh., *et al*. "Comfort and Ground Reaction Forces in Flat-Footed Female Runners: Comparison of Low-Dye Taping versus Sham Taping". *Journal of Sports Science and Medicine* 19.3 (2020): 620-626.

15. Ramin Beyranvand., *et al*. "The Effect of Ankle Kinesio Taping on the Explosive Power of Lower Limbs in Flat-Footed Volleyball Players". *International Journal of Sports Physical Therapy* 8.4 (2019): 393-406.

16. Dabie Wu and Navin Daniel Raj. "A Comparative Study between Taping and Medial Arch Support on EMG Activity of Selected Foot Muscles in Individuals with Flexible Flat Foot". *Indian Journal of Physiotherapy and Occupational Therapy - An International Journal* 8.4 (2014): 207.

17. Sojung Lee., *et al*. "Effect of Taping Therapy and Inner Arch Support on Plantar Lower Body Alignment and Gait". *Korean Journal of Applied Biomechanics* 27.3 (2017): 229-238.

18. One-bin Lim. "Comparison of the Effects of Barefoot, Kinesio Tape, and Dynamic Tape on Static and Dynamic Balance in Subjects with Asymptomatic Flexible". *Physical Therapy Korea* 27.1 (2020): 78-86.