Medicina Sportiva (2020), vol. XVI, no 2, 3238-3244
Journal of the Romanian Sports Medicine Society

Acute Effect of Kinesiological Taping on Balance, Endurance and Proprioception in Kickboxing and Boxing Athletes

Hüseyin Bora Saçar[1], Emine Atıcı[2]
[1]*Artvin Coruh University, Health Services Vocational School, Artvin, Turkey*
[2]*Istanbul Okan University, Faculty of Health Sciences, Istanbul, Turkey*

Abstract. This study aims to examine the acute effects of kinesiological taping performed to facilitate the quadriceps muscle used by the athletes of kickboxing and boxing, two separate self-defense sports which have similarities and differences, on balance, endurance and proprioception skills. *Material and Method*. The study included 34 athletes over the age of 18. Half of them were boxers while the other half were kickboxers. Kinesiological taping was performed on the athletes of both sports to facilitate the quadriceps muscle. 'Flamingo Balance Test' was performed to test athletes' static balance performances while dynamic balance performance was assessed with 'Y Balance Test'. Endurance was tested with 'Single Leg Squat' and 'Squat Test', and proprioception was assessed with 'Closed Kinematic Angle Reproduction Test'. These assessments were performed before banding and 50 minutes after the banding. IBM SPSS 20.0 was used to analyze the data. *Results.* The results of measurement performed before and after the implementation of kinesiological taping in the kickboxing group indicated a statistically significant difference in the right and left lower extremity Flamingo, Y Balance and Angle Reproduction tests ($p<0.05$). Single Leg Squat and Squat tests demonstrated no statistically significant difference between the right and left extremities ($p>0.05$). The results of measurement performed before and after the implementation of kinesiological taping in the boxing group indicated a statistically significant difference between the right and left lower extremity Flamingo and Angle Reproduction tests ($p<0.05$). Y Balance, Single Leg Squat and Squat tests demonstrated no statistically significant difference between the right and left extremities-($p>0.05$). *Conclusion.* Kinesiological taping yielded positive results for kickboxing and boxing athletes, including positively affecting the proprioception of athletes in both groups, however, it had no effects on the endurance levels of athletes in either group. All results were assessed on the bilateral lower extremities, and no difference was found between the extremities.
Key words: *balance, endurance, proprioception, boxing, kickboxing, kinesiological taping*.

Introduction

Short energy bursts are mainly provided by anaerobic metabolism in kickboxing. Anaerobic metabolism is effective for the intermittent kicks or punches thrown during kickboxing fights and the recovery achieved in the short breaks during these fights. As kickboxers perform many moves in fights, their physical and physiological needs are significant. Kickboxing is a dynamic sport that requires intense energy, which is divided into age, gender and body mass categories, and requires a mixed set of skills and tactical perfectness (1). Boxing is a sport requiring the use of the aerobic energy system, requiring intense energy and intermittent moves. Boxers need developed technical skills and high physical and physiological adaptation to avoid hits and achieve success in competition. The muscular strength in both upper and lower extremity is highly important for achieving victory and a key to the success in boxing (2).Maintaining contact with the ground and balance in fights, and using the quadriceps femoris muscle for displaying functional skills is as significant as using the lower extremity muscles in boxing and kickboxing. The agonist quadriceps muscle creates scissoring force on the tibia in the anterior direction during the normal activity of walking compared to the femur. The antagonist hamstring muscle resists this force so that the quadriceps muscle absorbs the load and ensures dynamic stability in the knee joint. In addition, weakness of quadriceps adversely affects daily life activities with a decrease in walking pace and skills of maintaining balance, climbing stairs and getting up from a sitting position. Therefore, strengthening the quadriceps femoris is important for developing functional skills and activities such as running that requires high performance and energy levels (3,4).The general effects of kinesiological taping (KT) include recoiling of the elastic fibers by ensuring adhesion over the upper skin layer, increasing the subcutaneous space and blood circulation and supporting the tissue to work comfortably. Certain researchers such as Macgregor et al. (2005) believe that the mechanism responsible for the effects of the band increases cutaneous afferent stimulation and motor unit

firing through neuro-facilitation and mechanic fixation (5).KT can facilitate the muscles in the direction of muscular contraction. Therefore, the taping should start from the origin of the muscle to improve movement and end at the insertion phase. The KT application can stimulate the muscular function due to its elastic characteristics. It is assumed that KT stimulates the cutaneous mechanoreceptors and increases the functionality of motor units. Moreover, according to relevant assumptions, KT stimulates the fascia by ensuring higher tension rates for the muscles and facilitating contraction (6).The function of the quadriceps muscle is a significant component for walking and sports performance. The quadriceps muscle affects endurance, balance and knee proprioception during a dynamic performance. KT potentially affects the functionality of the quadriceps muscle. However, the effects on balance, proprioception and endurance with a proper quadriceps' facilitation ensured with KT have yet to be studied for fighting sports.
This study examined acute effects of KT, which was performed through quadriceps facilitation, on balance, endurance and proprioception as KT is simple to use on boxing and kickboxing athletes.

Material and Method

Design. The Ethical Committee of Studies Regarding Scientific, Social and Non-Invasive Health Sciences at Istanbul Okan University gave necessary permission for the study. Each participant was informed about the study, and they were asked to give informed consent form.
The study included 34 athletes, half were boxing athletes while the others were kickboxers. The sample size was determined using GPower 3.1 program at 0.85 power rate, 0.05 error margin and 0.94 impact size and was developed at Kartal Efe Sports Club. The research subjects were selected from the people who had never experienced KT before.
Participants. Participants' characteristics included being over 18 years of age and participating in boxing or kick boxing professionally or as amateurs under the supervision of a professional trainer at a sports club. People who were over 65, have vestibular system disorder and suffer from lower extremity muscular, skeletal and neural system disorders were excluded.
Procedures. The athletes in the population were assessed for suitability based on the study criteria. The demographical characteristics of the athletes were recorded through an evaluation form. A limited information form including height, weight and lower extremity length information was recorded for use during the tests. KT was applied starting from the muscular origin toward the insertion area in the direction of muscular contraction to ensure facilitation on athletes' quadriceps femoris muscles. 'Flamingo Balance' and 'Y Balance' tests were performed to determine the effects of KT on balance. Moreover, 'Single Leg Squat Test (SLST)' and 'Squat' tests were done to see the effects on endurance, and 'Closed Kinematic Angle Reproduction Test (CKART)' was conducted to determine the effects on proprioception. The athletes were asked to keep the KT on for 50 minutes before the tests. Then they were asked to try the KT for once again not to cause fatigue before the initiation of tests which were implemented afterwards.
Flamingo Balance Test (FBT) was performed to determine static balance performance. FBT was performed with athletes' looking forward. Athletes were asked to stand on both feet on a wooden balance platform that was 50 cm in height, 4 cm in depth and 3 cm in width. The participants were asked to bring their inactive leg to a flexed position, retract the leg to their hip and hold their retracted leg with their hands at that side. They were asked to stay balanced in this position for a minute. The stopwatch was paused when they lost their balance (releasing the leg, falling from the balance board, contact of body with the ground). Athletes were asked to get on the balance board once again and the stopwatch continued. The test continued in this way for one minute. The test was stopped for the athletes who fell more than 15 times in 30 seconds, and they were scored zero (7).
Y Balance Test. Athletes were asked to stand on the center of 'Y-shaped' balance instrument, to maintain their balance while they were standing on one of their lower extremities, and to reach toward three different directions (anterior, posteromedial and posterior-lateral) with the free leg. They were told to reach the furthest point using the tip of their foot. While maintaining their balance, athletes were asked to return back to their initial position after each attempt. The test was stopped when athletes lost contact with their foot or failed to contact the access indicator with the tip of the other foot, and this score was not assessed. Test was scored by the measurement of the distance obtained by the athletes (8).
Single Leg Squat Test (SLST. Athletes were asked to squat with their knees at 45° flexion position and then they were asked to lift the other lower extremity from the ground and keep it in the full knee extension position. They were asked to keep their body in a fully straight position and to display full elbow extension

with their shoulders at a 90° flexion position. They were asked to maintain this position for as long as possible. The duration of maintaining the position was recorded at the completion of the test (9,10).
Squat Test. Athletes were asked to squat and stand successively for 30 seconds while they were in a standing position. The total number of squats were recorded (11,12).
Closed (Eyes) Kinematic Angle Reproduction Test (CKART. During the initial phase, athletes were asked to stand on one foot. The fulcrum of the goniometer was positioned on the lateral knee joint while one arm was in parallel to the trochanter major line and the other was in the direction of lateral malleolus line with the knee in an extended position. The goniometer was fixed to achieve reliable results. Athletes were asked to bring their knee into flexion from the extension position, and they were asked to hold the position when they were at 30° flexion position (approximately 10 degrees per second). After they held this position for four seconds, they were asked to extend their knee. They were asked to keep their eyes closed as they brought their knee into the 30° flexion position, the target degree. In conclusion, athletes' degree of deviation in the angle was recorded (13).
Facilitation Taping. KT was applied over and around muscles in a 'Y' shape while the athletes were lying on their backs with their knees dangling off the bed at a 90-degree flexion. The physiotherapist positions the center of the KT approximately ten centimeters under the center of rectus femoris at 0% tension rate. KT was applied to the skin covering the quadriceps femoris muscle at a light and moderate tension (25-50% of the current tension), then the tape was divided into two pieces between the quadriceps femoris and the patella, and ended on the tibial tubercula. KT pieces were positioned on the skin without applying tension when they are 2-5 centimeters away from the end point.
Statistical Analysis. Data were analyzed using Statistical Package for Social Sciences (SPSS) Version 20.0. Shapiro-Wilk test was used to determine whether normal distribution was present. The normally-distributed intra-group parameters were tested with Student's *t* Test while the abnormally-distributed parameters were assessed with Wilcoxon Test. Mann-Whitney U Test was used to perform comparisons between the groups. Significance was set at a 5% level ($p < 0.05$).

Results

This study was conducted to determine the effect of KT on balance, endurance and proprioception of 34 athletes. One half of them were kickboxing athletes while the others half were boxers. Both groups had 15 males and two female participants. The rate of males was 88% and 12% for females. Demographics and physical characteristics of the participants are shown in table 1.

Table 1. Demographics and Physical Characteristics of the Participants

Variables		**Athletes**	**N**	**Min**	**Max**	**Mean± SD**
Height (cm)		Boxing	**17**	164	182	1,72 ± 0,05
		Kickboxing	17	167	186	1,74 ± 0,05
Body Height (kg)		Boxing	**17**	48	75	65,88 ± 6,90
		Kickboxing	17	52	85	67,65 ± 9,06
Body Mass Index (kg/m^2)		Boxing	**17**	17,63	24,49	22,13 ±1,55
		Kickboxing	17	17,99	25,83	22,13 ±1,82
Age(yrs.)	Male	Boxing	15	18	50	21,93 ±7,74
		Kickboxing	15	18	55	24,07 ±10,45
	Female	Boxing	2	18	38	28 ± 10,00
		Kickboxing	2	25	35	30 ± 5,00

N=number, mean=average value, SD= Standard Deviation

Tests performed before KT practice indicated that static balance and proprioception parameters of kickboxing athletes were statistically and significantly better than those of boxing athletes ($p<0.05$). However, boxing athletes were statistically and significantly better in endurance tests compared to kickboxing athletes ($p<0.05$).

The results of the measurement (table 2)performed before and after the implementation of KT in the kickboxing group indicated a statistically significant difference in the right and left lower extremity in the Flamingo, Y Balance and Angle Reproduction tests ($p<0.05$).

Table 2. Test results of kick boxing and boxing athletes before and after taping

Variables	Leg	Assessment	Boxing (n=17) Mean ± SD	Kickboxing (n=17) Mean ± SD	*p*
Flamingo test, sec.	Right	Before KT	12,35 ± 2,95	10 ± 2,09	**0.014***
		After KT	9,41 ± 2,74	8,06 ± 2,35	0.139
		Pβ1	**0,000***	**0,003***	
	Left	Before KT	12,65 ± 2,76	11,76 ± 2,38	0.435
		After KT	10,29 ± 1,79	9,53 ± 2,00	0.209
		Pβ1	**0,005***	**0,005***	
Y Balance Test (cm)	Right	Before KT	0,74 ±0,06	0,73 ±0,01	0.361
		After KT	0,74 ±0,02	0,74±0,01	0.491
		Pβ2	0,556	**0,036***	
	Left	Before KT	0,74± 0,02	0,73 ± 0,02	1.000
		After KT	0,74 ± 0,02	0,74 ± 0,02	0.823
		Pβ2	0,797	**0,011***	
Single Leg Squat Test (SLST) (s)	Right	Before KT	31,47 ±5,45	29,12 ±4,67	0.332
		After KT	30,12 ± 4,89	28,65 ±5,31	0.690
		Pβ2	0,338	0,589	
	Left	Before KT	31,24 ±6,52	31,53 ±6,44	0.931
		After KT	30,59 ± 7,16	30,76 ± 5,87	0.945
		Pβ2	0,497	0,349	
Squat Test (number)	Right	Before KT	31,06 ± 5,66	23,06 ± 6,52	**0.001***
		After KT	30,82 ± 5,61	23,12 ± 6,64	**0.002***
		Pβ2	0,842	0,961	
	Left	Before KT	29,12 ± 5,98	24,24 ± 8,51	0.073
		After KT	27,94 ± 6,09	23,88 ± 7,53	0.133
		Pβ2	0,371	0,629	
Angle Reproduction Test (ART)	Right	Before KT	4,24 ± 1,43	3,47 ± 1,84	0.235
		After KT	0,76 ± 1,43	1,47 ± 2,45	0.302
		Pβ1	**0,000***	**0,007***	
	Left	Before KT	4,41 ± 1,372	3,35 ± 2,262	**0.041***
		After KT	2 ± 1,581	1 ± 1,225	0.055
		Pβ1	**0,001***	**0,001***	

Mean=Average Value, SD= Standard Deviation, p<0.05, KT: Kinesiotape, pγ: Mann-Whitney U Test, pβ1: Wilcoxon Test, pβ2: T Test*

The measurement results performed before and after the implementation of KT in the boxing group indicated a statistically significant difference in the right and left lower extremity Flamingo and Angle Reproduction tests ($p<0.05$). KT practice had statistically and significantly positive effects on the static and dynamic balance of kickboxing athletes ($p<0.05$). KT practice statistically and significantly increased the proprioception sense of both kickboxing and boxing athletes ($p<0.05$). However, KT had no effects on endurance in both groups. Regarding the squat test, significant difference was present between the groups before and after the taping on the right lower extremity ($p <0.05$).

Discussion and Conclusion

Results of the study indicated that KT practice had positive effects on the parameters of static and dynamic balance and proprioception for the kickboxing athletes but had no effects on endurance. Regarding the boxing athletes, KT positively affected static balance and proprioception but had no effects on dynamic balance and endurance parameters. The study performed for different sports branches (gymnastics, basketball and football) by Erkmen et al. (2007) have indicated that the dynamic balance skills of gymnastics athletes were only better than those of footballers, and that no difference regarding the maintenance of static balance was found for either branch (14). Perin et al. (1998) have compared the static balance test performance between judo, dance and control groups. No significant difference was found between the values of the athletes in the control group and in judoists. Under the conditions where visual input was blocked, judoists displayed significantly better performance than the dancers. As a result of the study, athletes with high scores were found to display developed balance control in relation to the requirements of each sports branch (15). This study indicated that static and dynamic balance parameters of kickboxing athletes were better than those of boxing athletes in the pre-taping tests. Results indicate that postural control was ensured as proprioceptive input increased due to the use of both lower and upper extremity by the kickboxing athletes, and that the functional stability was maintained accordingly. The KT practice performed on the university students by Cavanaugh et al. (2016) had no effects on balance(16).

The study performed on healthy young people by Nakajima et al. (2013) indicated that KT improved dynamic balance. Their study stated that the tension arising from KT might have increased the neural feedback during the movement of ankle and that balance improvement was possible but the tactile stimulant was not effective to the degree where muscular strength was increased when jumping was performed (17). The study performed on athletes by Hosp et al. (2017) indicated that KT improved balance significantly. According to that study, KT improved the decrease in balance skills arising from exercise-related fatigue. People with less than average balance skills benefited from KT more. Moreover, the most significant contribution of KT was to improve balance control and decrease the risk for sports-related injuries. Assuming that the improvements seen in knee proprioception with the use of KT would be reflected in the increased balance is logical (18). The study by Tekin et al. (2018) indicated that KT practice had no effect on the static balance of modern dancers but it positively affected dynamic and semi-dynamic balance (19).The present study showed that KT improved the static balance of both kickboxing and boxing athletes. However, the increase seen in the dynamic balance of kickboxing athletes was not seen for boxing athletes. The assessments made before taping indicated that kickboxing athletes were better than boxing athletes in both dynamic and static balance tests. This difference is believed to be attributed to the evidence that training performed by kickboxing athletes contained exercises that would stimulate the muscles, increasing the dynamic joint stability. The study performed on healthy and active people by Stedge et al. (2012) indicated that the KT application on the gastrocnemius muscle did not affect endurance. That study where two different methods were used also demonstrated that KT did not affect muscular performance and volume and blood circulation. No difference was found between both groups following the implementation of KT and placebo KT in that study. KT was found not to affect the endurance of healthy athletes (20). The study performed on healthy adults' rectus femoris by Lee et al. (2017) indicated that KT practice had no significant effects on endurance (21).Results from this study indicated that the endurance of boxing athletes was better than that of kickboxing athletes. This result is believed to be attributed to the evidence that training and performances of boxing athletes lasted longer and at a lower intensity. Eliminations and finals consist of three rounds in kickboxing which is a contact sport. Each round lasts two minutes, and breaks between each round last a minute. The duration of rounds is three minutes per fight with a minute of rest. Following taping, endurance parameters of neither groups increased. KT increased the endurance, however, in placebo groups in studies, which indicates that KT showed effects by boosting the motivation related to this parameter.

Different implementation durations and areas and different results can be present as studies are performed with different participants. The study performed by Park et al. (2016) has indicated that KT significantly improved the proprioception of paralyzed people and thus improved walking balance (22). Cho et al. have found that KT significantly improved proprioception of people with knee osteoarthritis (23).The study performed by Torres et al. (2016) to determine the effects of KT on proprioception of healthy people indicated no effects in this regard (24).In a study in which the immediate effect of KT on proprioception and the effect on day 1 and day 5, it was reported that the application period did not differ on proprioception. In this study, the immediate effect of KT was examined and the long-term effect was not examined (25).The results of this study indicated that proprioceptive sense parameter was better for kickboxing athletes before the implementation of banding. Significant difference regarding the left lower extremity was found between them. Considering the fact that the dominant extremity for most kickboxing athletes is the right extremity, proprioception sense might have increased as the extremity of the kickboxer contacting with the ground and receiving increased feedback regarding the sensory input was on the left side.

Following the KT implementation, proprioception sense of both kickboxing and boxing athletes significantly increased. Proprioceptive feedback is highly important for moving extremities while deliberately or non-deliberately knowing the status of the joints. Therefore, the improvement in dynamic joint stability is important for protection from sports injuries and rehabilitation. This result is a critical aspect of this study. Using KT on boxing and kickboxing athletes will be beneficial for reducing the rate of injuries during competition.

KT yielded positive results for kickboxing and boxing athletes, including positively affecting the proprioception of athletes in both groups; however, it had no effects on the endurance levels of athletes in either group. All results were assessed on the bilateral lower extremities, and no difference was found between the extremities.

Declaration of conflicting interests. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

1. Crisafulli A, Vitelli S, Cappai I, Milia R, Tocco F, Melis F, Concu A (2009). Physiological Responses and Energy Cost during a Simulation of a Muay Thai Boxing Match.*Appl. Physiol. Nutr. Metab;*34(2):143–150.
2. Chaabène H, Tabben M, Mkaouer B, Franchini E, Negra Y, Hammami Met al (2015). Amateur Boxing: Physical and Physiological Attributes. *Sports Med;* 45(3):337–352.
3. Segal, NA, Glass NA, Felson DT, Hurley M, Yang M, Nevitt M et al (2010). The effect of quadriceps strength and proprioception on risk for knee osteoarthritis. *Med. Sci Sports Exer*c; 42(11): 2081- 2088.
4. Eapen C, Nayak CD, Zulfeequer CP (2011). Effect of eccentric isotonic quadriceps muscle exercises on patellofemoral pain syndrome: an exploratory pilot study. *Asian J. Sports Med.* 2(4): 227-234.
5. Macgregor, K, Gerlach, S, Mellor, R, Hodges, PW (2005). Cutaneous Stimulation From Patella Tape Causes a Differential İncrease in Vasti Muscle Activity in People with Patellofemoral Pain. *J. Orthop. Res;*23: 351–358.
6. Nunes, GS, and friends (2013). Effect of kinesio taping on jumping and balance in athletes: a crossover randomized controlled trial. *J. Strength Cond Res;* 27(11): 3183-3189.
7. Deforche B, Lefevre J, d*e* Bourdeaudhuij I, HillsAP, Duquet, W, Bouckaert J (2003). Physical Witness and physical activity in obese and nonobese. *Flemish youth. Obes Res.* 11(3): 434–41.
8. Gribble PA, Hertel J, Plisky P (2012). Using the Star Excursion Balance Test to assess dynamic postural-control deficits and outcomes in lower extremity injury: a literature and systematic review. *J. Athl. Train;* 47: 339–57.
9. Weeks BK, Carty CP, Horan SA (2012).Kinematic predictors of single-leg squat performance: a comparison of experienced physiotherapists and student physiotherapists. *BMC Musculoskelet Disord*; 13: 207.DOI: 10.1186/1471-2474-13-207
10. Almangoush A, Herrington L, Jones R (2014).A preliminary reliability study of a qualitative scoring system of limb alignment during single leg squat. *Phys.Ther;* DOI: http://dx.doi.org/10.7243/2055-2386-1-2
11. Tarara DT, Hegedus EJ, Taylor JB (2014).Real-time test- retest and interrater reliability of select physical performance measures in physical active college-aged students. *Int. J. Sports Phys. Ther;* 9(7): 874-877.
12. Loudon, JK, and friends (2002). Intrarater reliability of functional performance tests for subjects with patellofemoral pain syndrome. *J. Athl. Train;* 37(3): 256-261.
13. Deshpande N, Connelly DM, Culham EG, Costigan PA (2003). Reliability and validity of ankle proprioceptive measures. *Arch. Phys. Med. Rehabil;*84(6): 883-889.

14. Erkmen N, Suveren S, Göktepe AS, Yazıcıoğlu K (2007). Farklı Branşlardaki Sporcuların Denge Performanslarının Karşılaştırılması. *SPORMETRE;*3: 115-122.
15. Perrin P, Schneider D, Deviterne D, Perrot C, Constantinescu L (1998). Training Improves The Adaptation to Changing Visual Conditions in Maintaining Human Posture Control in A Test of Sinusoidal Oscillation of The Support.*Neuroscience Letters;* 245(3): 155–158.
16. Cavanaugh MT, Quigley PJ, Hodgson DD, Reid JC, Behm DG (2016). Kinesiology Tape or Compression Sleeve Applied to The Thigh Does Not Improve Balance or Muscle Activation Before or Following Fatigue.*J. Strength Cond. Res;* 30(7): 1992–2000.
17. Nakajima MA, Baldridge C (2013). The Effect of Kinesio® Tape on Vertical Jump and Dynamic Postural Control.*Int. J. Sports Phys. Ther;*8(4): 393–406.
18. Hosp S, Folie R, Csapo R, HaslerM, NachbauerW (2017). Eccentric Exercise, Kinesiology Tape, and Balance in Healthy Men.*J. Athl. Train;* 52(7): 636–42.
19. Tekin D, Baltacı G, Agopyan A (2018). Proprioceptive Neuromuscular Training vs Kinesio Taping.*Med. Probl. Perform Art;* 33(3): 156–165.
20. Stedge HL, Kroskie RM, Docherty CL (2012). Kinesio Taping and The Circulation and Endurance Ratio of The Gastrocnemius Muscle.*J. Athl. Train.*; 47(6): 635–642.
21. Lee NH, Jung HC, Ok G, Lee S (2017). Acute Effects of Kinesio Taping on Muscle Function and Self-Perceived Fatigue Level in Healthy Adults.*Eur. J. Sport Sci;*17(6): 757–764.
22. Park, Y, Lee, J (2016). Effects of Proprioceptive Sense-Based Kinesio Taping on Walking Imbalance.*J. Phys. Ther. Sci;*28(11): 3060–3062.
23. Cho, H, Yoon, YW (2015). Kinesio Taping Improves Pain, Range of Motion, and Proprioception in Older Patients with Knee Osteoarthritis: A Randomized Controlled Trial.*Am. J. Phys. Med. Rehabil;* 94(3): 192-200.
24. Torres R, Trindade R, Gonçalves RS (2016). The Effect of Kinesiology Tape on Knee Proprioception in Healthy Subjects.. *J. Bodyw. Mov. Ther;* 20(4): 857-862.
25. Karatosun HS, Demir HM, Atalay YB, Cetin C (2019). Does KinesioTape application to thigh muscles affect muscle strength, proprioception and jumping on the following days? *Medicina Sportiva , Journal of Romanian Sports Medicine Society*; 15(2): 3112-3119.

Corresponding Author
Emine Atıcı
Department of Physiotherapy and Rehabilitation,
Istanbul Okan University, Faculty of Health Sciences,
Istanbul, Turkey,
E-mail address: *emimert@gmail.com*

Received: August 23, 2020 Accepted: November 28, 2020