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ORIGINAL ARTICLE

Effects of Muscle Energy Technique and Stretching Exercise on Pain, Hip Joint Range of Motion and Function in Working Pregnant Women with Piriformis Syndrome

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ABSTRACT

Background: Piriformis syndrome is a neuromuscular disorder characterized by pain, paresthesia, and numbness in the gluteal region and along the distribution of the sciatic nerve. It is commonly managed using therapeutic interventions such as Muscle Energy Technique (MET).

Objective: To determine the effects of muscle energy technique Efficacy of Therapeutic Exercise Protocols on Hip Range of Motion and Pain in Pregnant Women with Occupational Piriformis Syndrome

Methods: A randomized clinical trial was conducted at THQ Kamoke, Gujranwala, with 28 participants selected through non-probability convenience sampling. After informed consent, participants were randomly assigned to either the MET group or the stretching exercise group. Interventions lasted eight weeks with three sessions per week. Outcomes were measured using the Numerical Pain Rating Scale (NPRS), Lower Extremity Functional Scale (LEFS), and a goniometer for hip internal rotation ROM. Pre- and post-intervention data were analyzed using SPSS 22.

Results: Both groups showed significant improvements ($p < 0.05$) in pain, ROM, and function. NPRS scores improved from a mean of 6.27 to 0.14, LEFS from 0.14 to 6.13, and internal hip rotation ROM from 0.8 to 2.0. Post-intervention, stretching exercises showed slightly greater effectiveness than MET.

Conclusion: The study found that stretching exercises and muscular energy techniques reduce pain, increase hip joint ROM and function in working pregnant women with piriformis syndrome. However, stretching exercise is more effective than muscle energy technique.

Keywords: Muscle energy technique, Pain, Piriformis syndrome, Stretching exercises, Range of motion.

INTRODUCTION

Piriformis Syndrome (PS) is a rare, painful neuromuscular condition caused by the piriformis muscle, which compresses or irritations the sciatic nerve, causing numbness, tingling, and pain in the hip, buttock, and posterior thigh[(1)]. PS is more prevalent in women, with a female-to-male ratio of 6:1. This higher incidence may be attributed to anatomical differences in pelvic structure, variations in Q-angle, and hormonal changes during pregnancy. The syndrome often results from muscle overuse, prolonged sitting, repetitive activities such as

rowing, or prolonged standing. Diagnosis is challenging due to the lack of definitive clinical tests and its frequent misidentification as sciatica[2]. This condition is often misdiagnosed or ignored due to its similar symptoms to other conditions like lumbar radiculopathy, sacroiliac, trochanteric, bursa inflammation, and intervertebral disc inflammation. It is also known as wallet sciatica, socket neuropathy, and wallet syndrome[3].

Pregnancy brings about biomechanical, hormonal, and circulatory changes that may result in a wide range of musculoskeletal issues[4]. Pregnant women's mobility starts to deteriorate in the third trimester of their pregnancies due to the anatomical and physiological changes that occur during pregnancy, which can result in muscular imbalance. Many studies are conducted to identify and treat low back pain in pregnant women during the third trimester of pregnancy, which worsens after 15-20 minutes of standing, sitting, or lying while performing office tasks. The pain may radiate from the sacrum to the gluteal area and back of the thighs. Other symptoms include foot numbness, abdominal, pelvic, and inguinal pain[5].

Musculoskeletal disorders often cause pain in the gluteal region, affecting the hamstrings or calf. Manual therapies like Muscle Energy Technique (MET) help manage pain and improve joint mobility[6]. Stretching, massages, core stability drills, soft tissue and joint mobilizations, myofascial release, proprioceptive neuromuscular facilitation (PNF), Muscle energy technique (MET), and electrotherapeutic modalities like ultrasound are some of the interventions used in physiotherapy[7]. Stretching exercises, including static, ballistic, PNF, and self- or manual stretching, are a conservative treatment for PS, enhancing flexibility and range of motion[8].

Studies show that MET and stretching are effective in managing musculoskeletal conditions, with MET improving flexibility and core strengthening exercises reducing pain and dysfunction in patients with sacroiliac joint dysfunction, and post-isometric relaxation and active release techniques enhancing hip ROM[3].

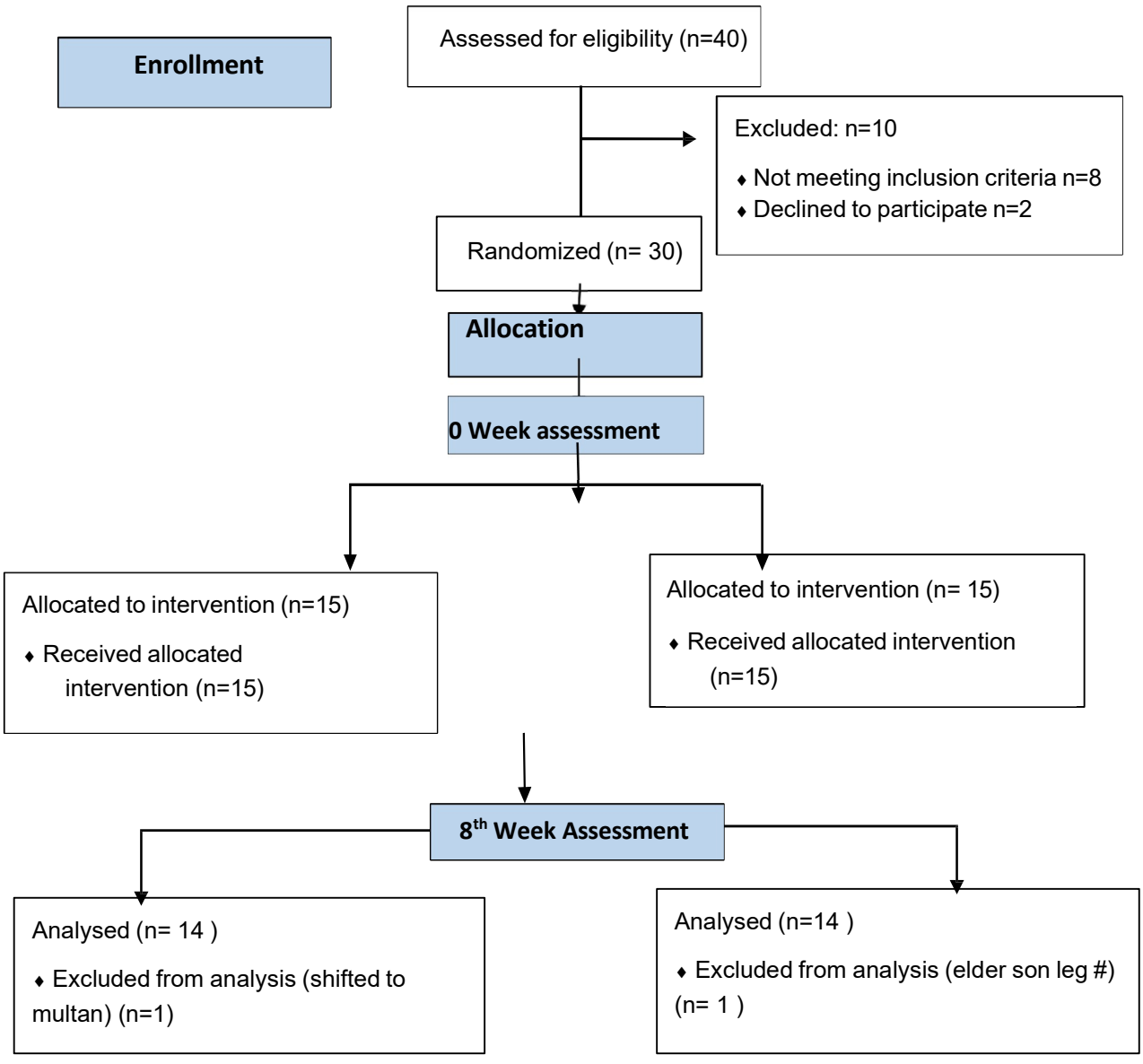
Current study can provide way to reduce pain, improve function and increase of hip joint range of motion that is disrupted by piriformis syndrome. This can help a lot of pregnant women who are working and have piriformis syndrome, which causes discomfort, tingling, and numbness in the buttocks and along the sciatic nerve, which interferes with their everyday activities and Effects of MET and Stretching Exercise on Pain, Hip Joint ROM and Function in Working Pregnant Women with PS Page 6 employment, such walking and standing for an extended period of time while giving a lecture. Lengthy sitting in a chair or bed while using a laptop or computer at home or in the office. We can instantly alleviate the symptoms by using MET, stretching exercises, and good posture. This could expand significantly in the interests of patients, doctors, and the general health of women.

MATERIALS AND METHODS

A randomized clinical trial (Clinical Trial Registry No: F21C14G92005) was conducted at THQ Hospital, Kamoke, District Gujranwala, to compare the effects of Muscle Energy Technique (MET) and stretching exercises on pain, hip joint range of motion (ROM), and function in working pregnant women with piriformis syndrome. A total of 30 participants were initially screened, and 28 who met the eligibility criteria were selected and randomly assigned to two groups: Group A (n=14) received MET, and Group B (n=14) received stretching exercises. The sample size was calculated using baseline NPRS values (mean 1 = 6, variance = 1.4; mean 2 = 7.3, variance = 1.5) with a confidence level of 95% and power of 80%, resulting in a sample size of 28. An additional 10% was added to account for possible attrition, bringing the total to 30 participants[9]. Participants were selected using a non-probability convenience sampling technique and randomly allocated using the lottery method. The study was completed over six months following approval from the Board of Advanced Studies and Research (BASR .Inclusion criteria included women aged 25–45 years, currently employed and in the second trimester of pregnancy, presenting with piriformis muscle tenderness, chronic non-specific low back pain, and positive findings on at least three special tests (FAIR, Freiberg, and Pace tests). Additional criteria included a Straight Leg Raise (SLR) less than 60 degrees and internal hip rotation less than 45 degrees. Exclusion criteria were a history of vertebral fractures, spinal surgery, lumbar disc lesions, spinal stenosis, spondylolisthesis, degenerative joint disease, sacroiliac joint dysfunction, spinal tuberculosis, rheumatoid disease, preeclampsia, gestational diabetes, or a negative SLR test. .Outcome measures included the Numerical Pain Rating Scale (NPRS) to assess pain intensity, the Lower Extremity Functional Scale (LEFS) to evaluate functional status, and a standard goniometer to measure internal hip rotation. Baseline assessments were conducted before the intervention, and post-treatment assessments were performed at the end of the eight-week intervention. Group A underwent MET sessions four times per week for eight weeks. The technique involved positioning the patient supine with the affected leg flexed and crossed over the opposite leg. Isometric contraction in abduction was performed for 7–10 seconds, followed by passive adduction held for 10–30 seconds. Group B received static stretching exercises performed in the same

position, with passive abduction and internal rotation of the hip to the pain-tolerable range, held for 30 seconds and repeated 3–5 times per session, also four times per week for eight weeks. All data were analyzed using SPSS version 22. Blinding was not applied in this study.

Data Analysis Procedure:
The study used SPSS version 22 for data analysis, with the Shapiro-Wilk test assessing normality. Parametric tests were applied, including paired sample t-tests for within-group comparisons and independent sample t-tests for between-group comparisons.



Consort diagram

RESULTS

Twenty-eight pregnant women were randomly assigned to two groups: Muscle Energy Technique (n = 14) and Stretching Exercise (n = 14). The Shapiro-Wilk test showed that all baseline data (NPRS, LEFS, and hip internal rotation ROM) were normally distributed ($p > 0.05$), so parametric tests were applied.

Figure 2 showed that, MET group included 60% Primiparous pregnant women and 40% multiparous pregnant women.

Within-group analysis showed that both groups had statistically significant improvements in pain, function, and hip mobility ($p < 0.001$). However, the Stretching Exercise group showed greater improvements in all outcomes compared to the MET group.

Pain (NPRS): Stretching group reduced from 6.60 to 3.33; MET reduced from 6.27 to 3.47.
Function (LEFS): Stretching improved from 33.26 to 66.40; MET from 33.13 to 60.26.
Hip ROM: Stretching improved from 28.93° to 40.93°; MET from 29.73° to 38.93°.
Between-group analysis also confirmed that the stretching group had significantly better outcomes post-treatment ($p < 0.001$ for all variables), indicating it was more effective than the Muscle Energy Technique.

Table 2 describes across the group comparison of internal rotation ROM. The p-value was .125 before to the treatment, which was not statistically significant. The p value after the treatment was that is < 0.05. This demonstrates that the treatment was successful in improving the range of motion (ROM) of the hip joint for the patients

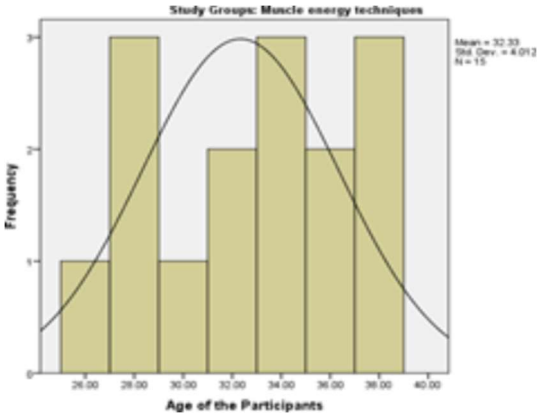


Figure 1: Histogram of Age (MET group)

In the muscle energy technique group, the mean age of the participants was 32.33 4.01 years.

Table 3 describes across the group comparison of LEFS. The p-value was 0.871 prior to the treatment, which was not statistically significant. Following the treatment, the p value was 0.001 that is < 0.05. This demonstrates that following therapy, functional ability on the LEFS greatly increased, and the treatment was also successful for the patients.

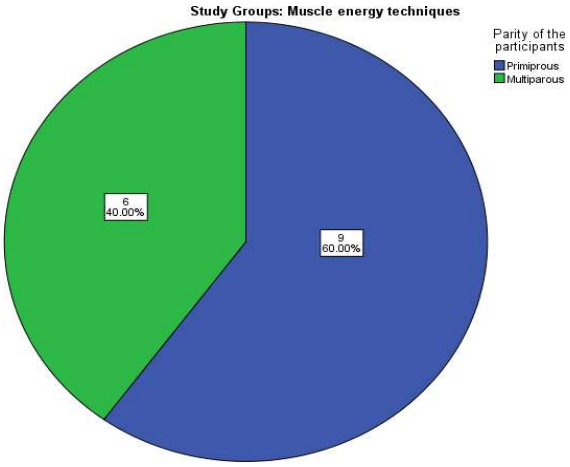


Figure 2: Pie Chart of PARITY (MET group)

Table 1. Comparison of Pre- and Post-Treatment Scores Between Muscle Energy Technique and Stretching Exercise Groups

Outcome	Group	Pre-Treatment (Mean ± SD)	Post-Treatment (Mean ± SD)	Mean Difference	p-value
NPRS	MET	6.27 ± 0.70	3.47 ± 0.56	2.8	0.001
	Stretching	6.60 ± 0.63	3.33 ± 0.49	3.27	0.001
LEFS	MET	33.13 ± 2.44	60.26 ± 1.62	27.13	0.001
	Stretching	33.26 ± 1.98	66.40 ± 2.69	33.14	0.001
Internal Rotation ROM (°)	MET	29.73 ± 1.63	38.93 ± 0.79	9.2	0.001
	Stretching	28.93 ± 1.18	40.93 ± 1.28	12	0.001

Table 2: Across the group comparison of INTERNAL ROTATION ROM (Independent sample T test)

Variable	Muscle Energy Technique	Aerobic Exercises	Mean Difference	P-Value
	Mean ± SD	Mean ± SD		
Pre-treatment Internal rotation ROM	29.73 ± 1.63	28.93 ± 1.09	0.8	.125
Post-treatment Internal rotation ROM	38.93 ± 0.79	40.93 ± 1.27	2.0	.001

Table 3: Across the group comparison of LEFS (Independent sample T test)

Variable	Muscle Energy Technique	Stretching Exercise	Mean Difference	P-Value
	Mean ± SD	Mean ± SD		
Pre-treatment LEFS score	33.13 ± 2.45	33.27 ± 1.98	0.14	0.871
Post-treatment LEFS score	60.27 ± 1.62	66.40 ± 2.89	6.13	.001

DISCUSSION

The aim of the current study was to compare the effects of muscle energy technique and stretching exercise on pain, hip joint range of motion and function in working pregnant women with piriformis syndrome. The results of the current study, showed that there was significant improvement in the values of NPRS, LEFS and internal rotation ROM of hip joint post interventions in MET group as compared with the pre- intervention values, there was also a significant improvement in NPRS, LEFS and internal rotation ROM of hip joint post-intervention values compared with the pre-intervention values in the stretching exercise group. Even though both treatments options when comparing both groups, were found to be effective. Between both groups there were statistically significant difference as there was significant improvement in the NPRS, LEFS and IR ROM values post interventions in stretching exercise group. The stretching exercise group was better treatment technique as compared to muscle energy technique group in pregnant women with piriformis syndrome.

According to literature a study conducted on Comparison of the Muscle Energy Technique's effectiveness with static stretching in subjects with tight Piriformis in male office workers. In that writing, there were male subjects[9-11]. In current study the included participants are females (working pregnant women).

In 2020, S Rajendran, SS Sundaram et al, conducted a research on how myofascial release compares to stretching for female college students with piriformis syndrome in terms of discomfort and range of motion. In this study the included females age between 19-25 years[11-13]. In current study the author includes the participants with age group 25-45.

In the research on the effectiveness of stretching and muscle energy approach in piriformis syndrome patients. According to the VAS score comparing the two groups, A (muscle energy technique) and B (stretching exercise), the difference between the post-test value (.000***) and the pre-test value (.328) is statistically significant. The statistical difference between the post-test result (.000***) and the pre-test value (.352*) is also well demonstrated by the LEFS score between Groups A and B. A statistically significant difference (14-16) (.000***) between pre- and post-tests may be seen in the VAS and LEFS scores of Groups A and B. The results of the study revealed that short wave diathermy and stretching exercises were significantly different when group A used the muscle energy technique[1]. In contrast to current study across the group comparison of Numeric pain rating scale showed before the treatment, the p-value 0.183 which was not statistically significant. After the treatment, the p value was .001 that is <0.05. This shows that the pain intensity on the Numeric pain rating scale improved significantly after the treatment and the treatment also proved to be effective for the patients. Across the group comparison of LEFS showed before the treatment, the p-value was 0.871 which was not significant statistically. After the treatment, p value was 0.001 that is <0.05. This shows that functional ability on the LEFS improved significantly after the treatment and the treatment also proved to be effective for the patients. This study conclude that stretching exercise showed greater significant difference as compared to muscle energy technique.

Previous literature on PIR and stretching exercise effects on piriformis syndrome . 30 participants were chosen and divided into groups A and B at random. Both groups improved after 10 days of therapy, however group A (PIR) demonstrated a substantial reduction in pain, the amount of hip internal rotation, and the level of disability as measured by the MODQ, compared to group B (stretching exercises) alone[15-19]. In contrast to current study stretching exercise showed greater decrease in pain, hip joint ROM and function in working pregnant women with piriformis syndrome.

Results of this study supported who conducted study on effects of stretching exercise and self myofascial release in piriformis syndrome. It concluded that stretching exercise is effective for piriformis syndrome[18,20]. The results of current study also revealed that stretching exercise is more effective in reduced pain, ROM of hip joint and function in pregnant women with piriformis syndrome.

A study was done, according to the literature, to assess the effects of eccentric muscular energy technique vs. static stretching exercises combined with cervical segmental mobilization in the treatment of upper cross syndrome in those who have neck discomfort. While patients in 2nd group engaged in static stretching

exercises and cervical segmental mobilization, patients in 1st group got therapy using the eccentric muscle energy technique. Each patient underwent two sessions every week for three weeks while being assessed using the neck impairment index, visual analogue scale, and tragus-to-wall distance. The passive cervical range of motion was measured with an inclinometer. Prior to the initiation of the treatment and three weeks afterwards, data were collected. Both Group A's static stretching and Group B's eccentric muscle energy approach involve stretching. The investigation's findings indicate that eccentric muscular energy strategy and static stretching both lessen discomfort, improve cervical range of motion, and lessen neck damage[19,21,22]. In contrast to current study stretching exercise has significant effect in reducing pain, ROM and function in piriformis syndrome.

The study compare Muscle Energy Technique and static stretching for subjects who worked in offices and had tight Piriformis. The subjects for this study are individuals with positive Active Piriformis Test findings and those who satisfy the inclusion criteria. Results were evaluated using ROM and LEFS. For both groups, the outcome measures were evaluated before the treatment (pretest) and again four weeks later (posttest). A statistical analysis was done on the data. Statistics show that muscle energy Technique is superior to static stretching in terms of effectiveness[21-27]. In contrast to my study stretching exercise is more effective in reducing pain, hip internal rotation ROM and function in pregnant women with piriformis syndrome. The aim of the study was to found whether stretching exercises and tissue mobilization techniques were effective for treating patients with piriformis syndrome. The study involved the participants, who were divided into 2 groups. Stretching exercises with a hot pack are in group A; tissue mobilization technique is in group B. For a total of four weeks, each group met twice a week. In terms of pain outcome metrics, the study demonstrated that stretching exercises were more effective than tissue mobilization techniques[28-31]. In current study stretching exercise is also more beneficial in decreasing pain, increase hip internal rotation ROM and function in piriformis syndrome.

The participants' psychological barrier was one of the study's primary drawbacks. Exercise during pregnancy was seen with fear or reluctance by many pregnant women. Because of this, each participant needed personal assurance and education to allay worries about the safety of therapeutic interventions. Furthermore, constant involvement and commitment to the treatment plan were difficult to guarantee due to the lack of knowledge regarding the advantages of exercise during pregnancy. The participants' general responsiveness and commitment might have been affected by these circumstances**.**

Future research on pregnant patients with piriformis syndrome should compare stretching exercises with a broader variety of physiotherapeutic approaches, including neural mobilization, myofascial release, and core stability. Future studies should examine the possible additive effects of combining the Muscle Energy Technique and stretching exercises, as both were found to be beneficial in reducing discomfort, increasing hip joint range of motion, and enhancing functional ability. To promote the formulation of evidence-based treatment guidelines for piriformis syndrome in the pregnant population and to confirm the stability of these outcomes, longer-term studies with bigger sample numbers and follow-up evaluations are required.

CONCLUSION

The study found that both Muscle Energy Technique (MET) and stretching exercises effectively reduce pain, increase hip joint ROM, and improve functional capacity in pregnant women with piriformis syndrome, with stretching being a more beneficial standalone treatment.

DECELARATION

Acknowledgement
We would Like to Acknowledge our collegues and paramedical staff of hospital for supporting us for data collection and making current study possible.

Authors contribution: Each author of this article fulfilled following Criteria of Authorship:

1. Conception and design of or acquisition of data or analysis and interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
3. Final approval of the version for publication.

All authors agree to be responsible for all aspects of their research work.

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Data availability
The data that support the fndings of this study are available from the corresponding author, upon reasonable request.

Ethics approval
This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by Ethics Committee of Ziauddin University, Karachi.

Consent to participate
Informed consent was obtained from all individual participants included in the study.

Competing interests
The authors declare that the research was conducted in the absence of any commercial or fnancial relationships that could be construed as a potential confict of interest.

Conflict of interest
The authors declared no conflict of interest.

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