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A COMPARATIVE STUDY OF THE IMMEDIATE EFFECTS OF ELECTROTHERAPY MODALITY COMBINED WITH YOGA IN PATIENTS WITH LOWER BACK PAIN

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Abstract

Background: *Low back pain (LBP) is a common musculoskeletal complaint that can restrict movement and daily activities. Physiotherapy may combine physical modalities with therapeutic exercise, but the immediate comparative effects of TENS and superficial heat alongside cobra extension exercise require further study.*

Objective: *To compare the immediate effects of TENS plus cobra extension exercise with hot pack plus cobra extension exercise on pain and lumbar range of motion in young adults with nonspecific LBP.*

Methods: *This experimental pre–post study included 30 male participants aged 18–28 years, purposively divided into two groups of 15. Group 1 received TENS and Group 2 received a hot pack; both groups then performed cobra extension exercise. Each modality was applied for 15 minutes. Exercise was performed for three minutes over three sets, with 30-second rests. Pain was assessed using a visual analogue scale (VAS), and lumbar flexion and extension were measured using a universal goniometer. Data were analysed in SPSS version 23.*

Results: *Mean VAS scores decreased from 1.80 (SD 0.775) to 1.47 (SD 0.743) in the TENS group and from 2.20 (SD 0.414) to 1.53 (SD 0.640) in the hot-pack group. Flexion increased from 58.27° to 61.73° and from 51.67° to 53.80°, respectively. Extension increased from 27.33° to 30.93° and from 19.13° to 21.47°. Group-by-time interactions were not significant for pain (p=.218), flexion (p=.307), or extension (p=.537).*

Conclusion: *Both treatment combinations were associated with immediate improvements, but the analysis did not demonstrate a significant difference in change between groups. Findings are limited by the small, all-male sample and immediate assessment only.*

Introduction

Low back pain (LBP) is commonly described as the pain or discomfort which is felt between the lower costal margin and the inferior gluteal folds of an individual, with or without symptoms that are referred or radiating. It is one of the most common reason for seeking healthcare and can also affect the physical function, work

participation, and quality of life of any individual. Although LBP may arise from a range of specific pathologies, many presentations are classified as nonspecific when a single structural cause cannot be established. Factors that promote the prognosis of LBP are associated with persistent symptoms which include greater intensity of pain, higher body weight, work that is physically demanding, difficult working postures, and psychological distress (Nieminen et al., 2021). The burden of LBP is just not the immediate experience of pain but it can also involve factors which are physical, occupational, and psychosocial in nature.

Management of nonspecific LBP which is commonly advised is composed of, exercise-based rehabilitation, and selected non-pharmacological interventions. Evidence reviews indicate that exercise approaches can differ in their effects, and that no single exercise programme is appropriate for every patient in their overall pain management and betterment (Hayden et al., 2021; Owen et al., 2020). Yoga-based interventions have also been investigated. Reviews suggest that yoga may improve pain and disability compared with non-exercise controls, while outcomes can be broadly comparable with other forms of therapeutic exercise (Zhu et al., 2020). The cobra posture is an extension-based movement involving controlled spinal extension. In this study it was used as a standardised exercise component rather than as a complete yoga programme.

Physical modalities may be used alongside exercise to provide short-term symptom relief. Transcutaneous electrical nerve stimulation (TENS) delivers electrical stimulation through surface electrodes and is commonly used with the intention of modulating pain. The gate-control model proposes that stimulation of large-diameter sensory afferents can influence nociceptive transmission in the spinal dorsal horn. Superficial heat, delivered through a hot pack, is another commonly used intervention. Heating may increase local circulation, promote relaxation, and alter sensory input from the treated area. Both approaches are used in clinical practice, although responses may vary between individuals.

The thesis on which this article is based compared TENS plus cobra extension exercise with hot pack plus cobra extension exercise in young adults with nonspecific LBP. Its rationale was to examine whether one modality, when paired with the same exercise, produced greater immediate changes in pain and lumbar movement. The present article reports that comparison, focusing on the outcomes and statistical results documented in the original research. The objective was to compare immediate pre–post changes in pain intensity, lumbar flexion, and lumbar extension between the two treatment groups.

Materials and Methods

Study design and setting

An experimental pre–post comparative study was conducted, with data collected from different physiotherapy clinics. The thesis reports a study duration of six months after approval of the synopsis. The study was designed to assess immediate changes following one treatment session; it did not report longer-term follow-up.

Participants and sampling

Thirty male adults aged 18–28 years with nonspecific LBP participated. Purposive sampling was used, and participants were divided into two equal groups: 15 received TENS with cobra extension exercise (Group 1), and 15 received hot pack with cobra extension exercise (Group 2). Inclusion criteria were nonspecific LBP, age between 18 and 28 years, male sex, and willingness to participate. Exclusion criteria included chronic back pain, lumbar radiculopathy, disc bulge or herniation, spinal stenosis, metabolic disorders, recent injury, and spinal injury. The thesis also lists unwillingness to participate as an exclusion criterion.

Intervention procedures

Group 1 received TENS for 15 minutes, followed by cobra extension exercise. Group 2 received a hot pack for 15 minutes, followed by the same cobra extension exercise. The exercise component was prescribed for three minutes over three sets, with a 30-second rest between sets, as described in the thesis. The use of the same exercise in both groups was intended to allow comparison of the two physical modalities

when delivered with a common movement-based component. Detailed TENS parameters, electrode placement, hot-pack temperature, protective layering, and the precise number of cobra repetitions were not specified in the thesis and are therefore not reported here.

Outcome measures

Pain intensity was assessed before and after treatment using a visual analogue scale. The thesis describes the scale as ranging from 0 (no pain) to 10 (severe pain), with 5 representing moderate pain. Lumbar flexion and extension range of motion were assessed using a universal goniometer. Measurements were recorded before and after the intervention.

Statistical analysis

Data were analysed using SPSS version 23. The thesis methods section mentions paired t-tests for pre–post comparisons. However, the results chapter also presents within-subject contrasts and between-subject effects from a repeated-measures model. Accordingly, the reported model statistics are presented as recorded in the thesis. A p-value below .05 was treated as statistically significant in interpreting the reported tests. The thesis does not provide confidence intervals, effect sizes, or a complete account of assumptions testing.

Ethical considerations

The thesis reports that permission was obtained from the Institutional Ethical Review Committee of University of Karachi. Written informed consent was obtained from participants. Participant data were coded, and confidentiality was maintained. Participation was voluntary, and participants were informed of their right to withdraw.

Results

Participant characteristics

The study included 30 male participants. The age distribution was as follows: 6 participants (20.0%) were aged 18–20 years, 11 (36.7%) were aged 21–23 years, 9 (30.0%) were aged 24–26 years, and 4 (13.3%) were aged 27 years or older. Each intervention group contained 15 participants.

Pain intensity

In Group 1, the mean VAS score decreased from 1.80 (SD 0.775) before treatment to 1.47 (SD 0.743) after treatment. In Group 2, the mean decreased from 2.20 (SD 0.414) to 1.53 (SD 0.640). Thus, both groups showed lower mean pain scores at post-assessment. The reported within-subject effect for pain was statistically significant ($F=14.318$, $p=.001$), indicating an overall pre–post change. The group-by-time interaction was not statistically significant ($F=1.591$, $p=.218$), so the analysis did not establish that the magnitude of change differed between the two treatment groups.

Lumbar flexion

Mean lumbar flexion in Group 1 increased from 58.27° (SD 2.434) at baseline to 61.73° (SD 3.058) after treatment. In Group 2, it increased from 51.67° (SD 8.958) to 53.80° (SD 8.866). The reported within-subject effect was statistically significant ($F=19.063$, $p<.001$). The group-by-time interaction was not statistically significant ($F=1.081$, $p=.307$). The reported between-subject effect for group was statistically significant ($F=9.792$, $p=.004$); however, the groups already differed in their baseline flexion means. This between-group result should therefore not be interpreted as proof that one intervention produced a greater treatment response.

Lumbar extension

Mean lumbar extension increased in Group 1 from 27.33° (SD 3.539) to 30.93° (SD 9.430). In Group 2, the mean increased from 19.13° (SD 3.159) to 21.47° (SD 3.226). The reported within-subject effect was statistically significant ($F=8.567$, $p=.007$), while the group-by-time interaction was not ($F=.390$, $p=.537$). The between-subject effect for group was statistically significant ($F=25.718$, $p<.001$), but the baseline extension means were also different. Therefore, this finding indicates an overall group difference in the model, not a demonstrated difference in immediate improvement attributable to the treatment modality.

Overall, the descriptive results show improvement in the measured outcomes in both groups. For all three outcomes, the group-by-time interaction was not statistically significant.

Discussion

This study compared the immediate effects of TENS and hot pack, each combined with cobra extension exercise, in young male adults with nonspecific LBP. Mean pain scores declined in both groups, while mean lumbar flexion and extension increased. Overall pre–post effects were statistically significant, but none of the group-by-time interactions was significant. Thus, results show immediate improvement after both treatment combinations in this sample, without establishing superiority of either modality. The mean VAS score was decreased from 1.80 to 1.47 in the TENS group and from 2.20 to 1.53 in the hot-pack group. These changes are consistent with the possibility that both interventions, when followed by the same exercise, may contribute to short-term symptom relief. Common explanation for TENS is associated with pain-modulation mechanisms, such as the gate-control theory described in the thesis. Superficial heat can be comforting because it warms, increases local blood flow, and relaxes. Physiological mechanisms were not measured in the study hence these explanations are theoretical and not demonstrated effects of the dataset.

Lumbar flexion improvement was 3.46° in the TENS group and 2.13° in the hot-pack group. The extension was increased by 3.60° and 2.34°, respectively. These descriptive changes might relate to decreased pain-related guarding or short-term responses to the combination intervention. Disability, activity limitation, patient global improvement, and persistence of change, however, were not assessed. Therefore it is unclear whether observed changes led to meaningful improvements in daily function. This interpretation is based on the absence of significant group-by-time interactions. The mean values of flexion and extension were higher in the TENS group before and after treatment. ” The large between-subject effects reported for these outcomes may, in part, reflect baseline differences and should not be interpreted as evidence of greater improvement due to TENS. A larger randomized study with similar baseline characteristics and a baseline-adjusted analysis would be a more powerful test of comparative effectiveness.

The findings can be considered in relation to previous work on exercise and yoga for LBP. Certain exercise approaches such as Pilates and McKenzie therapy may be more effective than other types of exercise for pain or functional limitation in adults with chronic LBP (Hayden et al., 2021). Zhu et al. (2020) concluded that yoga may improve pain and disability compared with non-exercise interventions, but may have similar effects as other exercise programs. The studies are relevant to movement care, but do not specifically validate the short cobra extension protocol used here. This study should not be considered a test of a comprehensive yoga program.

The study also mirrors the clinical interest in non-pharmacological interventions. Traeger et al. (2019) emphasized the importance of avoiding unnecessary medicalized care and enabling appropriate physical and psychological management. Exercise and self-management are still valuable elements in continuing care for back pain (Kongsted et al., 2021). Physical modalities can therefore be viewed as adjuncts rather than substitutes to a rehabilitation program assessed for the individual.

The strength and generalizability of the findings are limited by several factors. The sample was only 30 men, which were selected on purpose. The small sample and small group of participants are noted as limitations in the thesis itself. Underrepresentation of women, older adults, and a wider variety of clinical presentations were noted. Assessment immediately after treatment cannot determine whether improvements were sustained. Further, the thesis does not define the TENS frequency, pulse duration, intensity, electrode placement, hot-pack temperature, or the exact number of repetitions of the cobra. Such omissions limit reproducibility.

Fix reporting problems before submitting to a journal. The methods section describes paired t tests, but the results tables display within subject contrasts and between subject effects for a repeated measures model. The descriptions of the participants are also inconsistent: the methods refer to physiotherapy clinics, the discussion mentions physiotherapy students and physiotherapists, and the limitations mention medical students. Verify recruitment detail and statistical procedure by checking original data set

and records. The thesis does not report a sample-size calculation, allocation method other than purposive division, assessor blinding or confidence intervals. Supporting documentation may not be provided retrospectively for these details.

Future studies should include larger and more heterogeneous samples, randomization where feasible, standardization of modality parameters and blinding of outcome assessors where possible. Longer follow up and other outcomes such as disability and functional performance are needed to establish clinical relevance and durability. The evidence would be strengthened by a pre-specified statistical plan and full reporting of the intervention.

Conclusion

Both TENS plus cobra extension exercise and hot pack plus cobra extension exercise were followed by immediate reductions in mean pain scores and increases in lumbar flexion and extension in this sample of young men with nonspecific LBP. Although overall pre–post changes were statistically significant, group-by-time interactions were not. The study therefore does not demonstrate that either modality is superior. The findings are preliminary and should be interpreted in view of the small purposive sample, baseline differences in range of motion, limited intervention detail, and absence of follow-up. Larger, methodologically rigorous studies are recommended.

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