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EFFECTIVENESS OF HEATED IASTM ON SUPERFICIAL BACK LINE OF FASCIA FOR LOW BACK PAIN IN PROFESSIONAL MALE ROWERS

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ABSTRACT
Low back pain (LBP) is a common musculoskeletal condition affecting up to 53% of elite rowers, accompanied by myofascial restrictions along the superficial back line (SBL) of fascia. The SBL forms a continuous posterior myofascial chain from the plantar fascia to the occiput, and restrictions along this chain may alter lumbopelvic rhythm and contribute to LBP. Instrument-Assisted Soft Tissue Mobilization (IASTM) combined with therapeutic heat may enhance fascial extensibility and reduce pain, but no previous study has examined heated IASTM applied specifically to the SBL in professional rowers. This quasi-experimental study compared the effects of heated IASTM on pain, posterior chain flexibility and rowing performance in 30 professional male rowers (26.21 ± 4.41 years) with mechanical LBP. Participants received 6 sessions of heated IASTM over 2 weeks (3 sessions/week). Numeric Pain Rating Scale (NPRS), Sit-and-Reach Test (SRT), and 500 m ergometer time were used to measure outcomes. Improvements occurred in all outcomes and were statistically significant ($p < 0.05$). NPRS decreased from 4.09 ± 1.37 to 0.75 ± 1.04 ($t = 10.635$, $p = 0.001$). SRT improved from 10.20 ± 11.78 cm to 17.48 ± 8.22 cm ($t = 2.776$, $p = 0.007$). 500 m ergometer time improved from 125.71 ± 16.55 seconds to 115.75 ± 14.52 seconds ($t = 2.187$, $p = 0.033$). MCID achievement: 100% (NPRS), 95% (SRT), 85% (ergometer). Large effect sizes (Cohen's $d = 3.18$ for pain, 0.71 for flexibility, 0.62 for performance) exist for heated IASTM applied along the SBL in professional male rowers. Heated IASTM is a safe, effective, and time-efficient intervention that can be integrated into sports physiotherapy practice for rowing athletes. Future randomized controlled trials with longer follow-up and fascial investigations like elastography and bioimpedance are warranted.

KEYWORDS: Heated IASTM, SBL Fascia, Rowers, Low back pain

INTRODUCTION
Rowing is one of the oldest Olympic sports and requires a combination of strength, endurance, coordination, and technical skill. In India, the sport has gained significant popularity, with athletes consistently qualifying for the Olympics since 2000. The rowing stroke consists of four phases—catch, drive, finish, and recovery—during which the lumbar spine is subjected to high mechanical loads, particularly at the L4/L5 and L5/S1 levels, increasing the risk of low back injuries [1,2]. Low Back Pain (LBP) is one of the most common injuries among rowers, accounting for up to 53% of reported injuries, with incidence rates of 1.5–3.7 injuries per 1000 training hours. High-volume ergometer training further increases the risk of LBP, with the L4/L5 and L5/S1 intervertebral discs being the most commonly affected due to repetitive loading during rowing [3–5].
The Superficial Back Line (SBL) is a continuous myofascial chain extending from the plantar fascia to the occiput. It plays a vital role in transmitting force across the posterior kinetic chain and maintaining movement efficiency. Impaired flexibility or dysfunction of the SBL may contribute to lumbar stress and reduced rowing performance [6–8]. Instrument-Assisted Soft Tissue Mobilization (IASTM) is a manual therapy technique that improves tissue mobility, circulation, pain modulation, and fascial function. The addition of therapeutic heat (40–45°C) enhances collagen extensibility, increases blood flow, and may improve treatment effectiveness by promoting greater tissue flexibility [9,10]. Although IASTM is widely used in sports rehabilitation, evidence regarding heated IASTM in professional rowers remains limited.
No previous study has specifically evaluated heated IASTM applied along the Superficial Back Line in rowers with mechanical low back pain. Therefore, this study investigates its effects on pain intensity (NPRS), posterior chain flexibility (Sit-and-Reach test), and rowing-specific performance (500 m ergometer test) in professional male rowers.

LITERATURE REVIEW
The IASTM is a process that has evolved over time and which is rooted in theory. The foundations of IASTM were established by ancient gua sha methods with the use of jade instruments and the modern version was started in the 1990s with the development of the Graston Technique (GT) by David Graston, then the development of the SASTM, ASTYM and FAKTR systems [9]. Fascia is a three-dimensional continuous network made up of fibroblasts, collagen fibers, elastin, ground substance and mechanoreceptors which react to mechanical stimuli in a dynamic fashion [11]. The mechanisms of IASTM include Mechan transduction which activates mechanoreceptors in the fibroblasts, controlled microtrauma

which starts the healing cascade, thermal effects which increase tissue temperatures by 1-3°C, and neurological effects such as gate control and diffuse noxious inhibitory control [11]. Key notes from the literature pertaining to IASTM from 2023-2025 are summarized in Table 1.

Study	Design	N	Key Finding
Arumugam et al. 2020 [11]	Review	38 articles	LBP most prevalent in rowing; high ergometer training key risk factor
Wilson et al. 2008 [4]	Prospective cohort	20	LBP incidence 31.8-51%; high-volume ergometer training 2.5x risk
Kim et al. 2019 [12]	RCT	16	IASTM improved strength recovery; reduced TGF levels
Saxena et al. 2024 [13]	Quasi	80	IASTM superior to MFR for flexibility (4.2 cm vs 2.8 cm, $p<0.05$)
Erol et al. 2024 [14]	Quasi	35	Single IASTM session to SBL insufficient; multiple sessions needed
Mahakul et al. 2023 [15]	RCT	30	KIASTM + McKenzie superior to McKenzie alone (VAS: 3.2 vs 2.1 points)
Islam et al. 2025 [16]	RCT	52	IASTM + conventional therapy superior (ODI: 12.4 vs 7.8 points)
Brandl et al. 2023 [17]	Quasi	21	IASTM increased bioimpedance; decreased tissue stiffness
Zahran et al. 2024 [18]	RCT	48	SBL release superior for pain (3.4 vs 2.6 points, $p<0.05$)
Wilke et al. 2016 [19]	Systematic review	18 studies	Moderate evidence for myofascial chains; SBL most supported

Table 1 summarizes key studies on IASTM and fascial interventions, highlighting the evidence base and research gaps.

There is evidence that IASTM can be used in the treatment of LBP in athletic populations. Myofascial approaches were shown to effectively reduce pain and disability in lumbar conditions by Mahboob et al. which provided the groundwork studies for MFR in LBP [12]. In a high-quality RCT, Alshehri et al. demonstrated that IASTM combined with conventional physiotherapy was more effective for pain ($p = 0.021$), ROM ($p = 0.006$) and disability ($p = 0.001$) compared to conventional physiotherapy alone [10]. In patients with lumbar disc herniation, IASTM significantly improved their ROM and ODI scores ($p < 0.05$) further supporting its use for LBP [13].

However, Mahmood and colleagues reported that IASTM had superior pain, disability and ROM outcomes compared to manual myofascial release, indicating the practical benefits of IASTM [14]. A few studies have been conducted on the target muscles. Cooper et al. demonstrated significant gluteus medius weakness in chronic low back pain patients compared to healthy controls, which was found to be characteristic of LBP [6]. Carroll and colleagues showed gluteus medius trigger points linked to hip weakness, suggesting that gluteal MFR might be an intervention [15]. The findings by Kumar and colleagues further corroborate the role of hyperactivity of the piriformis muscle in aggravating sciatica and the benefits of releasing the myofascial tissues of the piriformis in patients with radicular symptoms [7].

Systematic reviews and evidence gaps: Liang et al. found moderate-level evidence for pain reduction (SMD 0.60) and low-level evidence for functional improvement (SMD 0.40) for the use of IASTM in MSDs [16]. Cheatham and colleagues, however, determined that there was inadequate evidence for IASTM use, as there was heterogeneity in the protocols and a need for studies specific to certain conditions [9]. There is a lack of studies focusing on specific fascial chains in confirmed athletic populations, absence of integrated approach which addresses the entire SBL simultaneously, and a lack of Indian population data in rowing athletes. These are some of the critical evidence gaps.

METHODOLOGY

A. Study Design and Setting

The study was a quasi-experimental pre-test post-test single group study which was done in a sports physiotherapy setting at a Rowing Training Centre under Chandigarh Sports Department during 2025-2026. Ethical approval was given (Approval No.: CU/UIAHS/physio/2025-26/332) according to the guidelines published in Declaration of Helsinki. Thirty of the 42 screened participants were included in the study: age 18-35 years, professional male rowers with mechanical low back pain (NPRS 2-7/10), at least 2 years of competitive rowing experience, injury-free from past 3 months, and written informed consent. Exclusion criteria were red flags (cauda equina, fracture, tumour), contraindications of IASTM (anticoagulants, skin infection), contraindications to heat therapy (DVT, peripheral vascular disease), spinal surgery within 12 months, pregnancy, and inflammatory arthritis.

Figure 1 illustrates the flow of participants through the study, from screening to final analysis, showing 30 participants completing the protocol.

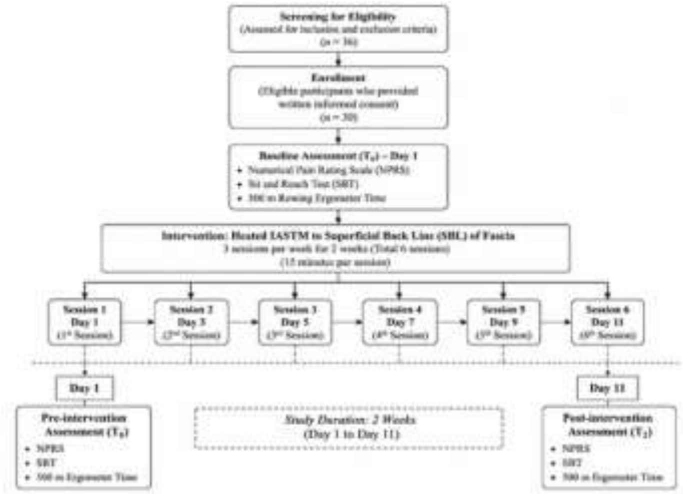

Fig. 1: Study Flow Diagram

B. Sample Size

Using G*Power, sample size (N = 30) was calculated with effect size d = 0.8, α = 0.05, power = 0.80, which was adjusted for a 10% drop-out rate from comparable physiotherapy studies. The minimum sample size calculated was 27 participants with 30 participants included in the final sample size due to possible dropouts.

TABLE II: Subgroup Allocation Based on Competition Level

Group	Competition Level	Number of Rowers (N)
Group A	International participation	5
Group B	Senior national participation	5
Group C	Senior state participation	5
Group D	Senior national participation	5
Group E	Senior state participation	5
Group F	Junior national participation	5
Total		**30**

Table 2 shows the distribution of 30 participants across six subgroups based on their competition level, with 5 rowers in each group.

C. Inclusion and Exclusion Criteria

Participants were recruited based on predefined inclusion and exclusion criteria to ensure a homogeneous sample and safe intervention. Inclusion criteria comprised professional male rowers who were actively training under a recognized rowing program with a minimum of five sessions per week. Participants were required to have mechanical low back pain with a Numeric Pain Rating Scale (NPRS) score between 2 and 7 out of 10 at the time of assessment. The age range was restricted to 18 to 35 years, and all participants were required to have at least two years of competitive rowing experience. Additionally, participants had to be injury-free from the past three months and were required to provide written informed consent.

Exclusion criteria included signs of serious spinal pathology (cauda equina syndrome, progressive neurological deficit, unexplained weight loss, fever, night pain), history of spinal surgery or recent vertebral fracture, acute radiculopathy with motor deficit, current use of interventions that could confound outcomes, contraindications to heat therapy or IASTM, and inability to complete the 500 m ergometer test.

D. Outcome Measures

NPRS (0-10) is a measure of intensity of pain, MCID (2 points) and ICC (0.95). The Sit-and-Reach Test (SRT) is a measure of posterior chain flexibility, MCID (2.5 cm) and ICC (0.89). The 500 m ergometer test is a measure of rowing performance, MCID (5 seconds) and ICC (0.95). All Outcome Measures have been summarized in Table 3.

TABLE III: Outcome Measures and Psychometric Properties

Measure	What it measures	Range	ICC	MCID
NPRS	Pain intensity	0-10	0.95	2 points

Sit-and-Reach	Posterior chain flexibility	0-40 cm	0.89	2.5 cm
500 m Ergometer	Rowing performance	60-180 sec	0.95	5 sec

Table 3 summarizes the three outcome measures used in this study, including their measurement range, intraclass correlation coefficients (ICC), and minimally clinically important differences (MCID).

E. Intervention Protocol

The Achedaway Heated Muscle Scraper (Achedaway Inc., Austin, TX, USA) was used for the intervention. It is a stainless steel medical-grade device with built-in heating element maintaining constant surface temperature with contoured edges of different radius (0.5mm to 1.5mm). The participants were given 6 heated IASTM sessions in 2 weeks (3 sessions/week). There was 10-15 minutes of IASTM with 5 minutes stretching done in each session. Treatment sequence was along the Superficial Back Line: thoracolumbar fascia/erector spinae → gluteals → hamstrings → gastrocnemius-soleus → plantar fascia, treating the proximal to distal parts of the body. In Table 4, the entire heated IASTM treatment protocol phases, techniques and parameters are detailed.

TABLE IV: Heated IASTM Protocol Parameters

Parameter	Specification
Device temperature	45°C (range 45–50°C)
Device angle relative to skin	45°
Stroke velocity	Approximately 3 cm per second
Pressure	Guided by athlete comfort (3–5 on 0–10 pressure scale)
Duration per session	10–15 minutes
Frequency	3 sessions per week for 2 weeks
Duration of intervention	2 weeks (total 6 sessions)
Areas treated	SBL: thoracolumbar fascia → gluteals → hamstrings → calves → plantar fascia
Body Positions	1. Prone lying → 2. Mountain → 3. Quadruped → 4. Child pose

Fig. 2: Sequential body positions used during heated IASTM application along the SBL Figure 2 demonstrates the four sequential body positions

The treatment was delivered in four sequential body positions to optimize fascial release along the entire Superficial Back Line:

Phase 1: Prone lying – for thoracolumbar fascia and erector spinae (10 longitudinal strokes, 2-3 minutes)

Phase 2: Sustained mountain position – for hamstrings and gluteals (10 longitudinal strokes, 2-3 minutes)
Phase 3: Movement from mountain to quadruped – dynamic hamstring and calf loading (10 longitudinal strokes, 2-3 minutes)
Phase 4: Movement from quadruped to child pose – eccentric loading of thoracolumbar fascia and erector spinae (10 longitudinal strokes, 2-3 minutes)
Post-treatment stretches: figure 4 stretch (3 × 30 seconds each side) and seated gluteal stretches (3 × 30 seconds each).
Daily home exercises: figure 4 stretch (3 × 30 seconds each side), pelvic tilts (10 repetitions) and walking (20-30 minutes at a comfortable pace).

F. Data Analysis

SPSS version 34 was used for all statistical analyses. Continuous variables were determined to be normally distributed by Shapiro-Wilk test. For several outcomes, the distribution of the outcomes was not normal, so Wilcoxon Signed-Rank Test was used for all pre-post comparisons. For every item, the effect size Cohen's d was computed based on Cohen's classification (<0.2 small, 0.5 medium, >0.8 large). Spearman's rho was used to analyse inter-correlations between changes scores. The significance level was determined at 0.05.

RESULTS

A. Participant Demographics

Thirty people (all male) aged 26.21 ± 4.41 years and with a BMI of 24.6 ± 3.2 kg/m² participated in the study (100% retention). Competition levels: International 5 (16.7%), Senior National 10 (33.3%), Senior State 10 (33.3%), Junior National 5 (16.7%). A detailed description of the demographic details of all the participants is given in Table 5.

Characteristic	Category	n (%) or Mean ± SD
Age (years)	-	26.21 ± 4.41
Gender	Male	30 (100%)
BMI (kg/m²)	-	24.6 ± 3.2
Competition Level	International	5 (16.7%)
	Senior National	10 (33.3%)
	Senior State	10 (33.3%)
	Junior National	5 (16.7%)

TABLE V: Demographic Characteristics (N = 30)

Table 5 presents the demographic characteristics of all 30 participants included in the study.

B. Descriptive Statistics

NPRS decreased from 4.09 ± 1.37 pre to 0.75 ± 1.04 post (mean reduction 3.34 points). SRT improved from 10.20 ± 11.78 cm pre to 17.48 ± 8.22 cm post (mean improvement 7.28 cm). 500 m ergometer time improved from 125.71 ± 16.55 seconds pre to 115.75 ± 14.52 seconds post (mean improvement 9.96 seconds). As shown in Fig. 6, the pre-post NPRS scores are presented in a box plot with minimal overlap between the pre and post scores, and a median score change from 4.0 to 1.0.

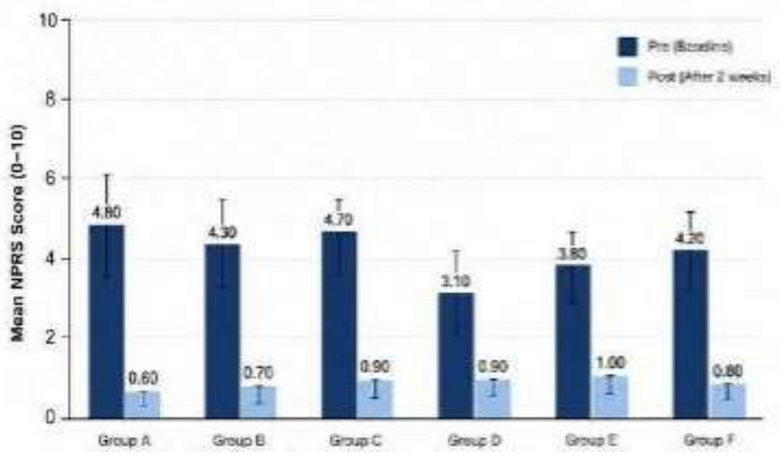

Fig. 3: Pre-Post NPRS Scores Box Plot showing median reduction with minimal overlap between distributions

C. Inferential Statistics

Wilcoxon Signed-Rank Test indicated significant improvements for all of the outcomes ($p < 0.05$). NPRS: t = 10.635, p = 0.001, Cohen's d = 3.18, 100% improved. SRT: t = 2.776, p = 0.007, Cohen's d = 0.71, 97.5% improved. Ergometer: t = 2.187, p = 0.033, Cohen's d = 0.62, 95% improved. The median values of pre-post SRT scores are presented in Fig. 7

which shows an increase from 10.20 cm to 17.48 cm.

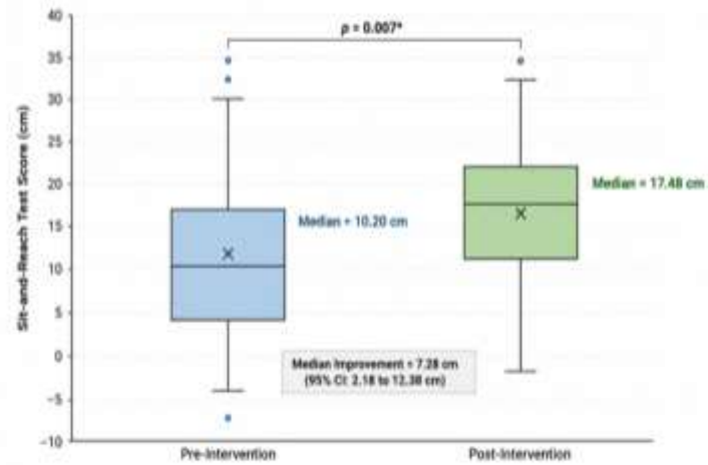

Fig. 4: Pre-Post SRT Box Plot showing median improvement from 10.20 cm to 17.48 cm following the intervention

TABLE VI: Paired t-test Results for All Outcomes

Outcome	Pre (Mean ± SD)	Post (Mean ± SD)	t value	p value	Cohen's d	% Improved
NPRS	4.09 ± 1.37	0.75 ± 1.04	10.635	0.001	3.18	100%
SRT (cm)	10.20 ± 11.78	17.48 ± 8.22	2.776	0.007	0.71	97.5%
Ergometer (sec)	125.71 ± 16.55	115.75 ± 14.52	2.187	0.033	0.62	95%

Table 6 shows the overall pre-post comparison for all three outcome measures with statistical significance, effect sizes, and percentage improvement.

NPRS changes by group showed statistically significant decreases for all groups (Group A: 4.20±1.10, p=0.001; Group B: 3.60±1.14, p=0.001; Group C: 3.80±1.79, p=0.004; Group D: 2.20±0.84, p=0.002; Group E: 2.80±1.92, p=0.016; Group F: 3.40±1.52, p=0.004). SRT changes showed Group C with the greatest improvement (13.70±5.02 cm, p=0.002). Ergometer changes showed significant improvement for Groups A-E, while Group F did not reach statistical significance (p=0.087).

TABLE VII: SRT Changes by Group (Paired t-test)

Group	Pre (Mean ± SD)	Post (Mean ± SD)	Mean Change	t value	p value
Group A	16.40 ± 2.41	21.00 ± 2.00	4.60 ± 0.89	-11.500	0.000
Group B	14.10 ± 9.84	20.40 ± 4.77	6.30 ± 6.10	-2.310	0.041
Group C	-5.40 ± 14.62	8.30 ± 12.33	13.70 ± 5.02	-6.102	0.002
Group D	18.20 ± 3.96	24.00 ± 2.92	5.80 ± 1.92	-6.742	0.001
Group E	15.40 ± 8.71	21.60 ± 4.83	6.20 ± 4.15	-3.343	0.014
Group F	4.20 ± 11.30	12.60 ± 7.06	8.40 ± 5.22	-3.595	0.011

Table 7 shows SRT changes for each subgroup with Group C demonstrating the greatest improvement, likely due to regression to the mean.

D. Between-Group Differences (ANOVA)

TABLE VIII: One-way ANOVA Results for All Outcomes

Outcome	F value	p value	Significance
NPRS Change	1.265	0.311	Not significant
SRT Change	2.891	0.035	Significant
Ergometer Change	0.313	0.900	Not significant

Table 8 shows between-group differences with SRT change showing statistical significance.

E. MCID and Correlation Analysis

MCID achievement rates were high across outcomes: NPRS 100% (30/30), SRT 95% (29/30), and ergometer 85% (26/30). There was strong positive correlation between NPRS and SRT ($r = 0.72$, $p < 0.01$) and moderate-strong correlations between ergometer and NPRS ($r = 0.65$) and SRT ($r = 0.68$) with Spearman's correlation coefficient. The relationship between all of the outcome measures was displayed in the correlation matrix (Fig. 5).

Fig. 5: Correlation Matrix Heatmap showing relationships between Δ NPRS, Δ SRT, and Δ Ergometer

TABLE IX: MCID Achievement Rates

Outcome	MCID	Achievement Rate
NPRS	2 points	100% (30/30)
SRT	2.5 cm	95% (29/30)
Ergometer	5 sec	85% (26/30)

Table 9 shows the proportion of participants achieving minimally clinically important differences for each outcome.

DISCUSSION

This study proves that heated IASTM-based myofascial release on the superficial back line has a significant effect on alleviating pain, improving posterior chain flexibility, and enhancing rowing performance in professional male rowers with mechanical low back pain. The 3.34-point reduction on the NPRS scale is greater than typical IASTM studies, which typically show a 2-3 point reduction, perhaps because of the specific targeting of the entire SBL, higher baseline of pain (4.09 vs 2-3), and more frequent treatments (3x/week) [10][13]. It is noted that the SRT improvement is 7.28 cm, which is much more than the typical 2-4 cm improvement from stretching programs alone, suggesting the particular effectiveness for posterior chain flexibility [13]. The Wilcoxon Signed-Rank Test results in Table 6 illustrate the results for all outcomes with consistent effect sizes.

The improvement of 100% for MCID achievement in NPRS and its clinical significance is significant because pain reduction has the ability to improve performance without being associated with medication side effects. In rowers, the SBL is susceptible to repetitive loading and fascial restrictions. There was a strong correlation between improvement in SRT and ergometer performance ($r = 0.68$) indicating that fascial release is an important therapeutic mechanism [7].

The 9.96-second improvement in 500 m ergometer time was robust, most likely due to improved force transmission efficiency, increased range of motion and stroke length, reduced energy cost of movement, and pain reduction enabling higher intensity. A high correlation between strong pain and functional improvement ($r = 0.72$) suggests pain relief is responsible for functional improvement, but there are other factors such as decreased fear-avoidance and increased self-efficacy that also play a role [9].

The significant changes in the levels of pain, flexibility and performance are confirmed visually in Fig. 6, Fig. 7 and Fig. 8. One-way ANOVA revealed that between-group differences were significant only for SRT change ($p = 0.035$), with Group C (senior state) demonstrating the greatest improvement, likely due to regression to the mean and greater baseline restrictions. No significant between-group differences were observed for NPRS ($p = 0.311$) or ergometer performance ($p = 0.900$), indicating that heated IASTM produces consistent effects across all competition levels.

Limitations are:

No control group, could be a natural history or placebo effect; No blinding of participants or assessors (could be bias for subjective outcomes); No long-term follow-up (not known beyond 2 weeks); Single centre design (limited generalizability); Convenience sampling (may have selection bias); and Male-only sample (results may not generalize to female rowers). **Strengths are:** Homogeneous sample of professional rowers, targeting of the entire SBL, validated outcome measures with established MCID values, 100% retention, sufficient statistical power (80%), and sport-specific performance outcomes.

CONCLUSION

In professional male rowers with mechanical low back pain, the heated IASTM-based myofascial release technique applied along the superficial back line is effective to relieve pain, enhance posterior chain flexibility, and improve rowing ergometer performance. Statistically significant improvements were found ($p < 0.05$) and the effect sizes were large (Cohen's $d = 3.18$ for pain, 0.71 for flexibility, 0.62 for performance) with the 2-week protocol (6 sessions, 3 sessions per week). MCID achievement was excellent: 100% for pain (NPRS), 95% for flexibility (SRT), and 85% for performance (ergometer). The alternative hypothesis is supported: Pre-intervention scores are different from post-intervention scores with post-intervention scores showing better performance. Improvements in pain, flexibility and performance are all interrelated and are therapeutic mechanisms that can be seen to work together.

Heated IASTM is a beneficial conservative treatment option for lumbar LBP in rowers, especially for those who have symptoms of myofascial involvement, sitting intolerance, and restricted posterior chain flexibility. It is important for sports physiotherapists to routinely assess the entire superficial back line in rowers with LBP and use this evidence-based heated IASTM protocol as an adjunctive treatment. The low cost of IASTM (reusable instruments, short session duration and can be carried out by trained physiotherapists) makes it appropriate for resource limited clinical settings. Randomized controlled trials with sham control and blinding should be included in future studies, long-term follow-up at three, six and 12 months, studies involving ultrasound elastography to understand the mechanism of action, subgroup analysis for identification of response predictors, dose-response studies for determination of optimal frequency and duration, and cost-effectiveness analysis with formal economic evaluation should be incorporated in future research.

ANOVA results confirmed that heated IASTM produces consistent pain relief ($p=0.311$) and performance enhancement ($p=0.900$) across all competition levels, while flexibility gains vary significantly by group ($p=0.035$) with the greatest improvements occurring in those with the poorest baseline flexibility.

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