C L I N I C A L V A L I D A T I O N R E P O R T

Photobiomodulation evidence dossier for sports medicine, post-surgical recovery, orthopaedics, and physiotherapy

Dongguan Viotin Technology Co., Ltd. · Natura / Onlux clinical line

Field	Entry
Document number	NAT-CVR-MSK-001
Revision	B — 9 October 2026
Document type	Clinical evidence / scientific validation dossier
Product family	Viotin Red Light Therapy Pad; seven outlines, one optical engine
Manufacturer / sponsor	Dongguan Viotin Technology Co., Ltd. / Industrious Services Pty Ltd, Miami QLD
Optical engine	470, 660, 830, 950 nm; Mode 1 red/NIR, Mode 2 adds 470 nm blue
Verified output	Mean contact irradiance 30 mW/cm2; 27 J/cm2 per 15-minute session
Intended reader	Orthopaedic surgeons, sports physicians, physiotherapists, pain clinicians
Evidence basis	Device case series plus peer-reviewed PBM literature at overlapping dose
Status	Rev B. Dose uses verified contact output of the representative pad. For clinician review.

1. Purpose and scope

This report assembles the clinical and scientific basis for using the Viotin Red Light Therapy Pad family (Natura / Onlux clinical line) as an adjunct in sports medicine, post-surgical recovery, orthopaedics, and physiotherapy or pain management. It is written so a treating clinician can see three things in one place: what the devices actually deliver, what was observed when an Onlux applicator was used in orthopaedic practice, and how that use sits inside the wider photobiomodulation (PBM) evidence base.

The product family comprises anatomically shaped applicators — knee, shoulder, lumbar, neck, elbow, wrist, hip, foot and ankle, and related panel or wrap formats — that share one optical engine. Shape changes coverage. It does not change the wavelengths or the design irradiance. Literature and the device-specific series are therefore applied to the family, not to a single SKU.

1.1 Clinical questions addressed

- Does the delivered spectrum (660 nm red, 830 nm near-infrared, with 950 nm longer infrared and a 470 nm blue component) sit inside wavelengths with a mechanistic and clinical record in musculoskeletal tissue?
- Does a 15-minute session at the published surface irradiance land inside the fluence window used in positive musculoskeletal trials?
- What has been observed with this device family in orthopaedic patients who had already failed usual non-operative care?
- What do systematic reviews and randomised trials show for related indications: delayed-onset muscle soreness and return to function, postoperative pain and swelling, osteoarthritis, tendinopathy, spinal and neck pain?
- What are the boundaries: indications where evidence is only adjunctive, outcomes the device should not be claimed to achieve, and patients in whom it should not be used?

2. Product family and optical equivalence

2.1 Description

The pads are contact LED arrays worn over a joint, muscle group, or spinal region. Treatment is timed, typically 15 minutes, and ends automatically. The clinical advantage of the form factor is coverage and adherence: a wrap holds the array on the target for the full session without a clinician holding a probe, which is the delivery mode used in the device-specific series and in home-based PBM studies that report high compliance.

Family parameters below are the labelled specification, confirmed on the representative long pad (OLLMVP3103, 120 cm x 18 cm) by a 25-point contact grid. Other outlines use the same wavelengths and the same controller; shape changes coverage, not the optical design.

Parameter	Family value	Clinical relevance
Wavelengths	470, 660, 830, 950 nm	660 and 830 nm are core PBM bands; 950 nm adds a mild photothermal component; 470 nm is superficial
Labelled intensity	30 mW/cm2	Electrical output on the user manual and device labelling
Mean contact irradiance	30.08 mW/cm2	25-point contact grid on OLLMVP3103; all points valid
Contact range on that pad	9.2 to 65.0 mW/cm2	No uniformity reject limit; mean is the labelled figure
Session length	15 minutes, fixed, auto-off	Firmware session used for fluence; matches the IFU
Fluence per session	27.07 J/cm2	Unrounded mean x 900 s; SE-table fluence
Channel split of the mean	Red 11.6; infrared 11.4; short-wave 6.9; far-red 0.13 mW/cm2	Meter channels; firmware does not select wavelength
Models	OLFABMVP3001, OLEMVP3106, OLLMVP3103, OLNMVP3104, OLKMVP3102, OLHMVP3107, OLSMVP3105	Same engine, different outline and diode count (60 to 132)

Fluence is irradiance multiplied by time. At the verified mean of 30.08 mW/cm2 for the labelled 900-second session, surface fluence is 27.07 J/cm2. That is the figure to use in any substantial-equivalence or clinician dose discussion. Twice in one day, the maximum on the labelling unless a clinician directs otherwise, the skin under the array can receive about 54 J/cm2, with at least 90 minutes between sessions. These are surface values. Fluence at a joint line, labrum, or disc is lower and depends on tissue thickness, wavelength, and contact. The 830 nm and 950 nm channels are included because near-infrared reaches muscle and capsule that 660 nm addresses only superficially.

The contact grid was not flat. Valid points on the representative pad ran from 9.2 mW/cm2 to 65.0 mW/cm2. Stations toward the ends were red- and infrared-dominant; part of the middle was short-wave-dominant. Firmware cannot select a wavelength. Placement therefore matters: the array should sit on the structure being treated, and the labelled 30 mW/cm2 is a mean, not a promise that every square centimetre delivers 30. Applied-part temperature in type testing was 37.4 C, a mild warmth, consistent with the 950 nm water-absorption component rather than a heating-pad burn risk.

2.2 Equivalence across models

The seven pads differ in outline and in diode count (60 to 132). They do not differ in wavelength set or in controller firmware. OLLMVP3103, the 120 cm x 18 cm pad, is the model on which contact irradiance was verified; the others are treated as the same optical engine in a different outline. A knee-shaped pad and a shoulder-shaped pad are therefore the same design dose delivered to a different anatomical window. Clinicians should still match the pad to the target so the emitting face sits over the painful structure.

Mode 1, the default, drives the red and near-infrared emitters and is the mode this dossier addresses. Mode 2 adds the 470 nm blue channel and is labelled for mild to moderate inflammatory acne; it is outside the musculoskeletal scope except where a clinician is treating peri-incisional skin or acneiform skin in the same patient. The musculoskeletal labelling for Mode 1 is topical heating to elevate tissue temperature for temporary relief of minor muscle and joint pain and stiffness, minor arthritis pain or muscle spasm, a temporary increase in local circulation, and temporary muscle relaxation. The clinical sections below supply the photobiomodulation context for that use.

2.3 What each wavelength is doing

- 660 nm red. Absorbed by cytochrome c oxidase. Primary actions are in skin, superficial tendon, and the dermal microcirculation: ATP support, collagen-cell signalling, and a local anti-inflammatory shift. Penetration is millimetres to low centimetres.
- 830 nm near-infrared. A classical PBM wavelength with deeper reach into muscle, joint capsule, and peripheral nerve. Most of the positive laser trials in neck pain, knee osteoarthritis, and tendinopathy used 780 to 860 nm or 904 nm. 830 nm sits in that band.
- 950 nm longer infrared. Higher water absorption than 830 nm, so a larger fraction of energy becomes a gentle thermal gradient. Useful as a circulation adjunct; it is not the main cytochrome c oxidase wavelength. The family should not be described as a heat lamp only, nor as a pure non-thermal laser.
- 470 nm blue. Superficial. Antimicrobial and nitric-oxide effects at the skin surface. Not the driver of deep musculoskeletal results. Included for skin-barrier and wound-edge contexts, not for intra-articular dose.

3. Mechanism relevant to musculoskeletal use

PBM is the use of red and near-infrared light, typically 600 to 1100 nm, at irradiances that do not coagulate tissue, to change cell behaviour. The primary chromophore in this band is cytochrome c oxidase in the mitochondrial electron transport chain [3, 4, 6]. Photon absorption increases electron transport, raises ATP, and transiently modulates reactive oxygen species and nitric oxide. Nitric oxide displaced from cytochrome c oxidase both disinhibits respiration and contributes to local vasodilation [2].

Downstream, the pathways that matter for the indications in this dossier are:

- Reduced pro-inflammatory cytokines and a shift toward resolution, including effects on NF-kB, PGE2, TNF, and IL-1, with supporting IL-10 signalling in inflammatory-pain models [2, 22].
- Effects on nociceptor conduction and on peripheral and central sensitisation, which is the leading explanation for analgesia that outlasts the session [19].
- Support of fibroblast, tenocyte, and myoblast activity in the proliferative phase of repair, without the claim that light closes a structural defect [23, 24].
- A biphasic dose response. Too little energy does nothing useful; too much can flatten or reverse the effect [5]. The family mean of 30 mW/cm2 is a moderate LED irradiance. Time, not peak power, is what brings a session to 27 J/cm2.

Hamblin’s review of anti-inflammatory PBM concludes that red and near-infrared light reduce oedema, inflammatory cell infiltration, and pro-inflammatory mediators across a range of models, which is the mechanistic bridge from cell culture to joint and muscle pain [2]. Karu’s mitochondrial signalling work is the reason 660 nm and the 800 to 850 nm window keep recurring in device design [6].

4. Dosimetry rationale and the literature window

Musculoskeletal PBM trials are not uniform, but the effective cluster is consistent enough to use as a design check. A 2026 systematic review of 53 trials (about 2,800 patients) found that most protocols used 630 to 904 nm and 4 to 100 J/cm2, and that knee osteoarthritis, tendinopathy, low back pain, and postoperative pain were the indications with the clearest pain signal [25]. World Association for Photobiomodulation Therapy recommendations for 780 to 860 nm lasers are often on the order of 4 J per point for arthritis and tendinopathy, delivered to several points over a joint [21]. A wrap is not a point laser: it spreads a lower irradiance over the whole region for longer. A surface fluence of 27 J/cm2 per 15-minute session sits in the middle of that window: above the under-dosed trials, and below the high-fluence LED protocols that run to 50–100 J/cm2.

Stausholm and colleagues, in a placebo-controlled meta-analysis of knee osteoarthritis, found that benefit concentrated in trials that actually used recommended doses (approximately 4 to 8 J per point at 785 to 860 nm), and that under-dosed trials diluted the pooled effect [8]. That paper is the reason this dossier leads with dose

rather than with wavelength slogans. A device can use the right nanometres and still fail if the joint never sees the energy.

The biphasic constraint cuts the other way. Huang et al. showed inhibition at high fluence in cell models [5]. Clinical LED wraps in rehabilitation have been used at 50 to 100 J/cm2 over 5 to 10 minutes when irradiance is high (for example 180 mW/cm2 at 830 nm in the Omnilux rehabilitation series) [18]. At 30 mW/cm2 the pad reaches a mid-range fluence in the fixed 15-minute session, then locks out for at least 90 minutes. That is an appropriate design for unsupervised home use.

5. Device-specific clinical evidence

5.1 Study identity

Malhotra and Setter, Department of Orthopedic Surgery, SUNY Upstate Medical University, presented “Management of Orthopedic Injuries with the use of Red and Infrared Light Therapy: Three Case Reports” as an e-poster at the 2024 Annual Meeting of the Clinical Orthopedic Society [1]. The source document is published on the Onlux clinical study page. It is a case series, not a randomized trial, and it had not, at the time of the poster, completed journal peer review. It is included because it is the only human series in which the device family itself was the intervention.

5.2 Protocol used

In each case an OnLux LED applicator (wavelengths stated in the discussion as 470, 660, 830 and 950 nm) was worn for 15 minutes, twice a day. No device-related complaints were recorded. Surgery had been discussed and deferred. Usual care — physiotherapy, corticosteroid injection, oral anti-inflammatory courses, and in one case gabapentin — had already failed or had been limited by adverse effects.

5.3 Cases

Case 1 — symptomatic discoid meniscus

A 50-year-old man developed acute lateral knee pain and clicking without a defined trauma. Examination showed a mild effusion and mechanical symptoms; radiographs showed mild patellofemoral change. Three months of knee physiotherapy did not help. MRI showed a discoid meniscus with likely longitudinal disruption. An intra-articular injection of 80 mg depomedrol plus lidocaine gave about 50 percent relief for several weeks, then pain returned. Walking pain was 3 to 6 out of 10; he could not squat and struggled to rise from a chair. The knee applicator was used 15 minutes twice daily for 4 weeks. Pain was reported as 0 out of 10 by week 3. At one year he reported no knee pain and unrestricted function [1].

Case 2 — symptomatic L3 disc herniation

A 46-year-old man, himself an orthopaedic surgeon, had two years of activity-related low back pain that progressed to a walking tolerance of a few hundred feet, with anterior-thigh paresthesia. Six weeks of physiotherapy, two corticosteroid dose packs, and NSAIDs did not help. MRI showed a large left L3 disc herniation. Gabapentin reduced pain but caused somnolence and confusion and was stopped. The lumbar applicator, 15 minutes twice daily, produced incremental improvement over 6 weeks. By week 6 he was walking more than a mile without leg symptoms. Pain returned when treatment stopped and resolved when it was restarted. At two years, symptoms were occasional or absent [1].

Case 3 — collegiate pitcher, SLAP tear

An 18-year-old division pitcher had progressive throwing pain, dead-arm symptoms, loss of velocity, and loss of location despite physiotherapy and a mechanics review. MRI showed a large type 2 SLAP tear. An intra-articular injection allowed him to complete his freshman season with moderate, sometimes severe, symptoms. Surgery was declined because of academic timing. Between freshman and sophomore years he continued rehabilitation and used the shoulder applicator 15 minutes twice daily. Symptoms markedly improved after about 6 weeks. He

completed successful sophomore and junior seasons. He no longer uses the device daily, but uses it after bullpens and games [1].

5.4 Reading of the series

The authors report considerable clinical benefit on pain and function within 4 to 6 weeks, sustained after treatment in two of the three cases, and no adverse effects. They describe the action as increased local blood flow, decreased inflammation, and decreased pain, particularly where surgery is not the chosen path [1]. The series used real orthopaedic diagnoses, failed prior care, a defined device and dose, functional endpoints (walking tolerance, return to pitching), and follow-up out to one and two years. It is the empirical source of the 15-minute, twice-daily, 4-to-6-week course.

6. Sports medicine

The sports literature is the largest controlled body of work on PBM in muscle. It is mostly pre- or post-exercise irradiation of healthy or acutely loaded muscle, not treatment of surgical lesions. It is relevant because the family is used by athletes for soreness, fatigue, and return to training, and because Case 3 is a throwing athlete.

6.1 Performance and recovery meta-analyses

Leal-Junior and colleagues pooled trials of low-level laser and LED therapy on exercise performance and recovery markers and found a benefit of phototherapy over placebo on performance and on creatine kinase when irradiation was applied before exercise, with a weaker and less consistent signal when it was applied only afterwards [13]. Vanin et al., in a systematic review and meta-analysis restricted to healthy people, concluded that PBM improves muscular performance and reduces fatigue, again with the cleaner effect from pre-exercise treatment at adequate dose [12]. Ferraresi, Huang and Hamblin reviewed human muscle studies and argued that the advantage is mitochondrial: more ATP available during the bout, and less oxidative damage after it [14]. Borsa, Larkin and True reached a similar qualitative conclusion in athletic populations, with the caveat that protocols were heterogeneous [33].

A 2024 meta-analysis in the Journal of Strength and Conditioning Research looked specifically at injured athletes. Across six randomised trials (205 athletes, mean age 24), PBM reduced pain versus control (standardised mean difference 1.03, 95 percent CI 0.43 to 1.63). The two trials that measured time to return to play did not show a faster return [15]. The practical reading is the one that should be given to a team physician: expect help with pain and with the quality of movement in rehabilitation; do not promise a shorter layoff.

6.2 Delayed-onset muscle soreness

A 2026 meta-analysis of randomised trials in healthy people and athletes found that PBM reduced DOMS immediately and at 24 hours on visual analogue scores, improved pressure-pain threshold out to 96 hours, and supported strength out to 96 hours. Strength effects favoured higher doses [29]. This matches the clinical pattern athletes report — less next-day soreness, better preservation of torque — and it matches a 15-minute wrap session applied to the loaded muscle group after training or later the same day.

6.3 Field and crossover data

Antonialli et al. tested a super-pulsed laser plus LED combination in high-level rugby players during an anaerobic field test, in a randomised crossover double-blind design, and reported better performance and recovery markers than placebo [30]. A 2026 randomised crossover in CrossFit athletes compared PBM combined with static magnetic field against passive recovery, pneumatic compression, and shock-wave therapy. Jump height at one hour did not differ, but PBM produced better jump height at 24 and 48 hours and a larger fall in lactate dehydrogenase [26]. These are small trials. They are useful because they were done on athletes in real training, not only on a dynamometer.

6.4 LED rehabilitation series

Baxter, Bleakley, Glasgow and Calderhead reported initial clinical experience with an 830 nm LED rehabilitation system (about 180 mW/cm2, 5 or 10 minutes, 54 or 108 J/cm2) in 28 sports-injury patients: joint pain, tendinopathy, muscle pain, and back pain. Seventeen of 28 had an excellent result; acute and chronic pain both responded; there were no adverse effects [18]. Irradiance was higher than the Natura / Onlux engine. The wavelength and the clinical categories are the same, and the series is relevant as evidence that a hands-free LED array, rather than a laser probe, can be used in a sports-medicine room.

6.5 Tie-back to the family

For a pitcher, runner, or field athlete the pad is an adjunct to load management and physiotherapy. A rational sports protocol, consistent with the series, the recovery literature, and the labelling, is one 15-minute session over the affected region after the session that loaded it, and a second 15-minute session on high-soreness days only after at least 90 minutes, and not more than two sessions in a day unless the treating clinician directs otherwise. Pre-training use can be considered when the goal is fatigue resistance rather than pain [12, 13].

7. Post-surgical recovery

Postoperative use is an adjunct to surgical aftercare, not a substitute for protection, range-of-motion protocols, thromboprophylaxis, or wound review. The relevant outcomes in the literature are pain, swelling, inflammatory markers, and the speed of return to physiotherapy milestones.

7.1 Arthroplasty

Langella et al. ran a randomised, triple-blind, placebo-controlled trial of PBM for acute pain and inflammation after total hip arthroplasty. Active PBM reduced acute postoperative pain and inflammatory signs compared with an identical inactive device [17]. This is the cleanest single trial to cite to an arthroplasty surgeon: same operation, sham control, blinding, and a device that was either on or off. Prehabilitative PBM, pooled in the 2026 musculoskeletal review, was associated with about an 18 percent reduction in postoperative pain and a recovery trajectory shorter by about 10 days [25]. That pooled figure mixes operations and protocols and should be quoted as a review-level estimate, not as a guarantee for one procedure.

7.2 Wound and soft-tissue repair

Two early meta-analyses, Enwemeka et al. on tissue repair and pain and Woodruff et al. on wound repair, both found a positive effect of low-power laser across a heterogeneous literature, with the pain effect more consistent than complete wound closure [22, 23]. Later reviews of PBM in wound care describe faster progression through inflammation into proliferation, increased microcirculation, and better collagen organisation, again as an adjunct to standard wound care [34]. For an incision, the clinically sensible use of this family is around, not on, a closed and dressed wound, once the surgeon is content that the dressing and the skin edges allow it. The 660 nm component is the relevant one at the skin; 830 nm is the relevant one for the muscle and capsule deep to the incision.

7.3 Oedema and opioid-sparing context

The anti-inflammatory mechanism — less PGE2, less oedema, local nitric oxide — is the reason PBM is discussed as an opioid-sparing adjunct [2, 19]. The practical aim is to make movement tolerable so that physiotherapy can start, which is the pathway by which analgesic devices reduce opioid exposure in enhanced-recovery programmes.

7.4 Practical postoperative boundaries

- Do not apply over an open wound, an undrained haematoma, or a site of active infection.
- Do not apply over a fresh graft or flap until the operating surgeon agrees.
- Malignancy at the site, the eye, and the pregnant uterus are exclusions (see Section 10).
- A realistic expectation, drawn from Langella and from the review estimates, is less pain and less swelling in the first one to two weeks, so that range-of-motion work is easier.

8. Orthopaedics

8.1 Knee osteoarthritis

Knee osteoarthritis is the indication with the deepest controlled literature. Stausholm et al. (BMJ Open, 2019) pooled randomised placebo-controlled trials and found that adequately dosed 785 to 860 nm treatment reduced pain and disability, while inadequately dosed trials did not [8]. A 2024 network meta-analysis of 13 trials (673 participants) ranked 904 to 905 nm highest for pain, followed by multi-wavelength systems and the 785 to 850 nm band; overall low-level light therapy beat sham for pain (SMD 0.96) but not clearly for function or stiffness, and the authors graded the evidence as low [27]. An umbrella review of meta-analyses rated the disability benefit in knee osteoarthritis as moderate certainty and the pain benefit as low certainty [28]. Alfredo et al. had already shown, in a randomised trial, that laser plus exercise beat exercise alone on pain and function [36].

The family overlap is direct: 830 nm is inside the 785 to 860 nm band that carried the positive Stausholm result, and the multi-wavelength design matches the class that ranked second in the network analysis. A knee wrap also solves the adherence problem that probe protocols have in degenerative disease. Home-based PBM in the 2026 review showed about 85 percent compliance and a 22 percent visual-analogue reduction at 12 weeks [25]. Case 1 is not osteoarthritis — it is a symptomatic discoid meniscus — but the joint, the wrap, and the pain phenotype are the same clinical conversation.

8.2 Tendinopathy

Tumilty et al. reviewed low-level laser for tendinopathy and found benefit when World Association dose recommendations were followed, and little benefit when they were not [38]. Haslerud et al. reached the same conclusion for shoulder tendinopathy: positive trials were the ones with adequate per-point dose at 810 to 830 or 904 nm [37]. Tripodi et al., in a 2021 systematic review and meta-analysis of red and near-infrared PBM for tendinopathy, found a pain reduction (the umbrella review later graded this as low certainty) [11, 28]. The clinical message is consistent across three reviews: dose matters more than brand, and 830 nm is a defended wavelength for rotator cuff and other tendons.

Case 3 is a SLAP lesion, which is labral rather than a pure tendinopathy, but the throwing shoulder shares the cuff-and-labrum pain generator that these trials treated. In Case 3 the athlete returned to pitching and completed successful later seasons.

8.3 Spine

Huang et al. (Arthritis Research & Therapy, 2015) meta-analysed low-level laser for non-specific chronic low back pain and found a pain benefit versus sham [9]. Glazov, Yelland and Emery (2016) also found a short-term pain benefit, with more uncertainty on function and on how long the effect lasts [40]. Case 2 is more specific than non-specific low back pain — it is a large L3 herniation with radicular symptoms — so these reviews are supportive context, not a matched population. The on-off-on pattern in Case 2 (pain returned when the wrap stopped, resolved when it restarted) is the closest the series comes to an internal control, and it is the pattern expected if the effect is anti-inflammatory and analgesic rather than structural.

8.4 Neck and upper quarter

The Lancet meta-analysis by Chow et al. (2009) is the landmark neck-pain review: low-level laser reduced pain immediately and the benefit was still detectable at follow-up of up to 22 weeks, versus placebo [7]. Wavelengths clustered in the red and 830 to 904 nm near-infrared bands. A cervical applicator in this family is the form-factor equivalent. Neck pain is also the indication where a wrap has a practical advantage over a probe, because paraspinal and suboccipital coverage is awkward to deliver by hand for 15 minutes.

8.5 Meniscus, labrum, and what not to claim

There is no randomised trial of PBM that shows healing of a discoid meniscus tear or a SLAP tear. De Oliveira et al., reviewing laser and LED for the common musculoskeletal conditions, described clinically meaningful pain

reductions — on the order of 50 percent in some non-specific knee-pain cohorts treated alongside manual therapy — and graded the evidence as low, calling for better trials [16]. For a surgeon counselling a patient who is declining or delaying meniscal or labral surgery, the series supports reduced pain and better tolerance of rehabilitation.

9. Physiotherapy and pain management

PBM has been part of hospital physiotherapy for decades, particularly in Australian and Northern European departments, long before consumer LED wraps existed [32]. The modern indication set for a physiotherapist is adjunctive analgesia and recovery support inside an active programme, not passive treatment as the whole plan.

9.1 Acute and chronic musculoskeletal pain

Bjordal et al. reviewed low-level laser in acute pain and concluded that location-specific, adequately dosed treatment reduced pain and inflammatory markers versus placebo, with a proposed mechanism of reduced oxidative stress and PGE2 at the injury site plus effects on nerve conduction [19]. Their earlier review of chronic joint disorders found the same dose-dependence [20]. Clijsen et al. pooled musculoskeletal pain trials and found a significant pain reduction versus control, with heterogeneity that tracked protocol quality [10]. De Oliveira et al. specifically included LED, not only laser, and judged both suitable for the common outpatient conditions seen in physiotherapy, again with low-certainty evidence [16].

9.2 As an add-on to exercise

The interaction with exercise is the physiotherapy-relevant finding. The 2026 review estimated that PBM added to exercise improved strength outcomes by about 25 percent and reduced DOMS by about 30 percent relative to the comparators in the included trials [25]. Alfredo et al. is the knee example: laser plus exercise beat exercise alone [36]. This is how the family should be written into a physiotherapy plan — before or after the session, on the structure being loaded, so that the patient can complete the programme. It should not be written in as a replacement for load.

9.3 Home programmes and adherence

Probe PBM fails in practice when the patient cannot attend three times a week. Home LED programmes in the musculoskeletal review had about 85 percent compliance [25]. The Onlux case series used a one-button, auto-off, 15-minute wrap, which is the adherence design. For a physiotherapy service, the useful model is clinic teaching of placement in week one, then home use once or twice daily between visits, with the therapist checking skin and placement at review.

9.4 Pain phenotypes where the fit is good, and where it is speculative

- Good fit: activity-related joint and tendon pain, post-exercise soreness, mechanical spinal pain, postoperative soft-tissue pain, neck pain.
- Plausible but thinner evidence: radicular pain (Case 2 is encouraging and uncontrolled), plantar heel pain, myofascial trigger points.
- Not a fit for this dossier: neuropathic pain from diabetes or post-herpetic neuralgia as a primary indication, inflammatory arthropathy flares requiring disease-modifying treatment, and any pain whose cause has not been diagnosed.

9A. Additional controlled trials and reviews

The sections above carry the landmark reviews. This section adds the individual randomised trials and the narrower meta-analyses that a clinician can cite by name. They were selected because the wavelength, the fluence, or the anatomical target overlaps the pad: 660 nm and 830 to 850 nm, session energies in the same order as 27 J/cm2, and joints or muscle groups the seven outlines actually cover. Probe lasers and cluster LEDs are both included. The pad is the cluster-LED form of the same idea, worn rather than held.

9A.1 Knee osteoarthritis trials

Stelian and colleagues randomised elderly patients with degenerative knee osteoarthritis to red light, 830 nm infrared, or placebo, twice daily for 10 days. Both active wavelengths reduced pain and disability more than placebo, and the two wavelengths did not differ from each other [43]. That twice-daily schedule is the same rhythm as the Onlux orthopaedic series and as the pad labelling, which allows a second session after 90 minutes.

Alghadir and colleagues randomised 40 patients with chronic knee osteoarthritis to 850 nm at 6 J per point over eight points, or to sham, for eight sessions. The active group had less pain at rest and on movement, better knee function, and longer ambulation time than sham [44]. Gur and colleagues, in a double-blind randomised trial, found 904 nm regimens superior to placebo for knee osteoarthritis pain and function [45]. Fukuda and colleagues found a short-term gain in pain and function with 904 nm against sham [46]. Kheshie and colleagues found that 830 nm combined with exercise outperformed low-dose laser plus exercise on pain and function [47]. A 2025 double-blind randomised trial using 790 nm at the World Association dose of 4 J per point, nine knee sites, reported lower visual-analogue pain than sham and control, and within-group gains on WOMAC pain, stiffness, and function that the control arms did not show [48].

Taken together with Stausholm [8] and the 2024 wavelength network meta-analysis [27], the knee is the indication where the outside evidence is densest. The pad's 830 nm channel and 27 J/cm2 session sit next to the 6 J per point, multi-point protocols: eight points at 6 J is 48 J delivered into the joint, against a wrap that puts 27 J into each square centimetre of a much larger area. The wrap trades peak point-dose for coverage and for a dose the patient can repeat at home.

9A.2 Tendon, elbow, heel, and spine trials

Bjordal and colleagues meta-analysed low-level laser for lateral elbow tendinopathy and found that trials which actually irradiated the tendon insertion at an adequate 904 nm or 632 nm dose reduced pain by about 17 mm and 14 mm on a 100 mm scale, and raised the chance of global improvement [49]. Trials that treated acupuncture points, or that used an inadequate dose, did not. That paper is the reason the pad has to sit on the tendon, not next to it.

Konstantinovic and colleagues ran a double-blind, randomised, placebo-controlled trial of 904 nm in acute low back pain with radiculopathy and found better pain and function with active laser plus NSAID than with sham plus NSAID [50]. Djavid and colleagues found that laser plus exercise beat exercise alone for chronic low back pain at longer follow-up [51]. Macias and colleagues, in a placebo-controlled randomised trial, found 635 nm effective for chronic plantar fasciitis pain [52]. These three map onto the lumbar pad, and onto a foot-and-ankle outline, in the same way the knee trials map onto the knee pad.

9A.3 Sports and muscle-damage trials

Baroni, Leal-Junior and colleagues randomised 36 men to laser or sham before 75 maximal eccentric knee-extension contractions. Creatine kinase at 48 hours was 436 IU/L after laser and 1,328 IU/L after sham. Force loss was smaller immediately and at 24 and 48 hours [53]. De Marchi and colleagues, in a randomised double-blind crossover of 22 men, applied an 810 nm cluster to quadriceps, hamstrings, and calf before a run to exhaustion. Time to exhaustion and VO2max rose, and post-exercise creatine kinase, lactate dehydrogenase, and lipid peroxidation fell [54]. Leal-Junior and colleagues had already shown that 830 nm before repeated biceps work delayed fatigue [55], and that a multi-diode LED cluster performed in the same direction as a single-diode laser when both were used before high-intensity exercise [56].

Those four trials are the mechanistic backing for using the pad after, or before, a training session. The pad cannot match a 200 mW probe at a single motor point. It can cover the whole quadriceps or cuff for 15 minutes at a mean 30 mW/cm2, which is the delivery mode the LED-cluster trial was pointing toward.

9A.4 Postoperative trials beyond the hip study

Langella's hip trial is already in Section 7. The cytokine result is worth stating plainly: one session of a red-and-infrared cluster, 8 to 12 hours after total hip arthroplasty, lowered visual-analogue pain and serum TNF-alpha and IL-8 against an identical inactive device [17].

A 2025 systematic review and meta-analysis of photobiomodulation after total knee arthroplasty pooled five randomised trials. Against control, active treatment improved knee flexion by a mean 12 degrees (95 percent CI 2 to 22), reduced pain by 1.4 points, and improved function with a large standardised effect. No trial reported a device-related adverse event [57]. A double-blind placebo-controlled trial of 810 nm at 80 J per session, started on day 2 after minimally invasive knee arthroplasty in 62 patients, found less pain in flexion, better early range, and a better Knee Society Score at six weeks [58]. Chia and colleagues randomised 30 primary knee-arthroplasty patients to standard care or standard care plus photobiomodulation on days 1 to 5. By day 6 the treated group had less swelling on bioimpedance and walked 27 m in two minutes against 16 m in the control group [59]. A 2026 double-blind, double-dummy trial of preoperative 810 nm versus celecoxib in 80 knee-arthroplasty patients met a non-inferiority margin on 24-hour rest pain and recorded less thigh swelling on days 3 and 7 [60].

For a surgeon, the usable statement is that red and near-infrared light, started around the operation and continued for several days, has reduced pain, swelling, and time-to-mobility in more than one arthroplasty programme. The pad is suited to that pattern: 15 minutes over the dressed joint, a second session after 90 minutes if the surgeon agrees, for the first one to two weeks.

9A.5 Catalogue

Study	Design	Dose overlap	Result used here
Stelian 1992 [43]	RCT, elderly knee OA	830 nm and red, twice daily	Both wavelengths beat placebo on pain and disability
Alghadir 2014 [44]	RCT, n=40, sham	850 nm, 6 J x 8 points	Less pain, better function and walking than sham
Gur 2003 [45]	Double-blind RCT	904 nm regimens	Pain and function better than placebo
Fukuda 2011 [46]	Double-blind RCT	904 nm, short course	Short-term pain and function
Kheshie 2014 [47]	RCT plus exercise	830 nm with exercise	830 nm arm outperformed low-dose laser
Maciel 2025 [48]	Double-blind RCT	790 nm, 4 J x 9 points	VAS lower than sham; WOMAC improved in active arm
Bjordal 2008 [49]	Meta-analysis, tennis elbow	904 nm and 632 nm on the tendon	About 14 to 17 mm extra pain relief when dose and site were right
Konstantinovic 2010 [50]	Double-blind RCT	904 nm, acute radicular back pain	Pain and function better than sham plus NSAID
Djavid 2007 [51]	RCT	Laser plus exercise, chronic low back	Better long-term result than exercise alone
Macias 2015 [52]	Sham RCT	635 nm, plantar fascia	Chronic heel pain reduced versus sham
Baroni 2010 [53]	RCT, n=36	Laser before eccentric load	CK 436 vs 1,328 IU/L at 48 h; less force loss
De Marchi 2012 [54]	Crossover RCT, n=22	810 nm cluster before running	Longer time to exhaustion; lower CK, LDH, oxidative markers
Leal-Junior 2009 [55, 56]	Controlled exercise trials	830 nm; LED cluster vs laser	Delayed fatigue; LED cluster tracked the laser
TKA meta-analysis 2025 [57]	5 RCTs	Post-arthroplasty PBM	Flexion +12 deg; pain -1.4; large function effect
810 nm post TKA [58]	Double-blind RCT, n=62	810 nm, 80 J, days 2 to 4	Less flexion pain, better ROM, better 6-week score
Chia 2025 [59]	RCT, n=30	Days 1 to 5 after TKA	Less swelling; 2-minute walk 27 m vs 16 m
Preop 810 nm 2026 [60]	Double-blind RCT, n=80	810 nm vs celecoxib	Non-inferior 24 h pain; less thigh swelling

The family tie is the same in every row. Mode 1 delivers 660 nm and 830 nm, with 950 nm as the longer infrared component, at a verified mean of 30 mW/cm2 and 27 J/cm2 in the fixed 15-minute session. That is the dose a clinician can put next to these trials. The knee, lumbar, shoulder, elbow, and foot outlines are the anatomical match for the trials above.

10. Safety, contraindications, and interactions

Across the reviews cited here, serious adverse events were not a feature. The 2026 musculoskeletal review reported none [25]. The SUNY series reported none [1]. The Omnilux LED sports series reported none [18]. Expected minor effects are warmth, transient redness, and, rarely, a short-lived increase in local ache. Type testing recorded an applied-part temperature of 37.4 C. The labelling tells the user to stop if irritation, heat, or tingling occurs, and to stop if itching or tingling lasts more than an hour after a session.

10.1 Do not use

- Over a known malignancy, or where the pain might be a malignancy until that has been excluded.
- Directly into the eyes. Near-infrared is not a signal to blink.
- Over the pregnant uterus.
- Over an active haemorrhage, an undrained haematoma, or a site of acute infection.
- In a patient with a photosensitising drug or photodermatosis, until the prescriber has agreed.
- Over the thyroid, in a patient with active thyroid disease, as a precaution.
- Transcranial application. This family is a musculoskeletal pad.

10.2 Use only with the treating surgeon’s agreement

- Fresh incisions, grafts, flaps, and joints in the first postoperative days.
- Regions with impaired sensation, where a thermal complaint will not be reported.
- Paediatric use. Case 3 was an 18-year-old. The family is not characterised here for children.

10.3 What patients should be told

Pain relief, if it comes, is usually incremental over two to four weeks, not immediate. Stopping too early is a common reason for an apparent failure; Case 2 relapsed when treatment stopped and responded when it restarted. The device does not replace imaging where imaging is indicated, and it does not change the threshold for surgery.

11. Suggested clinical protocol

The protocol below is the one used in the device series, checked against the dosimetry in Section 4. It is a clinical suggestion for discussion, and it yields to the current IFU if the two differ.

Element	Suggestion	Source
Session	15 minutes, pad in contact, then auto-off	IFU and firmware; case series [1]
Gap	At least 90 minutes before the next session	Device labelling and warnings
Daily cap	Not more than two sessions unless a clinician directs	IFU; case series used two
Course	4 to 6 weeks, then review	Pain change by week 3 to 6 in the series [1]
Fluence	27 J/cm2 per session at the skin, mean	30.08 mW/cm2 x 900 s
Mode	Mode 1, red and near-infrared, for musculoskeletal use	Mode 2 adds blue and is the acne indication
With rehab	After the loaded session, or in the evening	Add-on to exercise [25, 36]
Stop rules	Irritation, heat, tingling, or no benefit by week 6	IFU; open wound, insensate skin, haemorrhage excluded

Placement matters more than extra time. The array should cover the joint line, the tendon, or the paraspinal segment, not the nearest comfortable piece of soft tissue. Two short sessions beat one very long session, because of the biphasic response [5].

12. Evidence appraisal

Domain	Best evidence	Device link	Reading
Device series	3 cases, COS 2024 e-poster	Direct	Supportive only. Pain and function, not structural healing.
Knee OA	SR/MA, dose-dependent	830 nm, knee wrap	Strongest controlled indication. Adjunct to exercise.
Tendinopathy / shoulder	SR/MA, dose-dependent	830 nm, shoulder wrap	Pain benefit when dose is adequate. Case 3 is uncontrolled.
Neck pain	Lancet SR/MA	830 nm, cervical wrap	Durable pain benefit in probe trials. Wrap is equivalent in spectrum.
Low back pain	SR/MA, short-term pain	Lumbar wrap	Supports Case 2 context. Radicular pain less studied.
Sports recovery	Several SR/MA	Any regional wrap	Soreness and torque. Not faster return-to-play.
Post hip arthroplasty	One triple-blind RCT	Regional wrap	Less acute pain and inflammation. Surgeon-led use.
Wound repair	Older MA, later reviews	660 nm at skin	Adjunct only, off open wounds.

Certainty is not uniform. Neck pain and adequately dosed knee osteoarthritis are the most defensible controlled indications. Sports-recovery effects on soreness are consistent and small-to-moderate. Postoperative evidence is promising and still thin outside individual trials. Device-specific evidence is Level 4. A clinician sharing this document with a patient should keep that order.

12.1 Gaps

- No randomised, sham-controlled trial of this device family.
- No head-to-head comparison with a validated laser probe at matched fluence.
- Limited data on 950 nm as a standalone musculoskeletal wavelength; it is justified as part of a multi-wavelength array, not on its own.
- No health-economic study.

13. Conclusions for the clinician

The Viotin Red Light Therapy Pad delivers 470, 660, 830 and 950 nm. Verified mean contact irradiance on the representative pad is 30 mW/cm2. A fixed 15-minute session deposits 27 J/cm2 at the skin, inside the window used in positive musculoskeletal PBM trials. Outline does not change that design dose. Labelling caps use at 15 minutes, with at least 90 minutes before the next session, and not more than two sessions a day unless a clinician directs otherwise.

Used twice daily for four to six weeks, the device was associated with large, sustained improvements in pain and function in three orthopaedic patients who had failed usual non-operative care: a symptomatic discoid meniscus, an L3 disc herniation, and a collegiate pitcher with a type 2 SLAP tear. Follow-up in the series ran to one and two years.

Independent of those cases, systematic reviews support adjunctive PBM for knee osteoarthritis and neck pain when dose is adequate, for tendinopathy when dose is adequate, for post-exercise soreness and strength preservation,

and, in at least one sham-controlled arthroplasty trial, for acute postoperative pain. The 660 and 830 nm channels are the scientific core of the device. The wrap format is the practical core, because it is what patients will actually wear between physiotherapy visits.

The clinical position is adjunctive analgesia and recovery support, alongside rehabilitation, in sports medicine, post-surgical care, orthopaedics, and physiotherapy.

14. References

1. Malhotra A, Setter K. Management of Orthopedic Injuries with the use of Red and Infrared Light Therapy: Three Case Reports. E-poster, Clinical Orthopaedic Society Annual Meeting, 2024. SUNY Upstate Medical University, Department of Orthopedic Surgery. Available via the Onlux clinical study page.

2. Hamblin MR. Mechanisms and applications of the anti-inflammatory effects of photobiomodulation. AIMS Biophys. 2017;4(3):337-383.

3. de Freitas LF, Hamblin MR. Proposed mechanisms of photobiomodulation or low-level light therapy. IEEE J Sel Top Quantum Electron. 2016;22(3):7000417.

4. Chung H, Dai T, Sharma SK, Huang YY, Carroll JD, Hamblin MR. The nuts and bolts of low-level laser (light) therapy. Ann Biomed Eng. 2012;40(2):516-533.

5. Huang YY, Chen ACH, Carroll JD, Hamblin MR. Biphasic dose response in low level light therapy. Dose-Response. 2009;7(4):358-383.

6. Karu TI. Mitochondrial signaling in mammalian cells activated by red and near-IR radiation. Photochem Photobiol. 2008;84(5):1091-1099.

7. Chow RT, Johnson MI, Lopes-Martins RAB, Bjordal JM. Efficacy of low-level laser therapy in the management of neck pain: a systematic review and meta-analysis of randomised placebo or active-treatment controlled trials. Lancet. 2009;374(9705):1897-1908.

8. Stausholm MB, Naterstad IF, Joensen J, Lopes-Martins RAB, Saebo H, Lund H, et al. Efficacy of low-level laser therapy on pain and disability in knee osteoarthritis: systematic review and meta-analysis of randomised placebo-controlled trials. BMJ Open. 2019;9:e031142.

9. Huang Z, Ma J, Chen J, Shen B, Pei F, Kraus VB. The effectiveness of low-level laser therapy for nonspecific chronic low back pain: a systematic review and meta-analysis. Arthritis Res Ther. 2015;17:360.

10. Clijsen R, Brunner A, Barbero M, Clarys P, Taeymans J. Effects of low-level laser therapy on pain in patients with musculoskeletal disorders: a systematic review and meta-analysis. Eur J Phys Rehabil Med. 2017;53(4):603-610.

11. Tripodi N, Feehan J, Husaric M, Sidiroglou F, Apostolopoulos V. The effect of low-level red and near-infrared photobiomodulation on pain and function in tendinopathy: a systematic review and meta-analysis of randomized control trials. BMC Sports Sci Med Rehabil. 2021;13:91.

12. Vanin AA, Verhagen E, Barboza SD, Costa LOP, Leal-Junior ECP. Photobiomodulation therapy for the improvement of muscular performance and reduction of muscular fatigue associated with exercise in healthy people: a systematic review and meta-analysis. Lasers Med Sci. 2018;33(1):181-214.

13. Leal-Junior ECP, Vanin AA, Miranda EF, de Carvalho PTC, Dal Corso S, Bjordal JM. Effect of phototherapy (low-level laser therapy and light-emitting diode therapy) on exercise performance and markers of exercise recovery: a systematic review with meta-analysis. Lasers Med Sci. 2015;30(2):925-939.

14. Ferraresi C, Huang YY, Hamblin MR. Photobiomodulation in human muscle tissue: an advantage in sports performance? J Biophotonics. 2016;9(11-12):1273-1299.

15. Morgan RM, et al. Effects of photobiomodulation on pain and return to play of injured athletes: a systematic review and meta-analysis. J Strength Cond Res. 2024;38(6):e310-e319.

16. de Oliveira MF, Johnson DS, Demchak T, Tomazoni SS, Leal-Junior EC. Low-intensity laser and LED (photobiomodulation therapy) for pain control of the most common musculoskeletal conditions. Eur J Phys Rehabil Med. 2022;58(2):282-289.

17. Langella LG, Casalechi HL, Tomazoni SS, Johnson DS, Albertini R, Pallotta RC, et al. Photobiomodulation therapy (PBMT) on acute pain and inflammation in patients who underwent total hip arthroplasty: a randomized, triple-blind, placebo-controlled clinical trial. Lasers Med Sci. 2018;33(9):1933-1940.

18. Baxter GD, Bleakley C, Glasgow P, Calderhead RG. A near-infrared LED-based rehabilitation system: initial clinical experience. Laser Therapy. 2005;14:29-35.

19. Bjordal JM, Johnson MI, Iversen V, Aimbire F, Lopes-Martins RAB. Low-level laser therapy in acute pain: a systematic review of possible mechanisms of action and clinical effects in randomized placebo-controlled trials. Photomed Laser Surg. 2006;24(2):158-168.

20. Bjordal JM, Couppe C, Chow RT, Tuner J, Ljunggren EA. A systematic review of low level laser therapy with location-specific doses for pain from chronic joint disorders. Aust J Physiother. 2003;49(2):107-116.

21. World Association for Photobiomodulation Therapy. Recommended treatment doses for low level laser therapy. WALT, 2010 revision.

22. Enwemeka CS, Parker JC, Dowdy DS, Harkness EE, Sanford LE, Woodruff LD. The efficacy of low-power lasers in tissue repair and pain control: a meta-analysis study. Photomed Laser Surg. 2004;22(4):323-329.

23. Woodruff LD, Bounkeo JM, Brannon WM, Dawes KS, Barham CD, Waddell DL, Enwemeka CS. The efficacy of laser therapy in wound repair: a meta-analysis of the literature. Photomed Laser Surg. 2004;22(3):241-247.

24. Kuffler DP. Photobiomodulation in promoting wound healing: a review. Regen Med. 2016;11(1):107-122.

25. Photobiomodulation therapy in musculoskeletal rehabilitation, mechanisms, clinical evidence, and integrated protocols: a systematic review. Sport Sci Health. 2026. Fifty-three trials, approximately 2,800 patients, 630 to 904 nm, 4 to 100 J/cm2.

26. Martins PHGN, Tomazoni SS, Machado CSM, et al. A randomised crossover trial comparing photobiomodulation therapy with other recovery strategies in CrossFit athletes. PLoS One. 2026;21(5):e0349880.

27. Network meta-analysis of wavelength for low-level light therapy in knee osteoarthritis. Aging Clin Exp Res. 2024. Thirteen trials, 673 participants.

28. Effects of photobiomodulation on multiple health outcomes: an umbrella review of randomized clinical trials. Syst Rev. 2025.

29. Zhao Z, Lu P, He J, et al. Can photobiomodulation therapy attenuate delayed-onset muscle soreness and strength loss after exercise? A meta-analysis of randomized controlled trials. Sci Sports. 2026.

30. Antonialli FC, De Marchi T, Tomazoni SS, Vanin AA, et al. Phototherapy in skeletal muscle performance and recovery after exercise: effect of combination of super-pulsed laser and light-emitting diodes. Lasers Med Sci. 2014;29(6):1967-1976. Related field protocol: NCT02588768.

31. Hegedus B, Viharos L, Gervain M, Galfi M. The effect of low-level laser in knee osteoarthritis: a double-blind, randomized, placebo-controlled trial. Photomed Laser Surg. 2009;27(4):577-584.

32. Liebert A, Kiat H. The history of light therapy in hospital physiotherapy and medicine with emphasis on Australia. Physiother Theory Pract. 2021;37(3):389-400.

33. Borsa PA, Larkin KA, True JM. Does phototherapy enhance skeletal muscle contractile function and postexercise recovery? A systematic review. J Athl Train. 2013;48(1):57-67.

34. Mosca RC, Ong AA, Albasha O, Bass K, Arany P. Photobiomodulation therapy for wound care: a potent, noninvasive, photoceutical approach. Adv Skin Wound Care. 2019;32(4):157-167.

35. Hamblin MR, Huang YY, eds. Handbook of Photomedicine. Boca Raton: CRC Press; 2013. Wavelength and chromophore background cited from the Onlux characterisation.

36. Alfredo PP, Bjordal JM, Dreyer SH, et al. Efficacy of low level laser therapy associated with exercises in knee osteoarthritis: a randomized double-blind study. Clin Rehabil. 2012;26(6):523-533.

37. Haslerud S, Magnussen LH, Joensen J, Lopes-Martins RAB, Bjordal JM. The efficacy of low-level laser therapy for shoulder tendinopathy: a systematic review and meta-analysis of randomized controlled trials. Physiother Res Int. 2015;20(2):108-125.

38. Tumilty S, Munn J, McDonough S, Hurley DA, Basford JR, Baxter GD. Low level laser treatment of tendinopathy: a systematic review with meta-analysis. Photomed Laser Surg. 2010;28(1):3-16.

39. Badley EM, Canizares M, MacKay C, et al. Surgery or consultation: a population-based cohort study of use of orthopaedic surgeon services. PLoS One. 2013. Cited by Malhotra and Setter for the non-operative majority.

40. Glazov G, Yelland M, Emery J. Low-level laser therapy for chronic non-specific low back pain: a meta-analysis of randomised controlled trials. Acupunct Med. 2016;34(5):328-341.

41. McAlindon TE, LaValley MP, Harvey WF, et al. Effect of intra-articular triamcinolone vs saline on knee cartilage volume and pain in patients with knee osteoarthritis. JAMA. 2017;317(19):1967-1975. Context for injection limits, cited in the device series discussion.

42. Onlux clinical study page. Wavelength set 470, 660, 830 and 950 nm, and the Malhotra and Setter series. onluxmd.com/onlux-study. Accessed October 2026. Device dose in this dossier is the Viotin verified contact output, not the irradiance range quoted on that page.

43. Stelian J, Gil I, Habot B, Rosenthal M, Abramovici I, Kutok N, Khahil A. Improvement of pain and disability in elderly patients with degenerative osteoarthritis of the knee treated with narrow-band light therapy. J Am Geriatr Soc. 1992;40(1):23-26.

44. Alghadir A, Omar MTA, Al-Askar AB, Al-Muteri NK. Effect of low-level laser therapy in patients with chronic knee osteoarthritis: a single-blinded randomized clinical study. Lasers Med Sci. 2014;29(2):749-755.

45. Gur A, Cosut A, Sarac AJ, Cevik R, Nas K, Uyar A. Efficacy of different therapy regimes of low-power laser in painful osteoarthritis of the knee: a double-blind and randomized-controlled trial. Lasers Surg Med. 2003;33(5):330-338.

46. Fukuda VO, Fukuda TY, Guimaraes M, et al. Short-term efficacy of low-level laser therapy in patients with knee osteoarthritis: a randomized placebo-controlled, double-blind clinical trial. Rev Bras Ortop. 2011;46(5):526-533.

47. Kheshie AR, Alayat MS, Ali MM. High-intensity versus low-level laser therapy in the treatment of patients with knee osteoarthritis: a randomized controlled trial. Lasers Med Sci. 2014;29(4):1371-1376.

48. Effect of photobiomodulation (low-level laser therapy) in patients with knee osteoarthritis: a randomized controlled trial. 2025. 790 nm, 4 J per point, nine knee sites, double-blind, sham and control arms.

49. Bjordal JM, Lopes-Martins RAB, Joensen J, Couppe C, Ljunggren AE, Stergioulas A, Johnson MI. A systematic review with procedural assessments and meta-analysis of low level laser therapy in lateral elbow tendinopathy (tennis elbow). BMC Musculoskelet Disord. 2008;9:75.

50. Konstantinovic LM, Kanjuh ZM, Milovanovic AN, et al. Acute low back pain with radiculopathy: a double-blind, randomized, placebo-controlled study. Photomed Laser Surg. 2010;28(4):553-560.

51. Djavid GE, Mehrdad R, Ghasemi M, Hasan-Zadeh H, Sotoodeh-Manesh A, Pouryaghoub G. In chronic low back pain, low level laser therapy combined with exercise is more beneficial than exercise alone in the long term: a randomised trial. Aust J Physiother. 2007;53(3):155-160.

52. Macias DM, Coughlin MJ, Zang K, Stevens FR, Jastifer JR, Doty JF. Low-level laser therapy at 635 nm for treatment of chronic plantar fasciitis: a placebo-controlled, randomized study. J Foot Ankle Surg. 2015;54(5):768-772.

53. Baroni BM, Leal Junior ECP, De Marchi T, Lopes AL, Salvador M, Vaz MA. Low level laser therapy before eccentric exercise reduces muscle damage markers in humans. Eur J Appl Physiol. 2010;110(4):789-796.

54. De Marchi T, Leal Junior ECP, Bortoli C, Tomazoni SS, Lopes-Martins RAB, Salvador M. Low-level laser therapy (LLLT) in human progressive-intensity running: effects on exercise performance, skeletal muscle status, and oxidative stress. Lasers Med Sci. 2012;27(1):231-236.

55. Leal Junior ECP, Lopes-Martins RAB, Vanin AA, et al. Effect of 830 nm low-level laser therapy in exercise-induced skeletal muscle fatigue in humans. Lasers Med Sci. 2009;24(3):425-431.

56. Leal Junior ECP, Lopes-Martins RAB, Baroni BM, et al. Comparison between single-diode low-level laser therapy and LED multi-diode (cluster) therapy applications before high-intensity exercise. Photomed Laser Surg. 2009;27(4):617-623.
57. Photobiomodulation therapy for total knee arthroplasty: a systematic review and meta-analysis. Phys Ther Rev. 2025. Five randomised trials; flexion mean difference 12 degrees; pain mean difference -1.43; function standardised mean difference 2.96.
58. Double-blind, randomised, placebo-controlled trial of 810 nm low-level laser after minimally invasive total knee arthroplasty. 62 patients, 80 J per session from postoperative day 2 for 3 days. Early flexion pain, range of motion, and six-week Knee Society Score favoured active laser. Reported as EULAR abstract THU0571.
59. Chia WT, Wong TH, Jaw FS, Hsieh HC. The impact of photobiomodulation therapy on swelling reduction and recovery enhancement in total knee arthroplasty: a randomized clinical trial. Photobiomodul Photomed Laser Surg. 2025;43(2):65-72.
60. Preoperative photobiomodulation versus nonsteroidal anti-inflammatory drugs for pain and early functional recovery after total knee arthroplasty: a randomized controlled trial. Front Cell Dev Biol. 2026. 810 nm versus celecoxib, n=80, non-inferior 24-hour rest pain, less thigh swelling.

Annex A. Parameter bridge used in this revision

Figures below are the values used to tie the literature to the product. Intensity and fluence are the verified contact results on representative model OLLMVP3103, session 1, controller firmware V1.0, charger disconnected, 60-second warm-up, 900-second labelled session. Twenty-five of 25 grid points were valid.

Quantity	Value used	Note
Blue	470 nm	Superficial; not the musculoskeletal driver
Red	660 nm	Cytochrome c oxidase band; skin and superficial tendon
Near-infrared	830 nm	Core deep-tissue PBM band
Longer infrared	950 nm	Mild photothermal, circulation adjunct
Labelled intensity	30 mW/cm2	User manual electrical output
Mean contact irradiance	30.077 mW/cm2	Unrounded grid mean; 30 mW/cm2 rounded
Minimum valid point	9.25 mW/cm2	Representative long pad
Maximum valid point	64.98 mW/cm2	Representative long pad
Time	900 s	Fixed firmware session
Fluence	27.069 J/cm2	Mean x 900 x 0.001
Two sessions	About 54 J/cm2	Only with the 90-minute gap; clinician may vary
Literature window	4 to 100 J/cm2 in reviews	27 J/cm2 sits in the effective cluster [25]
Red channel mean	11.63 mW/cm2	Meter Er
Infrared channel mean	11.43 mW/cm2	Meter Eir
Short-wave channel mean	6.89 mW/cm2	Meter Eb; Mode 2 uses the blue emitters
Applied-part temperature	37.4 C	Type-test residual; mild warmth

Annex B. Labelled use that governs this dossier

Manufacturer: Dongguan Viotin Technology Co., Ltd., Building 202, Zhu Yuan No. 2, Humen Town, Dongguan, Guangdong, China. Australian sponsor: Industrious Services Pty Ltd, 15 Hythe Street, Miami QLD 4220. Applied part Type BF. IP22. Models covered: OLFABMVP3001 (43 x 43 cm), OLEMVP3106 (59 x 19 cm), OLLMVP3103 (120 x 18 cm), OLNMVP3104 (47 x 54 cm), OLKMVP3102 (54 x 28 cm), OLHMVP3107 (33.5 x 19 cm), OLSMVP3105 (50 x 38 cm).

Mode 1 indication, red and near-infrared: emit energy in the visible red and near-infrared spectrum to provide topical heating for the purpose of elevating tissue temperature, for the temporary relief of minor muscle and joint pain and stiffness, minor arthritis pain or muscle spasm, the temporary increase in local blood circulation, and the temporary relaxation of muscles. Mode 2, which adds 470 nm, is indicated for mild to moderate inflammatory acne and is not the subject of the clinical sections.

Use limits taken from the labelling: maximum 15 minutes per period; wait at least 90 minutes before the next period; do not exceed two sessions a day unless a licensed clinician recommends otherwise. Do not use on open wounds, sunburnt skin, insensate or highly irritable skin, directly over a pacemaker, where haemorrhage is possible after acute trauma or fracture, or with photosensitising medicines. Do not stare at the emitters.

End of report. NAT-CVR-MSK-001 Rev B. Prepared for clinician distribution. Evidence citations are to the published literature and to the SUNY Upstate / Clinical Orthopaedic Society 2024 case series.