applied sciences

MDPI

Review

A Systematic Review on Low-Level Laser Therapy in the Management of Shoulder Impingement Syndrome

Marco Castaldo [1], Andrea De Angelis D'Ossat [1], Pablo Gnessi [1] and Giovanni Galeoto [2,3,*]

[1] Department of Anatomical, Histological, Forensic and Orthopaedic Sciences, Sapienza University of Rome, 00185 Rome, Italy
[2] Department of Human Neurosciences, Sapienza University of Rome, 00185 Rome, Italy
[3] Neuromed-Istituto Neurologico Mediterraneo, Istituto di Ricovero e Cura a Carattere Scientifico-IRCCS, 86077 Pozzilli, Italy
* Correspondence: giovanni.galeoto@uniroma1.it

Abstract: Background: Conservative therapy is currently the elective treatment for shoulder impingement syndrome according to the scientific literature. The success of conservative therapy is due to physiotherapy and the application of its methods. The aim of this systematic review was to evaluate low-level laser therapy, a physiotherapeutic method for pain reduction and increasing the range of motion. Methods: This systematic review was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. The screening of the literature was carried out on the Cochrane, PEDro, PubMed/Medline, and Scopus databases up until December 2021. All studies were randomized controlled trials (RCTs), and five articles met the inclusion criteria and were included in this study. The risk of bias was evaluated with PEDro and Jadad scales. Results: In this study, we reviewed five RCTs that compared low-level laser therapy with other physiotherapy treatments to reduce pain and improve range of motion in patients with shoulder impingement syndrome. Conclusions: Low-level laser therapy for shoulder impingement syndrome requires further investigation in future studies.

Keywords: shoulder impingement; low-level laser therapy; physioterapy; systematic review

Citation: Castaldo, M.; De Angelis D'Ossat, A.; Gnessi, P.; Galeoto, G. A Systematic Review on Low-Level Laser Therapy in the Management of Shoulder Impingement Syndrome. *Appl. Sci.* **2023**, *13*, 3536. https://doi.org/10.3390/app13063536

Academic Editor: Alessandro de Sire

Received: 4 November 2022
Revised: 17 February 2023
Accepted: 2 March 2023
Published: 10 March 2023

1. Introduction

The term shoulder impingement syndrome (SIS) does not identify a precise morbid condition of the shoulder, but rather a variety of disorders, usually painful, that are characterized by inflammatory degenerative manifestations affecting the subacromial soft tissue. The progression of the pathological changes caused by the syndrome can lead to rupture of the rotator cuff [1].

The meSH database definition is "Compression of the Rotator Cuff tendons and subacromial bursa between the Humeral Head and the Acromion of the Scapula. This condition is associated with subacromial BURSITIS, as well as rotator cuff (largely supraspinatus) and bicipital tendon Inflammation".

Shoulder pain is highly prevalent within the general population. Several studies show that SIS is the most common cause of shoulder pain, accounting for approximately 30 to 35% of shoulder disorders [2]. Shoulder impingement syndrome is often the etiology in shoulder disorders, which seem to have an estimated prevalence of 7% to 34%. Since 1852, shoulder impingement syndrome has been considered by several authors to be the most common cause of shoulder pain; it is present in 44% to 65% of all shoulder disorders. It often evolves a chronic and/or relapsing condition, and 54% of people affected by shoulder pain report persistent symptoms after three years [1]. SIS incidence increases with age, and its major incidence occurs in the sixth decade of life [3]. Impingement symptoms may emphasize after a trauma, and pain usually develops over a period of weeks or months. Pain is often localized on the anterolateral acromion and often radiates to the

lateral mid humerus [4]. A primary and a secondary form of SIS are described. The primary form of this syndrome is due to structural alterations that mechanically narrow the subacromial space. The secondary form results from a functional disturbance of humeral head centering [5]. Examples of primary shoulder impingement syndrome are those due to structural alteration of the anatomy of acromion, such as hooked class III acromion, curved class II, flat class I, or soft tissue swelling. Another case of shoulder impingement syndrome might show the normal anatomy at rest, with the starting of impingement during shoulder movements, probably secondary to rotator cuff weakness, which permits uncontrolled cranial translation of the humeral head. Neer et Al. placed shoulder impingement into three categories based on stages of severity. In stage I, impingement is a consequence of edema, hemorrhage, or both, and it is classically seen with overuse-type mechanisms. Stage II shows greater fibrosis and tendon changes that are irreversible. A rupture or tear of a tendon may be the consequence of chronic fibrosis, and it is observed in stage III shoulder impingement syndrome [6].

Shoulder impingement syndrome is usually observed in individuals who engage in sports and activities requiring repetitive overhead activities, such as swimming, volleyball or handball; it also appears in people who work in manual jobs that require the prolonged overhead position of the upper limbs, such as builders, electricians or hairdressers [7]. Other extrinsic risk factors that may predispose individuals to SIS are bearing heavy loads, infections. and smoking [6].

This uncertainty about pathogenesis inevitably leads to confusion as regards the appropriate treatment; physiotherapy for SIS should be characterized by exercises for rotator cuff strengthening, with special attention on strengthening and retraining exercises for supraspinatus and infraspinatus rotator cuff muscles, and the trapezius and serratus anterior to reduce scapular dyskinesia [8]. In recent studies, SIS was also defined as subacromial pain syndrome (SAPS) because of the lack of significant correlations between the acromiohumeral distance (AHD) and pain in adults with subacromial pain syndrome, and the importance of other biopsychosocial factors was underlined [9].

For many years, acromioplasty with bursectomy has been considered the gold standard for treatment of patients with SIS, but recently some researchers have questioned the need for surgery in this kind of condition, and consequently a more in-depth study of the pathogenesis has led to the publication of several papers investigating the benefits of decompression techniques used in surgery [6]. In recent years, many systematic reviews about shoulder impingement syndrome treatment have been published; several studies shows that conservative management in the case of SIS is a resolutive solution in 70–90% of subjects. These studies correlated the effectiveness of interventions on different aspects such as pain, range of motion, functional limitations, and return to work. A systematic review by Dong et al. demonstrated that exercise programs and exercise-based treatments such as kinesiotaping and specific exercise and acupuncture are effective therapies for people at an early stage of SIS. Hanratty et al. also demonstrated that physiotherapy exercises are effective in the management of SIS. Many other studies have shown that the elective treatment for SIS is therapeutic exercise and stretching. The primary objective in the treatment of patients with SIS is to reduce pain and increase range of motion [10].

Other treatments mentioned in the literature include the low-level laser therapy (LLLT) technique. It uses the light energy of a laser to reduce pain and inflammation, accelerates healing of damaged tissue, relaxes muscle, and stimulates nerve regeneration. LLLT has been classified as a safe, non-invasive treatment modality; it constitutes a phototherapy or photobiomodulation, using photons at a non-thermal irradiance to stimulate biological processes. Cells or tissues are exposed to low levels of red and near infrared (NIR) light, and it is defined as “low level” because the energy densities of its light are low compared to other types of laser therapy that are used for other conditions. Power densities used in LLLT are lower than those needed to produce the heating of tissue, in fact it is also referred to as ‘cold laser’ therapy [2].

Recent studies describe LLLT as an additional treatment in the conservative management of individuals with shoulder pain. Nonetheless, the effectiveness of LLLT in reducing pain and improving function in individuals with shoulder pain, and specifically in Shoulder Impingement Syndrome is unclear.

The aim of this systematic review was to demonstrate the effectiveness of LLLT in SIS treatment.

2. Material and Methods

The review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines 2020. A meta-analysis was not conducted because there are no comparable outcomes in the selected studies.

2.1. Eligibility Criteria

Papers had to report the results of randomized controlled trials (RCTs) to be included in this systematic review. Selected studies had to examine the effectiveness of LLLT only or in association with other treatments for patients with a diagnosis of SIS, and had to be published in English.

2.2. Information Sources and Search Strategy

The literature search (Table 1) [11–15] was conducted on PubMed/Medline (PubMed Central is a free full-text archive of biomedical and life sciences journal literature at the U.S. National Institutes of Health's National Library of Medicine), Scopus (Scopus is Elsevier's abstract and citation database that was launched in 2004), PEDro (PEDro has been informing physiotherapy practice for over 23 years. It is a free database of over 56,000 trials, reviews and guidelines evaluating physiotherapy interventions), and the Cochrane databases (The Cochrane Database of Systematic Reviews (CDSR) is the leading journal and database for systematic reviews in health care) using the keywords "shoulder impingement" AND "low level laser therapy". For the PubMed database the search string ("Shoulder "Impingement Syndrome" [Mesh]) AND "Low-Level Light Therapy" [Mesh]" was used, inclusive of all of the subheadings of the Mesh database [16].

Table 1. Search strategy in different databases.

Database	Key Words	Number of Records
Cochrane Library	"Shoulder impingement" AND "Low level laser Therapy"	19
Pedro	"Shoulder impingement" AND "Low level laser Therapy"	10
Pubmed/Medline	"Shoulder impingement" AND "Low level laser Therapy"	22
Scopus	"Shoulder impingement" AND "Low level laser Therapy"	47

2.3. Selection Process

The systematic review was conducted by three independent physiotherapist reviewers who independently assessed the articles from the four databases. In a first phase, the titles and abstracts were evaluated, and in a second phase the full text was selected. Three independent reviewers were concerned with trial selection.

2.4. Inclusion Criteria

The following inclusion criteria were used to assess studies for the review: (1) studies that enrolled patients with a diagnosis of SIS; (2) studies that investigated LLLT in comparison with a placebo or another method; (3) studies published in English; (4) studies with the full text available; and (5) studies with subjects who were at least 18 years old.

2.5. Data Collection

The data extracted from the studies are summarized in Table 2, which includes: (1) references of the year of publication and authors; (2) sample size, age, diagnosis of participants; (3) duration of the study; (4) the presence of follow-up; (5) intervention; (6) scales for outcome evaluation; and (7) results. Data collection was performed by two researchers using Excel; no disagreements were found during this procedure.

Table 2. Characteristics of the study.

Author	Population	Duration of Treatment and Follow-Up	Intervention	Control	Outcome Measures	Results/Conclusions
Dogan et al. (2010) [17]	Group I (n = 30) Group II (n = 22) Age: GI: 53.7 ± 12.6 years GII: 53.45 ± 9.64 years Gender: GI: 10 M, 9 F GII: 20 M, 13 F	The dosage of LLLT used was 5 joule/cm^2 to a maximum of 5–6 painful points for 1 min. The same dosage was used for Placebo laser but the device was turned off. Cold pack therapy was used for 10 min. Each exercise was performed once a day for 10–15 executions. The therapy program was applied 5 times a week, once a day for 14 sessions No follow-up.	The study aimed to investigate the effectiveness of a laser therapy using 850-nm gallium arsenide aluminium, effects on range of motion, pain and disability in SAIS. LLLT was applied together with an exercise program.	Placebo LLLT, cold pack therapy and an exercise program were the therapies used to treat the control group. Patients were matched with the others of the intervention group with regard to sex and age.	VAS was used to assess pain severity, while a goniometer was used for the assessment of range of motion (ROM). SPADI was also used as the outcome measure.	The final results suggest statistically significant improvement in the intervention group as regards pain severity, SPADI scores and ROM, except for external and internal rotation. Improvements were noted in all parameters in the control group, except for ROM of external rotation. However, in comparing the two groups, no statistically significant differences were found.
Yeldan et al. (2008) [15]	Group I (n = 34) Group II (n = 26) Age: GI: 55.32 years GII: 55.00 years Gender: GI: 9 M, 25 F GII: 4 M, 22 F	Laser was applied to a maximum of 5 tender points found on clinical examination for 90 s at each location. Placebo laser intervention had the same duration. Treatment duration of laser or placebo laser was about 8 min. The duration of each exercise session was a minimum of 15 min and a maximum of 30 min. A cold pack was applied around the shoulder for 15 min. No follow-up.	The aim was to study the effectiveness of LLLT in addition to an exercise program on shoulder function in SAIS.	Control group received placebo laser and an exercise program.	Pain severity was assessed through VAS. Functional assessment of shoulder was performed with the constant scoring system. Disability was evaluated using the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. Muscle strength was assessed with a hand-held dynamometer using a "break test" technique.	There was no significant difference between LLLT and placebo LLLT when they supplemented an exercise program for rehabilitation in patients with SAIS.

Table 2. *Cont.*

Author	Population	Duration of Treatment and Follow-Up	Intervention	Control	Outcome Measures	Results/Conclusions
Bal et al. (2009) [12]	Group I (n = 22) Group II (n = 22) Age: GI: 51.7 ± 14.1 years GII: 53.1 ± 8.4 years Gender: GI: 5 M, 15 F GII: 7 M, 13 F	Laser therapy was applied to group I five times per week for 2 weeks with 10-min sessions. Each point was treated for 120 s. Exercise program for 12 weeks. Follow-up was 12 weeks.	The aim of this prospective randomized study was to evaluate benefits of gallium-arsenide laser therapy on the outcome of a comprehensive home exercise program in individuals with SIS.	Control group received a 12-week home exercise program.	Night pain was measured with VAS. SPADI was administered to all participants to evaluate shoulder disability. A UCLA score was used to assess the effectiveness of treatment at the second and 12th weeks.	This work did not demonstrate any distinct advantage of LLLT compared to exercise alone. Comprehensive home exercise programs should be the primary therapeutic option in the rehabilitation of patients with SIS.
Alfredo et al. (2020) [13]	Group I (n = 42) Group II (n = 42) Group III (n = 36) Age: GI: 51.9 ± 8.7 years GII: 56.0 ± 10.4 years GIII: 54.2 ± 7.1 years Gender: not specified	Group I received a treatment with LLLT and exercises, group II with exercises only, and group III with LLLT only. All participants received therapy sessions three times a week for 8 weeks. Follow-up was 2–3 months.	The aim of this study was to investigate the effectiveness of LLLT combined with exercise on shoulder pain and disability in patients with SAIS.	Control groups received home exercise only and LLLT only.	Perceived pain intensity was the primary outcome, and it was assessed using the numeric pain rating scale, and also SPADI. Secondary outcomes were also assessed: medication intake with paracetamol and active ROM; teese were last measured with a goniometer.	The results suggest that LLLT used together with strength exercises reduce pain intensity and improve shoulder function and use of drugs over 3 months in patients with SAIS.
Abrisham et al. (2011) [14]	Group I (n = 40) Group II (n = 40) Age: GI: 52.2 ± 5.7 years GII: 51.2 ± 6.7 years Gender: GI: 16 M, 24 F GII: 14 M, 26 F	10 sessions for 2 weeks. No follow-up.	The aim of the study was to evaluate the effects of LLLT used with exercise in comparison with exercise therapy applied alone in the treatment of patients with SAIS.	Control group received placebo, laser, and exercise therapy.	Pain measured through VAS and shoulder range of motion were evaluated.	LLLT combined with exercise was more effective than exercise therapy applied alone.

2.6. Risk of Bias Assessment

For evaluation of quality of studies, the PEDro and Jadad scales were used. Two researchers extracted data and scored the risk of bias and did not find disagreement.

3. Results

An initial literature search of the four databases identified 98 studies (Table 1), of which 93 studies were excluded (36 were duplicates; 26 were case reports, editorial letters, or reviews, 2 did not have the full text available, and 29 were not relevant). Therefore, five studies were included in the review (Figure 1). The characteristics of the study are presented in Table 2.

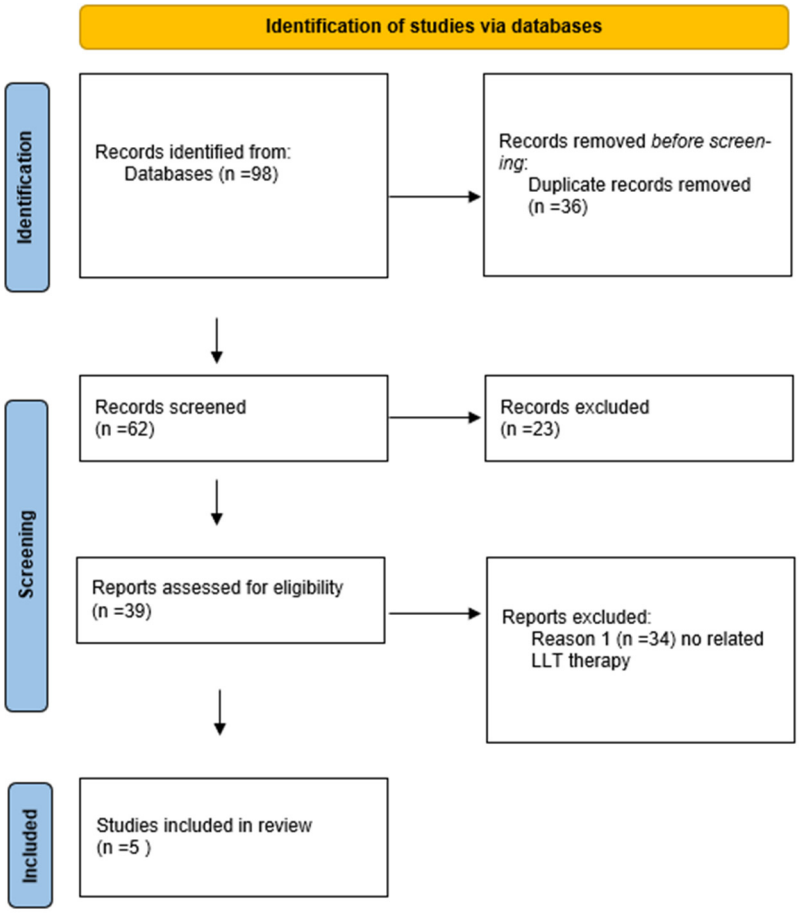

Figure 1. Flowchart of the screening.

3.1. Subjects

Sample size of the included studies ranged from 44 to 82 patients and the mean patient age ranged from 51.2 to 55.32 years.

3.2. Treatments

Treatment duration ranged from 2 [12,14] to 8 weeks [13]. Studies that included follow-up had follow-up periods of 12 weeks [12] and 2–3 months [13], while the rest had no follow-up [14,15,17].

The therapeutic interventions investigated by the five included studies were: (1) LLLT [17]; (2) LLLT in addition to an exercise program [15]; (3) LLLT with a home exercise program [12]; (4) LLLT combined with exercise [13]; and (5) LLLT combined with exercise [14].

The control group was treated with (1) cold-pack therapy, placebo laser therapy, and an exercise program [17]; (2) placebo laser and an exercise program [15]; (3) a home exercise

program [12]; (4) home exercises only and LLLT only [13]; and (5) placebo laser and exercise therapy [14].

3.3. Evaluation of Outcomes

The rating scales used by the studies in this review were:

- Visual analogue scale (VAS), a common response option used to measure pain; it generally includes a 100 mm line with anchor words at each end [18];
- Shoulder Pain and Disability Index (SPADI), an index that measures shoulder pain and disability in an ambulatory setting. It includes 13 items divided into two subscales: a five-item domain that measures pain and an 8eight item domain that measures disability [19];
- Constant scoring system, in which 35 points are given for subjective assessments of pain and ADL (activities of daily living), and 65 points are allocated for objective range of motion and shoulder strength measures [20];
- Disabilities of Arm, Shoulder, and Hand Questionnaire (DASH), a 30-item scale that addresses the difficulty in performing various physical activities that require upper extremity function: 21 items for physical function, five items for pain symptoms, and four items for emotional and social function [21];
- UCLA SCORE, a measure that provides a score based on five different domains that are pain, function, active forward flexion, strength of forward flexion, and general satisfaction. It has one item for each domain. Pain accounts for 10 points, function for 10 points, forward flexion for 5 points, strength for 5 points, and general satisfaction for 5 points; the total score is 35 points [11].

3.4. Risk of Bias

The methodological quality of the selected studies was assessed by the Jadad and PEDro scales (Table 3). As regards Jadad scores, two studies received a score of 2/5 [12,13], two studies were scored at of 3/5 [15,17], and one study received a score of 4/5 [14].

Table 3. Results of PEDro scale.

Author	Item Pedro Scale										
	1	2	3	4	5	6	7	8	9	10	11
Dogan et al. (2020) [17]	YES	YES	YES	YES	YES	YES	NO	NO	YES	YES	YES
Yeldan et al. (2008) [15]	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES
Bal et al. (2020) [12]	YES	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES
Alfredo et al. (2020) [13]	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES
Abrishiam et al. (2011) [14]	YES	YES	YES	YES	YES	YES	NO	NO	YES	YES	YES

Regarding PEDro scores, four studies achieved a score of 8/10 [12–14,17] and one study achieved a score of 9/10 [15] (Table 3).

4. Discussion

In the present study, we reviewed five RCTs that compared LLLT with other physiotherapy treatments to reduce pain and improve the range of motion in patients with SIS.

The results obtained by Alfredo et al. showed that LLLT added to a treatment based on an exercise program could accelerate the improvement of physical function through the control of inflammation or stimulation of tendon repair; the consequence is reduced pain and more rapid improvement of function. This RCT shows that LLLT added to an exercise therapy program for two months can lead to a clinically significant improvement in shoulder pain perception and also in disability (which is the primary outcome) in patients presenting with SIS. This intervention seems to also provide other benefits, such

as a reduction of pain intensity, a decrease in the utilization of analgesic medication (secondary outcome), and improvement in shoulder range of motion and in self-efficacy. This improvement was maintained for 3 months after the end of the program.

A similar result was shown by Abrisham et al. They found that LLLT combined with exercise therapy (Group I) was more effective than exercise therapy alone (Group II) in relieving pain and improving shoulder range of motion in individuals with SIS (with rotator cuff and biceps tendinitis). In both groups, significant improvements were noted in all parameters. However, significant improvements in all movements and in VAS scores were only found in group I.

In their study, Bal et al. utilized a home exercise therapy lasting 12 weeks, which was used together with LLLT, and an evaluation was performed after 2 weeks from the completion of LLLT and after 12 weeks. At the end of second week, the groups showed no significant differences in pain reduction at night, in addition to SPADI improvement, but after the 12th week a significant difference was noted between the group treated with LLLT also and the group that received only exercise treatment: the LLLT group showed better outcomes.

The last two RCTs by Dogan et al. and Yeldan et al. demonstrated that LLLT efficacy was controversial. In Dogan et al., the study results did not manage to demonstrate the superiority of LLLT with respect to the placebo group. Both groups seemed to show improvements in pain severity, range of motion measurements, and functional status. Yeldan et al. concluded that there were no significant differences between LLLT and placebo when added to a program including exercises for rehabilitation in patients with SIS. Both the LLLT and placebo LLLT groups showed improvements in assessment tools, and there was no significant difference between the two groups after intervention. Pain reduced significantly during activity, at rest and at night, while range of motion increased significantly.

This result is comparable to others. J. M. Bjordal also concluded that LLLT and passive therapies in general are no more effective than placebo [6]. In this review, the author investigated different passive therapies in SIS and concluded that the results, after a passive treatment, showed that ultrasound was not more effective than a sham application, and evidence for the effect of LLLT or electromagnetic (EMFT) field therapy were discordant. Thus, moderate evidence exists that passive treatments in rehabilitation are not more effective than sham applications, and their use cannot be recommended.

In the systematic review of Kromer et Al., results showed the effectiveness of surgery and home-based exercises in SIS, while passive therapies cannot be recommended as a valid treatment; however, the samples were small, and different diagnostic criteria were applied, which makes a firm conclusion difficult [6]. Wei Dong et Al. conducted a meta-analysis about different treatments for SIS, and found that LLLT is not recommended with respect to exercise therapy [22].

In these included studies, the results show an improvement in pain severity in groups treated with LLLT and LLLT added to exercise programs, but this aspect should be investigated using other outcome measures that evaluate both pain perception and the quality of life of patients. Furthermore, only two studies included an assessment at follow up after 12 weeks and 2–3 months; this data should be investigated to understand if the effects of LLLT on pain is a short term effect, or whether it lasts over time [12,13].

Only two RCTs found a positive effect of LLLT combined with an exercise program. However, no studies considered only conservative treatment with LLLT for SIS, thus there is limited evidence regarding the individual effectiveness of LLLT. In two studies (Alfredo et al.; Abrisham et al.), the effectiveness of LLLT combined with therapeutic exercise was demonstrated in terms of VAS and shoulder functional improvements and increased range of motion with the goniometer. In addition, the included experimental works did not show which are the individual reactions of healthy human tissue due to LLLT. A study about this aspect should be performed in the future.

Furthermore, also in Steuri et al., a meta-analysis found that a laser, manual therapy, tape, and extracorporeal shockwave therapy (ECSWT) could have a small benefit if added to

exercise, especially shoulder-specific exercises. This meta-analysis suggest that exercise may be considered as the main conservative treatment for shoulder impingement. Moreover, they found that manual therapy, laser and tape might provide an additional benefit. In addition, surgery may be a valid alternative after unsuccessful conservative treatments, as well as for those patients with clearly distinguished clinical symptoms [16].

Limitations

A limitation of this systematic review was the low number of experimental studies in the current literature and studies including comparable physiotherapy programs for the treatment of SIS using the LLLT technique.

Moreover, no a priori protocol was published and no reference screening was effectuated.

5. Conclusions

In conclusion, LLLT is used as a treatment for SIS along with therapeutic exercise. Given the low number of experimental studies found in the literature, it was not easy to find an answer to the primary question. The literature shows that more randomized clinical trials are needed in rehabilitation practice to better investigate the efficacy of physiotherapy methods and consequently offer quality therapies to patients. Evidence-based practices in rehabilitation are recommended as an important step to improve the quality of provided health care. According to this concept, randomized controlled trials and systematic reviews of RCTs are considered a gold standard to demonstrate the efficacy of clinical interventions. Clinicians are recommended to make their decisions about treatment considering RCT results. The findings obtained from high quality clinical trials are recommended as essential for patients and therapists for informed decision-making in health care decisions. Therefore, knowledge about evidence regarding the effectiveness of physiotherapy interventions is critical [23].

In this case, further studies using LLLT therapy are needed to determine the effectiveness of this type of treatment on different outcomes, but the data obtained are still very encouraging.

However, the efficacy of LLLT could not be demonstrated, and thus the benefits of this treatment should be further investigated in future studies.

6. Additional Information

This systematic review was conducted by a research group of Sapienza University of Rome. In this study, three independent reviewers worked on trial selection, while two of them extracted the data and scored the risk of bias [24–28].

Author Contributions: Conceptualization, G.G. and M.C.; methodology, G.G.; formal analysis, G.G.; investigation, M.C., P.G. and A.D.A.D.; writing—original draft preparation, M.C., P.G. and A.D.A.D.; writing—review and editing, G.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Data sharing not applicable.

Conflicts of Interest: The authors declare that they have no conflict of interest.

References

1. Pazzaglia, U.E.; Pilato, G.; Zatti, G.; Grassi, F.A. *Manuale di Ortopedia e Traumatologia*; Elsevier: Amsterdam, The Netherlands, 2015.
2. Simons, S.M.; Kruse, D.; Dixon, J.B. *Shoulder Impingement Syndrome*; UpToDate [online serial]: Waltham, MA, USA, 2016.
3. Consigliere, P.; Haddo, O.; Levy, O.; Sforza, G. Subacromial impingement syndrome: Management challenges. *Orthop. Res. Rev.* **2018**, *10*, 83–91. [CrossRef]
4. Koester, M.C.; George, M.S.; Kuhn, J.E. Shoulder impingement syndrome. *Am. J. Med.* **2005**, *118*, 452–455. [CrossRef]
5. Garving, C.; Jakob, S.; Bauer, I.; Nadjar, R.; Brunner, U.H. Impingement Syndrome of the Shoulder. *Dtsch. Ärzteblatt Int.* **2017**, *114*, 765–776. [CrossRef]

6. Bjordal, J. Review conclusion for low-level laser therapy in shoulder impingement syndrome appears to be sensitive to alternative interpretations of trial results. *J. Rehabil. Med.* **2010**, *42*, 700–701. [CrossRef]
7. Davis, D.D. Morgan Nickerson, and Matthew Varacallo. In *Swimmer's Shoulder*; StatPearls Publishing: Tampa, FL, USA, 2021.
8. Gebremariam, L.; Hay, E.M.; van der Sande, R.; Rinkel, W.D.; Koes, B.W.; Huisstede, B.M. Subacromial impingement syn-drome–effectiveness of physiotherapy and manual therapy. *Br. J. Sport. Med.* **2014**, *48*, 1202–1208. [CrossRef]
9. Park, S.W.; Chen, Y.T.; Thompson, L.; Kjoenoe, A.; Juul-Kristensen, B.; Cavalheri, V.; McKenna, L. No relationship between the acromiohumeral distance and pain in adults with subacromial pain syndrome: A systematic review and meta-analysis. *Sci. Rep.* **2020**, *10*, 20611. [CrossRef]
10. Bigliani, L.U.; Levine, W.N. Current Concepts Review—Subacromial Impingement Syndrome. *J. Bone Jt. Surg.* **1997**, *79*, 1854–1868. [CrossRef]
11. Kirkley, A.; Griffin, S.; Dainty, K.N. Scoring systems for the functional assessment of the shoulder. *Arthrosc. J. Arthrosc. Relat. Surg.* **2003**, *19*, 1109–1120. [CrossRef] [PubMed]
12. Bal, A.; Eksioglu, E.; Gürçay, E.; Gulec, B.; Karaahmet, O.; Cakci, A. Low-Level Laser Therapy in Subacromial Impingement Syndrome. *Photomed. Laser Surg.* **2009**, *27*, 31–36. [CrossRef]
13. Alfredo, P.P.; Bjordal, J.M.; Junior, W.S.; Marques, A.P.; Casarotto, R.A. Efficacy of low-level laser therapy combined with exercise for subacromial impingement syndrome: A randomised controlled trial. *Clin. Rehabil.* **2020**, *35*, 851–860. [CrossRef] [PubMed]
14. Abrisham, S.M.J.; Kermani-Alghoraishi, M.; Ghahramani, R.; Jabbari, L.; Jomeh, H.; Zare, M. Additive effects of low-level laser therapy with exercise on subacromial syndrome: A randomised, double-blind, controlled trial. *Clin. Rheumatol.* **2011**, *30*, 1341–1346. [CrossRef]
15. Yeldan, I.; Cetin, E.; Ozdincler, A.R. The effectiveness of low-level laser therapy on shoulder function in subacromial impingement syndrome. *Disabil. Rehabil.* **2009**, *31*, 935–940. [CrossRef] [PubMed]
16. Steuri, R.; Sattelmayer, M.; Elsig, S.; Kolly, C.; Tal, A.; Taeymans, J.; Hilfiker, J. Effectiveness of conservative interventions in-cluding exercise, manual therapy and medical management in adults with shoulder impingement: A systematic review and meta-analysis of RCTs. *Br. J. Sport. Med.* **2017**, *51*, 1340–1347. [CrossRef] [PubMed]
17. Dogan, S.K.; Ay, S.; Evcik, D. The effectiveness of low laser therapy in subacromial impingement syndrome: A randomized placebo controlled double-blind prospective study. *Clinics* **2010**, *65*, 1019–1022. [CrossRef]
18. Kersten, P.; Küçükdeveci, A.A.; Tennant, A. The use of the Visual Analogue Scale (VAS) in rehabilitation out-comes. *J. Rehabil. Med.* **2012**, *44*, 609–610. [CrossRef]
19. Breckenridge, J.D.; McAuley, J.H. Shoulder Pain and Disability Index (SPADI). *J. Physiother.* **2011**, *57*, 197. [CrossRef] [PubMed]
20. Constant, C.R.; Gerber, C.; Emery, R.J.; Søjbjerg, J.O.; Gohlke, F.; Boileau, P. A review of the Constant score: Modifications and guidelines for its use. *J. Shoulder Elb. Surg.* **2008**, *17*, 355–361. [CrossRef]
21. Roy, J.S.; MacDermid, J.C.; Woodhouse, L.J. Measuring shoulder function: A systematic review of four questionnaires. *Arthritis Care Res. Off. J. Am. Coll. Rheumatol.* **2009**, *61*, 623–632. [CrossRef]
22. Kromer, T.; Tautenhahn, U.; de Bie, R.; Staal, B.; Bastiaenen, C. Effects of physiotherapy in patients with shoulder impingement syndrome: A systematic review of the literature. *J. Rehabil. Med.* **2009**, *41*, 870–880. [CrossRef]
23. Hariohm, K.; Prakash, V.; Saravankumar, J. Quantity and quality of randomized controlled trials published by Indian physiotherapists. *Perspect. Clin. Res.* **2015**, *6*, 91–97. [CrossRef]
24. Fabbri, B.; Berardi, A.; Tofani, M.; Panuccio, F.; Ruotolo, I.; Sellitto, G.; Galeoto, G. A systematic review of the psychometric properties of the Jebsen–Taylor Hand Function Test (JTHFT). *Hand. Surg. Rehabil.* **2021**, *40*, 560–567. [CrossRef] [PubMed]
25. Iosa, M.; Galeoto, G.; De Bartolo, D.; Russo, V.; Ruotolo, I.; Spitoni, G.F.; Ciancarelli, I.; Tramontano, M.; Antonucci, G.; Paolucci, S.; et al. Italian Version of the Pittsburgh Rehabilitation Participation Scale: Psychometric Analysis of Validity and Reliability. *Brain. Sci.* **2021**, *11*, 626. [CrossRef]
26. Ruotolo, I.; Berardi, A.; Sellitto, G.; Panuccio, F.; Polimeni, A.; Valente, D.; Galeoto, G. Criterion Validity and Reliability of SF-12 Health Survey Version 2 (SF-12v2) in a Student Population during COVID-19 Pandemic: A Cross-Sectional Study. *Depress. Res. Treat.* **2021**, 6624378. [CrossRef] [PubMed]
27. Ruotolo, I.; Sellitto, G.; Ianniello, A.; Petsas, N.; Castelli, L.; Galeoto, G.; Berardi, A.; Barletta, V.; Conte, A.; Pozzilli, C. Italian trans-lation and validation of fatigue symptoms and impacts questionnaire in relapsing multiple sclerosis (FSIQ-RMS). *Neurol. Sci.* **2022**, *43*, 4925–4932. [CrossRef] [PubMed]
28. Marquez, M.A.; Speroni, A.; Galeoto, G.; Ruotolo, I.; Sellitto, G.; Tofani, M.; Gonzàlez-Bernal, J.; Berardi, A. The Moorong Self Efficacy Scale: Translation, cultural adaptation, and validation in Italian; cross sectional study, in people with spinal cord in-jury. *Spinal Cord Ser. Cases* **2022**, *8*, 22. [CrossRef]