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Strength in motion: Combating fatigue and enhancing performance in young swimmers through isometric and Pilates training

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Abstract

Swimming is a sport that demands endurance, strength, and precise technique, often leading to fatigue and overuse injuries such as Swimmer's Shoulder in young athletes. This quasi-experimental study aimed to evaluate the effectiveness of combining Isometric Shoulder Strengthening Exercises and Pilates Training with conventional swimming routines to combat fatigue and enhance performance among adolescent freestyle swimmers. Thirty participants aged 13-19 were purposively selected and divided into two groups: Group A underwent isometric shoulder strengthening with conventional training, while Group B performed Pilates-based exercises alongside conventional training. Fatigue levels were measured using the Rate of Perceived Exertion (RPE) scale, and performance was assessed using the FORM Score, both pre- and post-intervention over a 12-week period. Statistical analysis using paired and unpaired *t*-tests revealed significant improvements within both groups; however, Group B (Pilates + Conventional) demonstrated greater enhancement in performance (mean = 77.2 → 82.2) and a larger reduction in fatigue (mean = 14 → 9.87) compared to Group A. The findings conclude that integrating Pilates with conventional training provides superior benefits in improving core stability, flexibility, and endurance, thereby reducing fatigue and enhancing overall swimming performance.

Keywords: Pilates, isometric exercises, fatigue, performance, adolescent swimmers, freestyle, RPE, FORM score

1. Introduction

Swimming is a highly demanding sport that requires a combination of endurance, strength, flexibility, and precise technique. Due to repetitive upper limb movements, swimmers-especially adolescents-are prone to fatigue, muscular imbalances, and overuse injuries such as Swimmer's Shoulder. Fatigue leads to reduced stroke efficiency, slower performance, and an increased risk of injury. To address these challenges, complementary training approaches like Isometric exercises and Pilates have gained attention. Isometric exercises enhance shoulder stability and muscular endurance through static contractions, while Pilates focuses on core strength, posture, and body alignment. Integrating these methods with conventional swimming training may help reduce fatigue, correct muscular imbalances, and improve overall performance. This study investigates the combined effects of Isometric and Pilates training on fatigue reduction and performance enhancement in adolescent freestyle swimmers.

2.1 Materials Required

- Pen
- Pencil
- Eraser
- Paper
- Rate of perceived exertion scale
- Mobile phone
- Stopwatch
- Assessment chart

2.2 Study setting

The research had taken place in Lifespring 360 Swimming Academy, players warm-up room ensuring a standardized environment for the intervention and assessments.

2.3 Study design

It is a Quasi experimental study design.

2.4 Sample Size

The total number of participants were 30 and they were divided into three groups.

Group A - Group of Swimmers with Isometric shoulder strengthening exercises and Conventional training

Group B - Group of Swimmers with Pilates regimen and Conventional training.

2.5 Sampling Method

The participants were assigned for this study by purposive sampling method.

2.6 Study Duration

This study was conducted for about 6 months.

2.7 Treatment Duration

12 weeks

2.8 Selection Criteria

Inclusion Criteria

- **Age:** 13 to 19 years.
- **Gender:** Both Male and Female
- Competitive freestyle swimmers with at least one year of formal training.
- Swimmers reporting fatigue related to the repetitive nature of swimming.

Exclusion Criteria

Participants will be excluded if they meet any of the following conditions:

- Existing injuries or medical conditions that contraindicate participation in exercise.
- Swimmers with Swimmer's shoulder.
- Current engagement in structured exercise regimens targeting similar outcomes.
- Inability to commit to the full-time duration of the study.
- Individuals with Cardio respiratory issues

2.9 Outcome Measures

Independent Variables

- Isometric strengthening exercises
- Pilates regimen

Dependent Variables

- Fatigue level
- Overall performance

2.10 Measurement Tool

- Rate of Perceived Exertion (RPE) scale
- FORM Score

2.11 Procedure

Thirty adolescent freestyle swimmers were recruited and provided informed consent. They were split into two equal

groups (n=15):

Group A - Isometric shoulder strengthening + conventional swim training; Group B - Pilates + conventional swim training.

Both interventions ran for 12 weeks. Isometric exercises included wall push holds, plank holds, resisted shoulder extension, and resisted internal rotation (10 s × 5 sets, 30 s rest). Pilates exercises included back extensions, spinal twists, and side planks (10 s × 5 sets, 30 s rest).

2.12 Treatment Techniques

Isometric Strengthening Exercises

1. Wall Push Holds - 10 sec × 5 sets, 30 sec rest
2. Plank Holds - 10 sec × 5 sets, 30 sec rest
3. Resisted Shoulder Extension - 10 sec × 5 sets, 30 sec rest
4. Resisted Internal Rotation - 10 sec × 5 sets, 30 sec rest

Pilates Exercises

1. Back Extension - 10 sec × 5 sets, 30 sec rest
2. Spinal Twist - 10 sec × 5 sets, 30 sec rest
3. Side Plank - 10 sec × 5 sets, 30 sec rest

3. Results

Group A (Isometric + Conventional) showed improvement in fatigue (RPE 15.2→12) and performance (FORM 68.47→72.87).

Group B (Pilates + Conventional) showed greater improvement (RPE 14→9.87; FORM 77.2→82.2).

Thus, Pilates training was more effective in reducing fatigue and enhancing performance than isometric training.

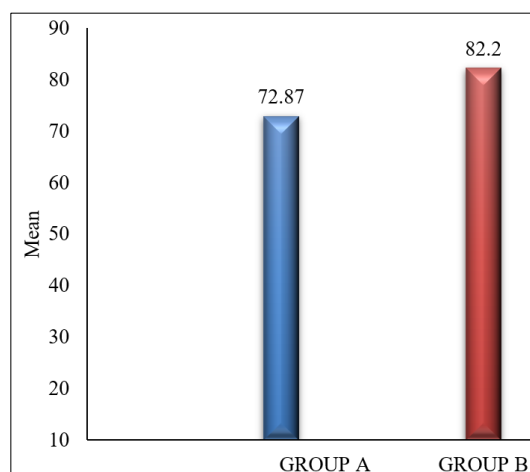
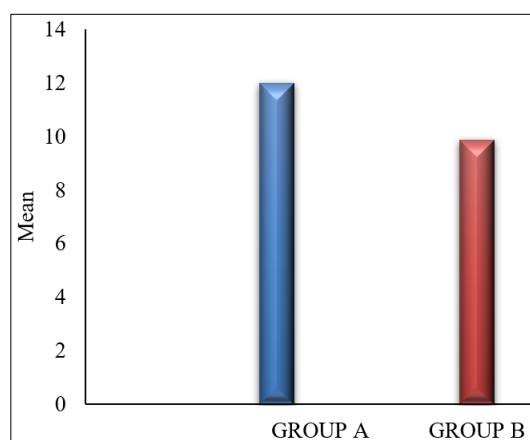


Fig 1: Comparison of results

4. Discussion

Both training methods improved swimmers' performance and reduced fatigue. Group A (Isometric) showed good progress, but Group B (Pilates) showed greater improvement in both RPE and FORM scores. Pilates enhanced core strength, flexibility, and control, leading to better results. Hence, Pilates with conventional training proved more effective than isometric training.

5. Conclusion

This study concludes that Group B (Pilates Training and Conventional Training) demonstrates a more significant improvement in reducing fatigue levels (RPE Scale) and enhancing overall performance (FORM Scale) compared to Group A (Isometric Training and Conventional Training).

Thus, the null hypothesis is rejected, and the alternate hypothesis is accepted, which states that "there is a significant difference in fatigue reduction and performance improvement between swimmers who receive Pilates training combined with conventional training and those who receive isometric training combined with conventional training."

References

- McLaine SJ, Ginn KA. A normal shoulder strength profile for the young swimmer. 2018.
- Habechian FAP, Van Malderen K. Concluded that muscle imbalance can occur in the shoulder girdle in young swimmers in 3 years. 2018.
- Almeida GPL, De Souza VL. Manual therapy techniques for the shoulder. 2011.
- Matthews MJ, Green D. This investigation revealed a reduction in stroke length across both arms. 2017.
- McLaine SJ, Bird ML. Eighty-five swimmers initially strength tested, thirty-seven swimmers (47%) returned completed questionnaires and eighteen (n = 27 shoulders). 2019.
- González-Gálvez N, Vaquero-Cristóbal R. Concluded that a 12-week exercise adapted program from PM. 2020.
- Cibinello FU, Neves JCJ. Manual therapy techniques for the shoulder, lower cervical spine and upper thoracic spine in combination with specific exercises for the stabilizers of the shoulder. 2023.
- Yoma M, Herrington L. Exercise therapy has positive effects on reducing the incidence of shoulder pain. 2022.
- Batalha N, Parraca JA. This indicates that a single practice seems not to affect the shoulders strength and balance of adolescent swimmers. 2021.
- Shay-McEntee A. The results are an improved core strength, control, stability and flexibility.
- Moon JH, Shin YA. Stated that it is considered that the *AB* muscle, *LES*, and gluteal muscle exercise is necessary when applying the Pilates exercise. 2019.
- Keiner M, Sander A. Stated that strength and speed are two major factors that determine a swimmer's performance. 2015.
- Buoite Stella A, Cargnel A. Shoulder muscles are active during front-crawl swimming to provide propulsion and stabilize the glenohumeral and scapulothoracic joints. 2024.
- Prasade SS, Nagrale S. The 4-week exercise training protocol designed for competitive swimmers was effective in improving shoulder range of motion and stability. 2023.
- Almeida-Neto PF, Baxter-Jones A. Stated that success in speed swimming depends on the efficiency of the anaerobic system for the production of cellular energy, especially during muscle power production. 2023.
- Pilates for swimmers. Available from: <https://www.ibphysio.com.au/pilates-for-swimmers/>
- Swimmers exercise. Available from: <https://www.rehabhero.ca/exercise/swimmers>