

Effectiveness of Aquatic-based Rehabilitation Protocol among Athletes Post ACL Reconstruction: A Systematic Review

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ABSTRACT

Introduction: In recent years, Anterior Cruciate Ligament (ACL) reconstruction surgeries have increased globally, but it is still questionable whether aquatic rehabilitation significantly improves knee function over land-based physiotherapy. Water naturally removes much of the body's weight, which leads to a reduction in joint swelling and provides resistance with every movement, creating conditions that allow patients to start exercising earlier and with less pain than would be possible on dry land.

Aim: To review the effectiveness of aquatic-based rehabilitation protocol for improving static balance, functional gait capacity, and proprioception among athletes post ACL reconstruction.

Materials and Methods: PubMed, Scopus, Web of Science, and Google Scholar were searched for systematic reviews. Eight studies satisfied the inclusion criteria: four randomised controlled trials, one prospective comparative clinical study, one single-subject multiple-baseline case series, one randomised comparative experimental study, and one comparative experimental study. Methodological quality was assessed using the (PEDro) scale, and risk of bias was evaluated using the Cochrane Risk of Bias 2.0 tool.

Results: Eight studies meeting the inclusion criteria were analysed. PEDro scoring classified three studies as high quality (6-8/10), two as moderate (4-5/10), and three as low quality (2-3/10). Risk

of bias assessment identified four studies at moderate overall risk and four at high risk. Notably, three out of four high-risk studies also scored lowest on the PEDro scale, demonstrating a consistent relationship between elevated bias and poor methodological quality. Studies included in this review with lower scores on PEDro and demonstrating a high risk of bias were excluded because of low methodological quality. But still, all the studies pointed towards aquatic rehabilitation being beneficial. Aquatic rehabilitation produced clinically meaningful improvements across all functional domains, with mean proprioception improving by 6.08° in joint position sense error, static balance improving by 4.03 mm² in sway area, and functional gait capacity increasing by 250 metres on the Six-Minute Walk Test.

Conclusion: Aquatic rehabilitation following ACLR demonstrates consistent clinical benefits, with six-week protocols delivered with three sessions weekly, proving most effective by targeting the early recovery in terms of static balance, joint position sense, and functional gait capacity. Future well-designed randomised trials should specifically investigate aquatic therapy's measurable effects on gait biomechanics, dynamic balance, and progressive strengthening protocols.

Keywords: Anterior cruciate ligament reconstruction, Aquatic rehabilitation, Balance, Gait, Hydrotherapy, Proprioception.

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