

# INPLASY

## Effects of swimming exercise on early adolescents' physical conditioning and physical health: a protocol for systematic review

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### ADMINISTRATIVE INFORMATION

**Support** - There was no financial support.

**Review Stage at time of this submission** - The review has not yet started.

**Conflicts of interest** - None declared.

**INPLASY registration number:** INPLASY2023100078

**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 23 October 2023 and was last updated on 31 March 2024.

### INTRODUCTION

**Review question / Objective** This review aims to systematically summarize the available literature on longitudinal effects of swimming exercise on physical conditioning and physical health outcomes in healthy adolescents (aged 10-15 years old) including both sexes.

**Rationale** Nowadays, physical activity before and during puberty is a necessary preventive measure to pursue greater physical conditioning and physical health benefits during lifespan. Regular exercise (framed in physical activity) has shown to have benefits for different age groups, particularly improvements in cognitive function, cardiorespiratory or muscular fitness, bone health, quality of sleep, decreased risk of cognitive deviations, anxiety levels and depression. From the various exercise types, swimming has become one

of the most practiced exercises at early ages, mostly for health benefits and safety purposes. However, studies regarding potential benefits for the cardiovascular system and health remain scarce. There is also a lack of information on how swimming can develop the various conditional and coordinative skills on water and if those can be transferred to daily activities. A systematic review examining the benefits of swimming exercise on physical conditioning and health-related outcomes will allow us to understand the true impact on adolescents. The systematic review will focus on comparison with controlled groups and will provide a synthesis for the different parameters assessed, the different methods used and the gaps related to ages up to years old.

**Condition being studied** How swimming exercise affects physical conditioning and physical health during early adolescence.

## METHODS

**Search strategy** This systematic review will be conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement. The Boolean search method (including AND/ OR) will be used to search literature related to physical conditioning and health-related variables. While the terms in databases search (PubMed, Scopus and Web of Science) must be present in the title, abstract or keywords, in International Symposium of Biomechanics and Medicine in Swimming proceedings they can be in all fields. Search lines selected will contain: (1) ("swim\*"); AND (2) ("adolescen\*" OR "pediatri\*" OR "teenag\*" OR "youth" OR "young\*" OR "age group\*" OR "(pre)pubert\*"); AND (3) ("intervent\*" OR "program\*" OR "train\*" OR "lesson\*" OR "exercise\*"); AND (4) ("health\*" OR "physical condition\*" OR "fitness").

**Participant or population** The population will include healthy adolescents, aged between 10-15 years old, and will exclude all spectrum of disabled adolescents and other aquatic activities practitioners (e.g. hydrotherapy and aquatic interventions).

**Intervention** The intervention will include swimming programs/interventions or training sessions and exclude combined interventions where the effects of swimming cannot be isolated.

**Comparator** Comparison will be provided with passive control groups and/or placebo or active control groups regarding other sports longitudinal interventions.

**Study designs to be included** The study designs to be included are randomized and non-randomized longitudinal designs. Cross-sectional designs will be excluded.

**Eligibility criteria** Peer-reviewed articles searching the current review scope will be eligible, without restrictions on language (as long as the studies include the title and abstract written in English) and the deadline for searching is November 2023. Also, conference abstracts will be included if published in the International Symposium of Biomechanics and Medicine in Swimming (BMS) proceedings since 1970, due to its relevance in swimming-specific context. Nonpeer-reviewed articles/journals, reviews (qualitative review, systematic review, meta-analysis), books, book chapters, commentaries, editorials, letters to the editor, overviews, dissertations, thesis or trial registrations

will be excluded from the analysis. According to PRISMA 2020 guidelines, eligibility criteria will be designed with PICOS (population, intervention, comparison, outcome and study design) framework.

**Information sources** The initial search will be conducted in three electronic databases (PubMed, Scopus, Web of Science) and in BMS proceedings (available at: <https://www.iat.uni-leipzig.de/datenbanken/iks/bms/>). There will be no restrictions on language (as long as the title and abstract of the studies are written in English) or publication date, and no filtering application to increase the chances of identifying appropriate studies. After data extraction, an additional search will be performed through manual search, snowballing citation tracking and expert consultation.

**Main outcome(s)** The outcomes will include effects on physical conditioning and physical health (e.g. muscle function, coordination, anaerobic/aerobic conditioning, heart rate, bone health). Studies aiming for performance outcome during sport-specific exercise (e.g. stroke rate, speed).

**Additional outcome(s)** None declared.

**Data management** Database screening will be realized by two authors using manual search and snowballing track citation methods. Automated duplicates removal will be performed automatically using EndNote 20.6 for Windows (ClarivateTM, Philadelphia, PA, USA). Two authors will complete an independent initial data extraction and, in case of disagreements a third author will provide arbitrage and meet with authors until consensus. Records will be extracted into a tailored Microsoft® Excel 2016 worksheet (Microsoft Corporation Redmond, WA, USA) created for data summary.

**Quality assessment / Risk of bias analysis** An independent reviewer will perform the risk of bias analysis of each included record and disagreements will be solved by another author. RoBANS 2 tool will be used to perform nonrandomized studies risk of bias (comparability of the target group, target group selection, confounders, measurement of intervention/exposure, blinding of assessors, outcome assessment, incomplete outcome data and selective outcome reporting) and Rob 2.0 tool will be used for randomized studies (which includes the domains: randomization process, deviations from the intended interventions, missing outcome

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data, measurement of the outcome, selection of the reported result). Additionally, each record will be judged with an overall bias.

**Strategy of data synthesis** Data will be grouped in accordance with the physical conditioning or physical health outcomes and information will be synthesized by: (i) author(s) and year of publication; (ii) country; (iii) sample characteristics (like group, sample size, sex, age); (iv) intervention characteristics (e.g. context, duration, frequency, session duration or distance); (v) assessments (number of assessments, aim and variables); (vi) main results.

**Subgroup analysis** We will not perform subgroup analysis.

**Sensitivity analysis** No analysis to report.

**Language restriction** There will be no restrictions on language (as long as the title and abstract of the studies are written in English), imposed on inclusion criteria.

**Country(ies) involved** Portugal.

**Other relevant information** None declared.

**Keywords** Swimming; longitudinal; sports medicine; physical fitness; adolescence.

**Dissemination plans** The systematic review will be submitted and published in international peer-reviewed journals with impact factor and disseminated in sport sciences related scientific conferences.

#### **Contributions of each author**

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