

# INPLASY

## A Scoping Review on Optimal Power Load with Barbell Exercises: A Key to Enhance Performance in Athletes

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### Corresponding author:

Pedro Ribeiro

pedronetoribeiro@gmail.com

### Author Affiliation:

CIDEFES, Centro de Investigação em Desporto, Educação Física e Exercício e Saúde, Universidade Lusófona, 1749-024 Lisboa, Portugal.

Ribeiro, PN; Rebelo, A; Arrais, I; Pires, I; Valente-dos-Santos, J; Pereira, JR.

### ADMINISTRATIVE INFORMATION

**Support** - Non applicable.

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

**Conflicts of interest** - None declared.

**INPLASY registration number:** INPLASY202450080

**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 16 May 2024 and was last updated on 16 May 2024.

## INTRODUCTION

**Review question / Objective** What is the influence of the Optimal Power Load (OPL) attained during barbell exercises on the specific performance outcomes (such as linear sprint, vertical jump or change of direction) of athletes engaged in both individual and team sports across various competitive levels?

This scoping review aims to conduct a systematic exploration of both cross-sectional and longitudinal studies that focus on the methodologies employed to establish the OPL in barbell exercises. The goal is to provide a detailed overview of the current research landscape in this area.

**Background** In the domain of strength training, the concept of power, as defined in physics, is of significant importance. Power can be

mathematically expressed by the equation:  $P = F \cdot V$ , where "P" denotes power, "F" represents force, and "V" stands for velocity. This equation elucidates that power is derived from the multiplication of the applied force and the velocity at which this force is exerted. This principle is particularly salient in the context of strength training activities, such as barbell lifts, serving as a quantitative measure of an athlete's capacity to rapidly generate force.

This capacity to generate force rapidly is a critical determinant of performance in a wide array of both individual and team sports, as it directly influences the speed and intensity of an athlete's performance. Incorporating barbell exercises into strength training regimes can enhance an athlete's strength, speed, and power. This form of training is a valuable addition to the complementary training of any sport, whether team-based or individual. Enhancing these athletic qualities through strength

training can provide athletes, regardless of their level, with a competitive advantage.

Optimal Power Load (OPL) is characterized as the load that maximizes power output in a specific exercise. This load is determined from the load-power relationship, which is quantified using various measurement devices, including linear position transducers, accelerometers, and force plates. Each of these devices provides precise data that aid in determining the load that optimizes power output.

**Rationale** Within the field of physical quality training, there is a constant pursuit for the optimal prescribed load in barbell exercises. This detail is crucial when working with athletes who require that the complementary training to their sport contributes to the enhancement of their performance.

With the development of the velocity based training, alternative methods for determining loads in barbell exercises have been explored. That is, in addition to the one repetition maximum (RM), other type of tests began to be made based on the velocity achieved by the barbell with a given load.

Indeed, these methods provide a profile based on the relationship of load, velocity, and power.

Unlike the method of determining loads from the percentage of an RM that only considers the weight factor, through the profile we can find power values, which arise from a load and its respective bar-velocity.

## METHODS

**Strategy of data synthesis** For this scoping review, we will conduct our search across four electronic databases: PubMed, Scopus, Web of Science, and SportDiscus. The development and execution of the search strategy will be overseen by the lead researcher. The search strategy must be meticulously designed to ensure comprehensive retrieval of evidence, encompassing both peer-reviewed publications and unpublished works (commonly referred to as grey literature), pertinent to the research question.

To guarantee the thoroughness and resilience of our search, we will align our strategy with the guidelines provided in the Peer Review of Electronic Search Strategies (PRESS) checklist.

The search strategy will encompass terms that include all types of athletes, optimal power load, zone, or spectrum. All types of synonyms, related terms, and appropriate variations will be used.

Our research approach will be tailored to the syntax and subject headings of each database to ensure thoroughness and reproducibility.

For example in PubMed the query box will be like this: `athlet* OR player OR professional OR high-level OR elite OR amateur OR recreati* OR colleg* OR "high school" AND "optimal power load*" OR "optimum power load*" OR "maximal power output" OR "maximum power output" OR "maximal power zone" OR "maximum power zone" OR "optimal power spectrum" OR "optimum power spectrum" OR "optimal power zone" OR "optimum power zone" OR "load-power relat*" OR "power profil*" OR "load-power profil*" OR "force-power relat*" OR "force-power profil*" OR "force-velocity relat*" OR "force-velocity profil*" OR "load-velocity relat*" OR "load-velocity profil*" OR "power-velocity relat*" OR "power-velocity profil*"`.

**Eligibility criteria** This review will be guided by the following criteria:

1) The research will include athletes from a wide range of individual and team sports, across various levels of competition and ages.

2) The search aims to identify all methodologies that quantify the OPL in any exercise executed with a barbell, using any device capable of measuring bar velocity.

3) The research will elucidate the correlation between OPL and specific sports performance metrics, such as linear sprinting, vertical jumping, and change of direction.

The delineation of these criteria will be design to summarize a comprehensive spectrum of studies investigating OPL within the context of sports. The rationale for incorporating athletes covering all age demographics and performance tiers will be to capture a diverse range of methodologies pertaining to OPL.

The language of publication will serve as a limiting parameter. Solely studies published in English will be incorporated to ensure the research team's efficacious comprehension and summary of the findings.

No restrictions will be imposed on the publication date, ensuring a comprehensive synthesis of all relevant research.

### Source of evidence screening and selection

The abstracts of all the articles identified in the search will be screened independently against the predefined selection criteria by two authors. Any disagreements between the two authors regarding article inclusion will be further discussed and, if agreement is not reached, a third author will be consulted to establish consensus.

Full-text copies will be acquired for all papers that meet title and abstract screening criteria. The full-text screening will be performed by the same two reviewers. As before, any discrepancies will be

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discussed until the authors reach an agreement, and a third author will be consulted when required. A systematic verification process will be instituted to ascertain the inclusion of all pertinent studies. Duplicates will be identified and eliminated via the CADIMA platform, thereby preserving the integrity of the review. This meticulous selection methodology will be adopted to guarantee the comprehensiveness and pertinence of the studies that will be incorporated in the review.

**Data management** A data extraction form will be developed to collect key information on the selected articles, focusing on the population, concept, and context. This form will be reviewed and tested by all research team members prior to implementation, ensuring that the form accurately captures the necessary data.

Upon finalization of the charting form, the data extraction phase will commence. Each included study will be independently charted by two authors, utilizing the CADIMA software. This tool will play a crucial role in administering the extraction process and fostering collaboration among the team. In the event of inconsistencies, they will be discussed and resolved through consensus, with the input of a third author if necessary.

**Language restriction** This review will restrict its scope to studies published in English.

**Country(ies) involved** Portugal.

**Keywords** Load-power relationship; Barbell Velocity; Power Output; Athletic Development.

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

Author 1 - Pedro Ribeiro.

Email: pedronetoribeiro@gmail.com

Author 2 - André Rebelo.

Email: andre94rebelo@hotmail.com

Author 3 - Inês Arrais.

Author 4 - Inês Pires.

Email: inesgrijopiresigp@gmail.com