CAN THE "PERSONAL RECORD" ADEQUATELY PREDICT STRENGTH ENDURANCE PERFORMANCE IN A CLEAN & JERK WORKOUT: AN ANALYSIS OF THE CROSSFIT® BENCHMARK GRACE

Thiago Albernaz [1]
Pedro Augusto Inacio [2]
Davi das Águas Caixeta [3]
Talita Rodrigues Corredeira Mendes [4]
Izabela Linhares Monturil [5]
Iransé Oliveira Silva [6]
Josivam Peixoto Siqueira [7]
Marcelo Magalhães Sales [8]
Anne Caroline de Almeida Rodrigues [9]
Gaspar Rogério da Silva Chiappa [10]
Pedro Sardinha Leonardo Lopes Martins [11]
Patrícia Sardinha Leonardo Lopes Martins [12]
Rodrigo Alvaro Brandão Lopes Martins [13]
Sérgio Machado [14]
Alberto Souza Sá Filho [15]

ABSTRACT

Our objective was to predict the strength endurance performance of Clean & Jerk (C&J) from the PR (personal Record). 17 physically active individuals classified as trained for strength exercises

[1]Master's in Human Movement and Rehabilitation; Evangelical University of Goiás; thiagoalbernaz@yahoo.com.br
[2]Master's in Human Movement and Rehabilitation; Evangelical University of Goiás; pedroqinacio@gmail.com
[3]Physical Education undergraduate; Evangelical University of Goiás; davi.caixeta@gmail.com
[4]Master's student in Pharmaceutical Sciences; Evangelical University of Goiás; talita.mendes@docente.evangelicagoianesia.edu.br
[5]Master's student in Human Movement and Rehabilitation; Evangelical University of Goiás; izabela.alves@gmail.com
[6]PhD in Physical Education; Evangelical University of Goiás; iranse.silva@unievangelica.edu.br
[7]Master's student in Human Movement and Rehabilitation; Evangelical University of Goiás; josivanedf11@gmail.com
[8]PhD in Physical Education; State University of Goiás; marcelomagalhaessales@gmail.com
[9]Undergraduate in Physical Education; Evangelical University of Goiás; acarodrigues.85@gmail.com
[10]Doctor in Health Sciences; Evangelical University of Goiás; gaspar.chiappa@gmail.com
[11]Medical student; Evangelical University of Goiás; pdlopesmartins@gmail.com
[12]PhD in Biomedical Engineering; Evangelical University of Goiás; patricia.martins@unievangelica.edu.br
[13]PhD in Cellular and Molecular Biology; Evangelical University of Goiás; rodrigo.martins@unievangelica.edu.br
[14]Doctor in Mental Health; Federal University of Rio de Janeiro; secm80@gmail.com
[15]Doctor in Mental Health; Evangelical University of Goiás; doutor.alberto@outlook.com

participated in the study. The study was conducted over 2 visits. All participants underwent a bioimpedance procedure and familiarization with the C&J movements. On the second visit, the subjects underwent the actual performance of C&J. The PR was defined based on the most recent report of the highest workload lifted. The results were expressed in work time (min). The simple linear regression analysis showed a significant association between the PR records of C&J and the time performance of the same movement (p = 0.001). The relationship demonstrated a significant association between the predicted and predictor variables (r = 0.680; R2 = 0.462), suggesting that the PR would explain 46% of the C&J performance. It is concluded that the Personal Record in C&J showed significant predictive capacity with strength endurance performance times.

Keywords: Electrostimulation, Performance, VO2Max, Crossfit

INTRODUCTION

Crossfit originated in the mid-1980s with Greg Glassman, a former gymnast who started the practice with some friends in training sessions using fixed bars, weighted bars, and their own body weight. Glassman realized that the systematic approach provided some results and thus started a new physical practice called Crossfit® (Fortunato et al. 2019).

Crossfit is a high-intensity and competitive training model, where, in most workouts, strength exercises and cardiorespiratory exercises are performed simultaneously. There are different pre-configured training models, called benchmarks. Such workouts are standardized worldwide (exercises, repetitions, and load), which provides great comparative possibilities. Moreover, due to being a relatively new modality, it does not yet have clear parameters and regulations, as well as an understanding of the determining variables for the success of physical performance.

We know that various factors can be related to performance in the modality, among them: anthropometric, physiological, age, sex, previous experience, nutrition, and others. Recent studies such as that of Tibana et al. (2017) sought to investigate the relationship between performance success in a specific WOD (Workout of the Day) and anthropometric, physiological data, and experience time of practitioners in the modality. The study found a positive and statistically significant correlation ($p<0.05$) between body fat percentage and the shorter time in completing the proposed WOD. They also observed a positive correlation between time and muscle strength in snatch, clean, back squat, and front squat, as well as in relation to VO2 max. Individuals with

a lower body fat percentage, greater strength, and higher VO2max achieved the best results in the proposed WOD.

The reference standards had already been defined by Meier, Rabel, and Schmidt (2021) for the workouts Grace, Fran, and Helen, but the determining variables for the success of such benchmark WODs are still an unknown. So, considering the WOD benchmark Grace, we aim to establish the predictive capacity of the Personal Record (PR) on the performance of strength endurance in Clean & Jerk.

MATERIALS AND METHODS

17 physically active individuals of both sexes, classified as competitively trained for Crossfit exercises (> 5 years), non-smokers, and who respond to the coronary artery disease (CAD) risk stratification questionnaire, as proposed by the American College of Sports Medicine. Individuals who used psychoactive substances, or previous ergogenic substances, or who had predetermined osteomuscular injuries were excluded. All participants will be informed about the procedures and will sign a free and informed consent form (FICF). This protocol was approved by the Research Ethics Committee (CAAE 25686219.9.0000.5512; protocol 3.790.808 / 2019).

Study Design

The study was conducted over a total of 2 visits. After signing the consent form during the first visit, all participants underwent a bioimpedance procedure for sample characterization, as well as familiarization with the Clean & Jerk movements. On the second visit, the subjects underwent the experimental procedure. The Protocol began with a sequence of joint mobility exercises involving the hip, ankle, thoracic spine, shoulder, and wrist joints, followed by a few repetitions of the Clean & Jerk movement with progressive loading, in order to prepare the individual. Subsequently, the protocol, WOD Grace, involving Clean & Jerk lifting movements, was performed, executing a total of 30 repetitions in the shortest time possible. The demonstrations of the movements can be found in Figure 1. The workload, already known, is set at 60kg for men and 42kg for women. The time limit for executing the protocol was set at eight

minutes. The total protocol time (TTotal) was recorded, as well as the subjective perception of effort.

Figure 1. Clean & Jerk lifting movement pattern

A descriptive analysis of the data was previously conducted and presented as mean ± standard deviation (SD). A linear regression analysis was used to determine the predictive capacity of PR on performance.

RESULTS

After analyzing the assumptions of normality, the characterization was described as mean ± standard deviation (SD) (Table 1).

Table 1. Sample characterization

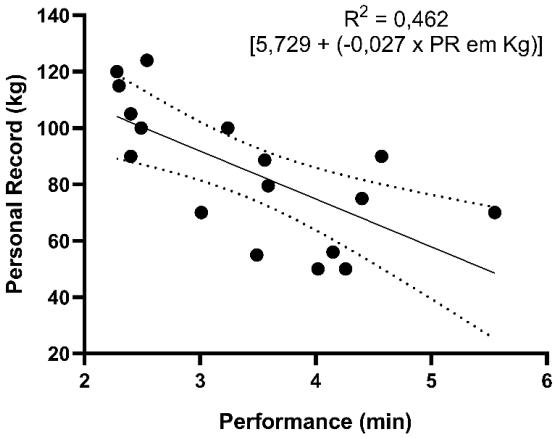
Age (years)	Exp (months)	Mass (kg)	Altura (cm)	BMI kg/cm	% Fat (%)	M.M. (kg)	Water (L)
31,3	47,6	77,3	1,73	25,9	17,8	36,1	46,2
5,4	30,4	12,3	0,1	2,9	8,4	5,7	7,0

Legend: Exp = Time of experience; BMI = Body Mass Index; % Fat = Percentage of fat; M.M. = Muscle mass content; Water = Hydration index

The simple linear regression analysis showed a significant association between personal records (PR) of Clean & Jerk and Performance in minutes ($p = 0.001$). The relationship demonstrated a significant association between the predicted and predictor variables ($r = 0.680$; $R2 = 0.462$), suggesting that the PR would explain 46% of the Clean & Jerk performance (Workout Grace). Additionally, the regression analysis showed a pattern of independent residual distribution as suggested by Durbin-Watson (1.752). The ANOVA showed that the fit of the regression model with the PR predictor was significant ([$F (1,15) = 12.899$, $p = 0.003$]). The graph of the distribution of

standardized residuals against predicted values showed a homoscedastic distribution pattern. Finally, the prediction equation from the line can be described by: [5.729 + (-0.027 x PR in Kg)]. Figure 1 shows the behavior of the regression line.

Figure 1. Presentation of the behavior of the regression line



CONCLUSION

It is concluded that the maximum strength values (PR) in Clean & Jerk lifts showed significant association and predictive capacity with strength endurance performance times.

BIBLIOGRAPHIC REFERENCES

1. Glassman, G. What is CrossFit. Crossfit J. 2005. Retrieved from http://journal.CrossFit .com/
2. Tibana, R; Sousa, N; Cunha, G; Prestes, J. Correlação das variáveis antropométricas e fisiológicas com o desempenho o Crossfit. Revista Brasileira de Prescrição e Fisiologia do Exercício, São Paulo. v.11. n.70. Suplementar 1. p.880-887. Jan./Dez. 2017.
3. Feito, Y; Giardina, M; Butcher, S; Mangine, G. Repeated Anaerobic Tests Predicts Performance Among a Group of Advanced CrossFit Trained Athletes. Appl. Physiol. Nutr. Metab. 2018.
4. Leitão, L.; Dias, M.; Campos, Y.; Vieira, J.G.; Sant'Ana, L.; Telles, L.G.; Tavares, C.; Mazini, M.; Novaes, J.; Vianna, J. Physical and Physiological Predictors of FRAN CrossFit® WOD Athlete's Performance. Int. J. Environ. Res. Public Health 2021, 18, 4070
5. Bellar D, Hatchett A, Judge LW, Breaux ME, Marcus L. The relationship of aerobic capacity, anaerobic peak power and experience to performance in CrossFit exercise. Biol Sport. 2015;32(4):315–320.
6. Meier, Rabel e Schmidt. Determination of a CrossFit® Benchmark Performance Profile. Sports (Basel) 2;9(6):80.2021.