ISSN: 2318-8413 DOI: 10.18554/refacs.v8i2.4336

REFACS

Benefits of extreme fitness programs for women

Benefícios de programas de condicionamento extremo para mulheres

Beneficios de programas de condicionamiento extremo para mujeres

Received: 12/12/2019
Approved: 31/03/2020
Published: 15/05/2020

Lucimara Ferreira Magalhães[1]
Antônio Ribeiro Neto[2]
Isabel Aparecida Porcatti de Walsh[3]
Dernival Bertoncello[4]

This is an observational cross-sectional study, conducted in 2019, with the aim of quantifying strength, flexibility and quality of life according to the time of practice in an extreme conditioning program. 23 women participated, divided into two groups, one including women with less than eight months of practice (G1 - 12 participants) and another with those with more than eight months (G2 - 11 participants). Even without significant differences, it was possible to observe greater scapular strength in G2 (20.94) in relation to G1 (17.75) and greater strength of the lower limbs in G2 (84.12) in relation to G1 (67.39). There was a significant reduction in flexibility for shoulder rotation ($p = 0.012$), a slight increase in the final quality of life score and in most domains. Women can benefit from the practice of extreme conditioning programs both in the short and in the long term.
Descriptors: Woman's health; Motor activity; Muscle strength; Quality of life.

Este é um estudo observacional de caráter transversal, realizado em 2019, com o objetivo de quantificar a força, a flexibilidade e a qualidade de vida de acordo com o tempo de prática no programa de condicionamento extremo. Participaram 23 mulheres, divididas em dois grupos, mulheres com prática menor que oito meses (G1 – 12 participantes) e maior que oito meses (G2 – 11 participantes). Mesmo não apontando diferenças significativas, é possível observar maior força escapular no G2 (20,94) em relação ao G1 (17,75) e maior força dos membros inferiores no G2 (84,12) em relação ao G1 (67,39). Houve uma redução significativa da flexibilidade para rotação de ombro (p=0,012), um discreto aumento na maioria dos domínios e no escore final da qualidade de vida. As mulheres podem se beneficiar com a prática de programas de condicionamento extremo tanto em curto quanto em longo prazo.
Descritores: Saúde da mulher; Atividade motora; Força muscular; Qualidade de vida.

Este es un estudio observacional de carácter transversal, realizado en 2019, con el objetivo de cuantificar la fuerza, la flexibilidad y la calidad de vida de acuerdo con el tiempo de práctica en el programa de condicionamiento extremo. Participaron 23 mujeres, divididas en dos grupos, mujeres con práctica menor que ocho meses (G1 – 12 participantes) y mayor que ocho meses (G2 – 11 participantes). Incluso sin señalar diferencias significativas, es posible observar mayor fuerza escapular en el G2 (20,94) en relación al G1 (17,75) y mayor fuerza de los miembros inferiores en el G2 (84,12) en relación al G1 (67,39). Hubo una reducción significativa de la flexibilidad para rotación de hombro (p=0,012), un discreto aumento en la mayoría de los dominios y en la puntuación final de la calidad de vida. Las mujeres pueden beneficiarse con la práctica de programas de condicionamiento extremo tanto a corto como a largo plazo.
Descriptores: Salud de la mujer; Actividad motora; Fuerza muscular; Calidad de vida.

* Funding: Masters's Degree, Doctor's Degree, and Scientific Initiation Scholarships (CAPES, CNPq, FAPEMIG)
1. Physical Therapist. MS student of the Postgraduate Program in Physical Education (PPGEF) at the Federal University of Triângulo Mineiro (UFTM), Uberaba, MG, Brazil. ORCID: 0000-0002-5301-521X. E-mail: lucimara_108@yahoo.com.br
2. Physical Education Professional. MS student in Physical Education at PPGEF/UFTM, Uberaba, MG, Brazil. ORCID: 0000-0002-9112-2585 E-mail: antoniorn11@yahoo.com.br
3. Physical Therapist. PhD in Physical Therapy. Associate Professor of the Graduation Course in Physical Therapy at UFTM and the Postgraduate Program in Physical Therapy (PPGF) at UFTM/Federal University of Uberlândia (UFU), Uberaba, MG, Brazil. ORCID: 0000-0002-2317-1326 E-mail: isabelpwalsh@gmail.com
4. Physical Therapist. PhD in Physiological Sciences. Associate Professor of the Physical Therapy Graduation Course and PPGF at UFTM/UFU, Uberaba, MG, Brazil. ORCID: 0000-0002-2317-1326. E-mail: dernival.bertoncello@uftm.edu.br

INTRODUCTION

Physical activity is directly linked to the health situation and to the prevention of non-communicable diseases such as diabetes, obesity, heart diseases, among others[1,2]. Its insufficiency is considered a public health problem, the 4th largest cause of early death in the world[3]. In addition to being associated with all non-communicable diseases, data suggests that 31% of the world population does not practice the recommended amount of physical activity[4,5].

According to the IBGE, in Brazil, the practice of physical activity has a direct relationship with educational level and income. About 66% of women do not exercise due to lack of time. Fitness activities were the fourth most sought physical activity by women. They seek quality of life and / or improvement of physical fitness[6].

The World Health Organization (WHO) recommends that adults between 18 and 64 years of age should practice a minimum of 150 minutes of light to moderate physical activity or 75 minutes of intense activity per week. Greater benefits are achieved with 300 minutes of light to moderate activity or 150 minutes of intense activity, divided into two or more days of the week, which may include strengthening muscle groups [2].

There is a great diversity of physical activities, such as weight training, walking, sports, gymnastics, and others. These activities promote improvements of the practitioner's physical conditions, acting on the cardiorespiratory, muscular, visceral, and mental systems. But the lack of activities can be linked to obesity, cardiac, neurological, cancerous, physical diseases, and premature aging, all of which directly affect the quality of life of the patient[7,8].

In this setting, the practice of intense physical activity, such as extreme conditioning programs (PCE), is growing, due to their effectiveness and short-term results[9]. Within PCE, CrossFit® has been on the rise in recent years, increasing the number of practitioners over time[10]. This type of activity promotes health through a program of intense exercises, known for mixing exercises from modalities such as Olympic weight lifting, aerobics, gymnastics, among others[11,12].

CrossFit® seeks to develop the following skills: cardiovascular / respiratory resistance, energy, strength, flexibility, power, speed, coordination, agility, balance, and precision. The diversity of training and the sense of community adopted maintains the bond between practitioners and promotes mental well-being[10].

Although the activity has been on the rise for some years, most researchers have dedicated themselves to quantifying blood markers, injuries, and qualitative factors through online questionnaires[13-15]. In this context, variables such as global strength, flexibility and quality of life, which point to physical and subjective capacities, can differentiate this population from those who practice another type of activity[16,17]. Since this is a high intensity activity and deals with strength training to a large extent, the maximum overall strength of the body is considered to increase with its practice. Another variable indicating physical health is flexibility. It also was found at adequate levels, according to the demand of the exercises that involve a high load with large ranges of movement[18].

The lack of data regarding strength, flexibility, and quality of life among the benefits of this practice indicates the need for studies that access these variables. Such information is important for the scientific community to understand the possibilities and benefits that training promotes for its practitioners.

Due to the importance of physical activity for the female public, to define the profile of strength and flexibility of this public, it is necessary to analyze the time of practice related to changes in these variables, in addition to changes in the general quality of life. The aim of this study was to quantify strength, flexibility, and quality of life according to the time of practice in the extreme conditioning program.

METHOD

This study has a cross-sectional observational design, with a convenience sample. The participants were women practicing PCE (CrossFit®) at a gym in the city of Uberaba - MG. Data collection took place at the UFTM Human Movement Analysis Laboratory, from May to July 2019.

Participants were recruited at the gym and informed about the study. The participants were instructed to read and sign the Free and Informed Consent Form approved by the Ethics Committee in Research with Human Beings of the Universidade Federal do Triângulo Mineiro, under legal opinion No. 3.290.661. The data was identified by codes in order to avoid bias during the analysis and to maintain confidentiality.

The inclusion criteria were being female, 18 years old or older, to accept participating in the research, and to have good health and physical conditions (without severe pain, inflammatory or infectious processes, among others) to perform the tests. The evaluations were carried at least 24 hours from the last training session, to avoid bias in the results. Participants were guided on how to dress for the tests, with flexible clothing and barefoot.

Initially, a form containing anthropometric and personal data and the questionnaire for assessing general quality of life, *Whoqol-Bref* were filled. The *Whoqol-Bref* is an abbreviated and validated questionnaire for application in Brazil. It has 4 domains (physical, psychological, social relations, and environmental) and generates a final score that measures the quality of life at a specific moment in life. The 26 questions are assessed using a Likert scale from 1 to 5. Two of them are about the general quality of life and the others represent the domains of the original instrument, which has 100 questions. *Whoqol-Bref* is easier and more accessible to apply, and has psychometric characteristics similar to those of the original instrument[19,20].

To measure the strength of the lower limbs, a dorsal hydraulic dynamometer (*Crown*®, Brazil), with a capacity of 200kgf and divisions of 1kgf was used. The participant was instructed to remain barefoot, positioned on the platform containing a load cell attached, with the spine erect, knees flexed at about 20˚, keeping the arms extended in front of the thighs, holding the puller that would be used. They were asked to pull the handle using the maximum strength of their lower limbs (anterior and posterior sets), in a direction perpendicular to the platform, and to maintain it for 5 seconds[17].

To measure the scapular force, a scapular hydraulic dynamometer (*Crown*®, Brazil) with a capacity of 50kgf and divisions of 0.5kgf was used. The participant was comfortably seated, with the shoulders abducted at 90˚, elbows flexed at 90˚, forearms in a neutral position, and the wrist in a position that could vary from 0 to 30˚ in extension. Participants were guided to hold the handles of the device and, at the signal, to pull it horizontally in the opposite direction, with maximum isometric effort maintained for about 5 seconds[21].

The flexibility assessment was performed using a pendulum fleximeter (Sanny®, Brazil), which is an easy method to measure this variable, requiring only the correct positioning of the subject, the device, and the researcher. The initial position is taken as 0˚ and the result can be read at angles at the end of the movement to be measured[22].

The joint movements analyzed were flexion / extension; horizontal abduction / adduction; internal rotation / external rotation of the shoulder; hip flexion / extension. For shoulder flexion and extension movements, the participant was seated; for horizontal abduction / adduction, external / internal shoulder rotation, and hip flexion / extension the participant was positioned lying on a stretcher. After positioning, the fleximeter was fixed distal to the joint to perform the movement explained before it started. The data was generated from both sides and a mean was generated between the two values for each joint movement. In addition, the flexion value was added to the extension value, thus totaling the flexion / extension amplitude value. This calculation was performed for all pairs of measurements.

From an initial descriptive analysis, the sample was divided into two groups: women who practiced the activity for less than eight months (G1) and women who did it for eight or more

months (G2). The qualitative and characterization data of the sample were presented by frequency and the data from the quality of life questionnaire were analyzed in domains and compared between groups G1 and G2. Quantitative data were presented using mean and standard deviation. Normality tests and Student's *t* test were performed, considering a significance level of 5%. IBM SPSS statistical software, version 23, was used for all analyses.

RESULTS

23 women participated, divided into two groups: women with less than eight months of practice (G1 - 12 participants) and those with more than eight months (G2 - 11 participants). From those surveyed, 17 (73.91%) had completed or incomplete college education, 6 (26.09%) had postgraduate degrees and most were single (60.87%).

When asked if they had any pain, 6 reported pain in the shoulder (26.09%), 6 in the knee (26.09%), 2 in the spine (8.69%), and 1 in the foot (4.35%); 11 (47.82%) reported not practicing another activity, 7 (30.43%) practice weight training, and 3 (13.04%) running, cycling or Pilates. About their objective, most seek physical conditioning (11 - 47.83%), others weight loss (5- 21.74%) and quality of life (4 - 17.39%). As for the satisfaction with the practice of the activity, from 0 - 10, 13 (56.52%) reported a score of 10, 8 (34.78%) reported a score of 9, and 2 (8.69%), a score of 8.

Table 1 presents the frequency in minutes per week and Table 2 among other aspects the pain and flexibility of exercise.

Table 1. Women in extreme training according to frequency of practice, body mass index, age, reported pain, and quality of life. Uberaba, 2019.

	G1 (N=12)	G2 (N=11)		
Variables	**Mean (standard deviation)**	**Mean (standard deviation)**	**T Test**	**p value**
Frequency (minutes / week)	185.00 (47.58)	310.91 (45.04)	-6.502	**<0.000**
Body mass index (BMI) (kg / m²)	24.62 (3.37)	23.31 (2.53)	1.046	0.308
Age (years)	32.58 (5.11)	29.64 (4.63)	.445	0.163
Reported pain (0 - 10)	1.50 (1.93)	3.09 (3.45)	-1.381	0.182
Quality of life (%)	72.82 (7.03)	75.94 (8.01)	-0.996	0.330

Table 2. Women in extreme training according to strength and flexibility. Uberaba, 2019.

	Group 1 (n=12)	Group 2 (n=11)	T Test	p value
	Mean/Standard deviation	**Mean /Standard deviation**		
Scapular force (kgf)	17.75 (5.97)	20.94 (6.21)	-1.255	0.223
Lower limb strength (kgf)	67.39 (18.42)	84.12 (26.95)	-1.751	0.094
Shoulder F / E (°)	215.54 (20.16)	207.23 (18.85)	1.019	0.320
Shoulder A / W (°)	172.58 (11.43)	163.64 (12.81)	1.770	0.091
Shoulder LR/MR (°)	174.12 (15.68)	156.27 (15.56)	2.737	**0.012***
Hip F / E (°)	110.29 (19.88)	104.45 (13.96)	0.807	0.428

* F / E = flexion + extension; A / A = abduction + adduction; LR / RM = lateral rotation + medial rotation.

DISCUSSION

The results indicated slightly lower values of BMI and age and report a greater pain intensity and better quality of life for the G2 (group with longer than eight months practice). The training frequency (minutes / week) was significantly higher for G2.

As for quality of life, although there was no significant difference between the groups, the results were 72.82 ± 2.03 for G1 (group with less than eight months practice) and 75.94 ± 8.01 for G2. This score reaches the third and fourth quartiles, indicating that both groups have a good to excellent quality of life.

As for flexibility for the shoulder joint, a study that addressed the same methodology to measure flexibility[23], despite analyzing a population of both genders and with chronic shoulder pain, showed values for flexion / extension from 175.98 to 186.14°, for abduction / adduction of 147.83 to 155.23°, and for medial / lateral rotation from 151.1 to 158.01°. The values for this work were higher, considering that none of the volunteers had any pathology installed.

A study[24] that evaluated the effect of strength training for 10 weeks with healthy and sedentary men found values that ranged from 235.5 to 251° for shoulder flexion / extension; and for hip flexion / extension, and from 105 to 114° after the intervention[24,]. This converges with the data found regarding the hip and shoulder, even though it is in a different gender and with a different intervention.

There was a decrease in shoulder and hip flexibility in G2. However, this difference was significant only for the lateral rotation / medial rotation movements of the shoulder.

The PCE is characterized as an activity with global movements. It is understood that, depending on the participant's baseline flexibility, there will be gains to reach the minimum required to perform certain exercises[25]. Therefore, the tendency towards reduction observed in this sample may be related to strength gain and to the non-specific training for the activity. A study indicates that with just one session of strength training it is possible to observe the positive effect on the flexibility of that segment[18], but it is understood that, in the long term, there may be a reduction due to muscle hypertrophy.

A study that evaluated young and healthy women (aged 26.8 ± 1.6 years old) applied an eight-week program with moderate to high intensity activity and found baseline and final values from 161 to 174.9° for the group that performed alternate strength training[24]. The values found in this study (215,54°) suggest that, with a longer period of intense activity, the participant tends to gain greater flexibility in shoulder flexion / extension. In this context, a study reports that activities that involve strength training offer gains in flexibility for middle-aged women, but that result is not observed for all joints[26].

Scapular strength was measured in other studies[17,27], with values of 9.2 ± 4.2 kgf for physically active middle-aged women and 13 ± 4.4 kgf for healthy women. However, the measurements were performed in the orthostatic position. For this sample, the values found in the scapular dynamometry were 17.75 kgf in G1 and 20.94 kgf for G2. With this result, it is possible to observe that the scapular strength of women practicing PCE is greater than that of healthy and / or physically active women. This is due to the high intensity of this type of activity.

There was a slight increase in muscle strength for G2, but this difference was not significant in relation to G1. The strength of the lower limbs measured in this study was different from that of another research[28], since, currently, studies of lower limb strength focus on the use of the isokinetic dynamometer. Although this methodology is the standard, it is expensive, which makes its use in clinics and gyms unfeasible. Therefore, the values found in this sample are the first to be measured in this way, and thus, encourage further studies to be carried out in order to validate this methodology. As a result, for this population, the methodology used here meets the needs of professionals in their daily activities.

CONCLUSION

A longer training time means more frequent training (minutes / week) and less flexibility for lateral rotation / medial shoulder rotation.

A limitation of this study was its observational design, which prevented cause-effect relationships to be investigated. However, the study serves as a base for future investigations

involving strength, flexibility, and quality of life, facilitating the methodology for future interventions and understanding the effects of this modality for the female audience.

Given the scarcity of studies defining this modality for this audience, further research is needed with a qualitative and quantitative approach for better knowledge and discussion of the topic. In addition, the longitudinal monitoring of these women, for a longer period, may show the benefits of the practice of PCE.

REFERENCES

1. Organização Mundial de Saúde. Plano de ação global para a atividade física 2018-2020. 2018 [Internet]. [cited in 30 Aug 2019]. Available from: https://apps.who.int/iris/bitstream/handle/10665/272721/WHO-NMH-PND-18.5-por.pdf
2. World Health Organization. Global recommendations on physical activity for health [Internet]. Geneva: World Health Organization; 2010 [cited in 06 Feb 2020]. Available from: https://www.who.int/dietphysicalactivity/global-PA-recs-2010.pdf
3. Kohl HW, Craig CL, Lambert EV, Inoue S, Alkandari JR, Leetongin G, et al. The pandemic of physical inactivity: global action for public health. Lancet [Internet]. 2012 [cited in 06 Feb 2020]; 380 (9838):294-305. Available from: https://www.ncbi.nlm.nih.gov/pubmed/22818941. DOI: 10.1016/S0140-6736(12)60898-8
4. Liu J-F, Chang W-Y, Chan K-H, Tsai W-Y, Lin C-L, Hsu M-C. Blood lipid peroxides and muscle damage increased following intensive resistance training of female weightlifters. Ann N Y Acad Sci. [Internet] 2005 [cited in 06 Feb 2020]; 1042(1):255-61. Available from: https://www.ncbi.nlm.nih.gov/pubmed/15965070. DOI: 10.1196/annals.1338.029
5. Hanson S, Jones A. Is there evidence that walking groups have health benefits? A systematic review and meta-analysis. Br J Sports Med. [Internet]. 2015 [cited in 06 Feb 2020]; 49(11):710-5. Available from: https://bjsm.bmj.com/content/49/11/710. DOI: http://dx.doi.org/10.1136/bjsports-2014-094157
6. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional por Amostra de Domicílios: práticas de esporte e atividade física: 2015 [Internet]. Rio de Janeiro: IBGE; 2017 [cited in 20 Aug 2019]. Available from: https://biblioteca.ibge.gov.br/visualizacao/livros/liv100364.pdf
7. Tallis J, James RS, Seebacher F. The effects of obesity on skeletal muscle contractile function. J Exp Biol. [Internet] 2018 [cited in 06 Feb 2020]; 221(13):jeb163840. Available from: https://jeb.biologists.org/content/jexbio/221/13/jeb163840.full.pdf.
DOI: 10.1242/jeb.163840
8. Baert V, Gorus E, Mets T, Bautmans I. Motivators and barriers for physical activity in older adults with osteoporosis. J Geriatr Phys Ther. [Internet]. 2015 [cited in 06 Feb 2020]; 38(3):105-14. Available from: https://www.ncbi.nlm.nih.gov/pubmed/25594524. DOI: 10.1519/JPT.0000000000000035
9. Moreau D, Chou E. The acute effect of high-intensity exercise on executive function: a meta-analysis. Perspect Psychol Sci. [Internet] 2019 [cited in 06 Feb 2020]; 14(5):734-64. Available from: https://www.ncbi.nlm.nih.gov/pubmed/31365839. DOI: 10.1177/1745691619850568
10. Glassman G. What is fitness? CrossFit J. [Internet]. Oct 2002 [citado 01 Nov 2018]:1-11. Available from: http://library.crossfit.com/free/pdf/CFJ-trial.pdf
11. Hak PT, Hodzovic E, Hickey B. The nature and prevalence of injury during CrossFit training. J Strength Cond Res. [Internet]. 2013 [cited in 05 Jan 2020]. Available from: https://www.ncbi.nlm.nih.gov/pubmed/24276294. DOI: 10.1519/JSC.0000000000000318
12. Tibana RA, Almeida LM, Prestes J. Crossfit® riscos ou benefícios? O que sabemos até o momento? Rev Bras Ciênc Mov. [Internet]. 2015[cited in 06 Feb 2020]; 23(1):182-5. Available from: https://portalrevistas.ucb.br/index.php/RBCM/article/view/5698. DOI: http://dx.doi.org/10.18511/0103-1716/rbcm.v23n1p182-185
13. Hopkins BS, Cloney MB, Kesavabhotla K, Yamaguchi J, Smith ZA, Koski TR, et al. Impact of crossfit-related spinal injuries. Clin J Sport Med. [Internet]. 2017 [cited in 05 Jan 2020].

Available from: https://www.ncbi.nlm.nih.gov/pubmed/29189338. DOI: 10.1097/JSM.0000000000000553
14. Keogh JWL, Winwood PW. The epidemiology of injuries across the weight-training sports. Sports Med. [Internet]. 2017 [cited in 06 Feb 2020]; 47(3):479-501. Available from: https://www.ncbi.nlm.nih.gov/pubmed/27328853. DOI: 10.1007/s40279-016-0575-0
15. Tibana RA, Almeida LM, Sousa Neto IV, Sousa NMF, Almeida JA, Salles BF, et al. Extreme conditioning program induced acute hypotensive effects are independent of the exercise session intensity. Int J Exerc Sci. [Internet]. 2017 [cited in 06 Feb 2020]; 10(8):1165-73. Available from: https://www.ncbi.nlm.nih.gov/pubmed/29399246
16. Wells KF, Dillon EK. The sit and reach: a test of back and leg flexibility. Res Q. [Internet] 1952 [cited in 06 feb 2020]; 23(1):115-8. DOI: https://doi.org/10.1080/10671188.1952.10761965
17. Soares AV, Carvalho Júnior JM, Fachini J, Domenech SC, Borges Júnior NG. Correlação entre os testes de dinamometria de preensão manual, escapular e lombar. Acta Bras Mov Hum. [Internet] 2012 [cited in 06 Feb 2020]; 2(1):65-72. Available from: http://www.periodicos.ulbra.br/index.php/actabrasileira/article/view/2956
18. Moura DP, Tonon DR, Nascimento DF. Efeito agudo do treinamento de força sobre a flexibilidade de membros inferiores. Rev Bras Prescr Fisiol Exerc. [Internet] 2018 [cited in 06 Feb 2020]; 12(72):96-100. Available from: http://www.rbpfex.com.br/index.php/rbpfex/article/view/1350
19. Fleck MP, Louzada S, Xavier M, Chachamovich E, Vieira G, Santos L, et al. Aplicação da versão em português do instrumento abreviado de avaliação da qualidade de vida "WHOQOL-bref". Rev Saúde Pública [Internet]. 2000 [cited in 06 Feb 2020]; 34(2):178-83. Available from: http://www.scielo.br/pdf/rsp/v34n2/1954.pdf
20. Silva PAB, Soares SM, Santos JFG, Silva LB. Cut-off point for WHOQOL-bref as a measure of quality of life of older adults. Rev Saúde Pública. [Internet] 2014 [cited in 06 Feb 2020]; 48(3):390-7. Available from: http://www.scielo.br/pdf/rsp/v48n3/0034-8910-rsp-48-3-0390.pdf. DOI:10.1590/S0034-8910.2014048004912
21. Fernandes AA, Marins JCB. Teste de força de preensão manual: análise metodológica e dados normativos em atletas. Fisiot Mov. [Internet]. 2011 [cited in 06 Feb 2020]; 24(3):567-78. Available from: http://www.scielo.br/pdf/fm/v24n3/21.pdf
22. Gouveia VHO, Araújo AGF, Maciel SS, Ferreira JJA, Santos HH. Confiabilidade das medidas inter e intra-avaliadores com goniômetro universal e flexímetro. Fisioter Pesq. [Internet]. 2014 [cited in 06 Feb 2020]; 21(3):229-35. Available from: http://www.scielo.br/pdf/fp/v21n3/pt_1809-2950-fp-21-03-00229.pdf. DOI: 10.590/1809-2950/52921032014
23. Silva IH, Silva Junior JM, Santos-de-Araújo AD, Gomes CAFP, Souza CS, Matias PHVAS, et al. Intra- and inter-reliability of fleximetry in individuals with chronic shoulder pain. Phys Ther Sport. [Internet]. 2018 [cited in 06 Feb 2020]; 32:115-20. Available from: https://www.ncbi.nlm.nih.gov/pubmed/29778827. DOI: 10.1016/j.ptsp.2018.05.011
24. Cyrino ES, Oliveira AR, Leite JC, Porto DB, Dias RMR, Segantin AQ, et al. Comportamento da flexibilidade após 10 semanas de treinamento com pesos. Rev Bras Med Esporte [Internet]. 2004 [cited in 06 Feb 2020]; 10(4):233-7. Available from: http://www.scielo.br/pdf/rbme/v10n4/22040.pdf
25. Santos E, Rhea MR, Simão R, Dias I, Salles BF, Novaes J, et al. Influence of moderately intense strength training on flexibility in sedentary young women. J Strength Cond Res. [Internet]. 2010 [cited in 06 Feb 2020]; 24(11):3144-9. Available from: https://www.ncbi.nlm.nih.gov/pubmed/20940647. DOI: 10.1519/JSC.0b013e3181e38027
26. Monteiro WD, Simão R, Polito MD, Santana CA, Chaves RB, Bezerra E, et al. Influence of strength training on adult women's flexibility. J Strength Cond Res. [Internet]. 2008 [cited in 06 Feb 2020]; 22(3):672-7. Available from: https://journals.lww.com/nsca-

jscr/fulltext/2008/05000/influence_of_strength_training_on_adult_women_s.4.aspx. DOI: 10.1519/JSC.0b013e31816a5d45
27. Reis Filho AD, Santini E, Neves T, Felt WCR, Felt CA. Análise do estado nutricional e da força de preensão palmar, lombar e escapular em mulheres de meia idade e idosas. Braz J Biomotr. [Internet] 2012 [cited in 06 Feb 2020]; 6(4):245-53. Available from: https://www.redalyc.org/pdf/930/93025807003.pdf
28. Meereis ECW, Mota CB, Silva AD, Schmidt A. Força muscular de membros inferiores: uma revisão sistemática sobre métodos de avaliação utilizados na fisioterapia. Rev Bras Ciênc Saúde [Internet]. 2013 [cited in 06 Feb 2020]; 17(4):401-6. Available from: https://periodicos.ufpb.br/ojs2/index.php/rbcs/article/view/13793

CONTRIBUTIONS
Lucimara Ferreira Magalhães, **Antonio Ribeiro Neto** and **Dernival Bertoncello** contributed to the conception, design, analysis and interpretation of data, writing and revision. **Isabel Aparecida Porcatti de Walsh** participated in the review.

How to cite this article (Vancouver)
Magalhães LF, Ribeiro Neto A, Walsh IAP, Bertoncello D. Benefits of extreme conditioning programs for women. REFACS [Internet]. 2020 [cited in *insert day, month and year of access*]; 8(2):274-281. Available from: *insert access link*. DOI: *insert DOI link*.

How to cite this article (ABNT)
MAGALHÃES, L. F.; RIBEIRO NETO, A.; WALSH, I. A. P.; BERTONCELLO, D. Benefits of extreme conditioning programs for women. **REFACS**, Uberaba, MG, v. 8, n. 2, p. 274-281, 2020. Available from: *insert access link*. Access in: *insert day, month and year of access*. DOI: *insert DOI link*.

How to cite this article (APA)
Magalhães, L.F., Ribeiro Neto, A., Walsh, I.A.P., & Bertoncello, D. (2020). Benefits of extreme conditioning programs for women. *REFACS*, 8(2), 274-281. Recovered in: *insert day, month and year of access* from *insert access link*. DOI: *insert DOI link*.