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## **Potential Health Benefits and Risks Associated with Calisthenics, a Sport of Increasing Popularity – A Literature Review**

### **Authors:**

#### **Wiktor Werenkowicz [WW]**

Powiatowe Centrum Zdrowia Sp. z o. o.

44 Batorego st.

Otwock, 05-400

Masovia, Poland

<https://orcid.org/0009-0008-8487-2426>

[wiktorwerenkowicz@gmail.com](mailto:wiktorwerenkowicz@gmail.com)

#### **Aleksandra Boral [AB]**

Katowickie Centrum Onkologii

26 Raciborska st.

40-074 Katowice

<https://orcid.org/0000-0003-0342-5349>

[boral-a@wp.pl](mailto:boral-a@wp.pl)

**Bartłomiej Czarnecki [BC]**

Provincial Specialist Hospital No. 5 named after St. Barbara in Sosnowiec,

Plac Medyków 1,

41-214 Sosnowiec,

Silesia, Poland

<https://orcid.org/0009-0006-8960-5760>

[bartlomiejszymonczarnecki@gmail.com](mailto:bartlomiejszymonczarnecki@gmail.com)

**Dominika Kryś [DK}**

Samodzielny Publiczny Zakład Opieki Zdrowotnej MSWiA im. Sierżanta Grzegorza Załogi w Katowicach

39/41 Wita Stwosza st.

40-042 Katowice

<https://orcid.org/0009-0005-5183-7008>

[dominika.anna.krys@gmail.com](mailto:dominika.anna.krys@gmail.com)

**Julia Koczur [JK]**

St. Elizabeth Hospital in Katowice, American Heart of Poland Group,

52 Warszawska st.

40-008 Katowice

<https://orcid.org/0009-0004-8578-0866>

[juliakoczur8@gmail.com](mailto:juliakoczur8@gmail.com)

**Michał Górski [MG]**

Samodzielny Publiczny Zakład Opieki Zdrowotnej MSWiA im. Sierżanta Grzegorza Załogi w Katowicach

39/41 Wita Stwosza st.

40-042 Katowice

<https://orcid.org/0009-0003-5147-0192>

[michal.gorski@onet.eu](mailto:michal.gorski@onet.eu)

**Wiktoria Pniok [WP]**

Katowickie Centrum Onkologii

26 Raciborska st.

40-074 Katowice

<https://orcid.org/0009-0004-0287-8527>

[wiktoriajoannapniok@gmail.com](mailto:wiktoriajoannapniok@gmail.com)

**Wojciech Kurkiewicz [WK]**

Doctor of Medicine, Hospital of the Ministry of the Interior and Administration in Cracow, 25

Kronikarza Galla st.

30-053 Cracow, Poland;

<https://orcid.org/0009-0000-0137-1311>

[kurkiewiczw@gmail.com](mailto:kurkiewiczw@gmail.com)

**Joanna Brzoza [JB]**

Student of medicine at the Faculty of Medical Sciences of the Silesian Medical University in

Katowice-Ligota,

18 Medyków st.

40-752 Katowice

Silesia, Poland

<https://orcid.org/0009-0003-1076-5461>

[jbrzoaaa@gmail.com](mailto:jbrzoaaa@gmail.com)

**Corresponding author: Wiktor Werenkiewicz**

Powiatowe Centrum Zdrowia Sp. z o. o.

44 Batorego st.

Otwock, 05-400

Masovia, Poland

<https://orcid.org/0009-0008-8487-2426>

[wiktorwerenkiewicz@gmail.com](mailto:wiktorwerenkiewicz@gmail.com)

## **SUMMARY**

### **Introduction and purpose:**

Calisthenics is a sport in which the load and resistance is the body of the person exercising. It can be practiced indoors or in outdoor gyms, and to perform exercises such as pull-ups, push-ups, jumping jacks and lunges, no special equipment is needed or only basic equipment in the form of a bar and parallel bars. Due to the ease of performing most calisthenic exercises, their availability, and the health benefits of practicing it, its popularity is constantly growing among people of all ages. The purpose of this article is to collect information on the possible health benefits of calisthenics and the most common injuries associated with practicing it.

### **A brief description of the state of knowledge:**

During calisthenics training using your body weight, people who exercise face a number of mental and physical challenges that depend on the level of advancement of the exercise or gymnastic figure being performed. During calisthenics training using your body weight, exercisers face a number of mental and physical challenges that depend on the level of advancement of the exercises or gymnastic figures performed. These exercises can lead to health benefits as well as injuries. Injuries during body weight exercises can affect any limb. The most common joints that are injured are the knee, shoulder, or wrist joints. The health benefits of this type of exercise are many, both physical, such as reduced cardiovascular risk and muscle growth, and mental, such as reduced anxiety, a lower chance of depression and better sleep.

### **Conclusions:**

The risk of injury during calisthenics is relatively low, and the health benefits of the exercises are undeniable. Calisthenics is a good choice for people who do not want to spend a lot of money on equipment or a gym membership and want to improve their physical and mental health with a low risk of serious injuries.

**Keywords:** calisthenics; body weight exercise injuries; calisthenics health benefits; push-ups injuries; elderly exercises

## 1. Introduction and purpose

Calisthenics exercises are dynamic, body-weight-based aerobic activities that rely on the individual's own weight as resistance, and they can be performed without the need for equipment. [1,2] A typical calisthenics workout includes a range of movements such as swinging, twisting, jumping, kicking, and bending. Common exercises incorporated into calisthenics routines include push-ups, pull-ups, lunges, planks, squats, step-ups, crunches, dips, burpees, mountain climbers, and plyometric exercises like jump squats. [1] These exercises have been shown to improve flexibility, strength, agility, muscle endurance, cardiovascular health, balance, coordination, overall vitality, and physical preparedness for daily life. [3–5]

On the other hand, in addition to the aforementioned benefits, engaging in calisthenics exercises also carries an inherent risk of injury. The likelihood of injury is directly correlated with the complexity and intensity of the exercises performed. Exercises that demand greater physical exertion and skill are associated with an increased risk of injury due to the higher forces involved during execution. [6–9]

The objective of this review is to compile and analyze existing scientific literature on the health benefits of calisthenics, as well as the potential risks of injury associated with these exercises.

## 2. Description of the state of knowledge

During calisthenics training using your body weight, people who exercise face a number of mental and physical challenges that depend on the level of advancement of the exercise or gymnastic figure being performed. Performing more complex exercises, i.e., engaging more muscles at the same time, can result in numerous health benefits, as well as an increased risk of injury. [10,11] Calisthenics can be practiced both indoors, such as a gym or your home, using basic equipment such as a bar or parallel bars, and outdoors, using outdoor gyms. [2] [12] The latter are becoming more and more accessible, usually in cities.

### ACUTE Injuries

Calisthenics can be classified as a relatively safe activity, but not without any risk. Research indicates that the frequency of injuries increases in direct proportion to the increase in popularity of this type of sport. [13–15]

Various improper technique usage along with inadequate warm-up along with excessive loading and unsuitable environmental factors lead to acute injuries during calisthenics practice.

[16,17] A profound understanding of injury nature and mechanisms serves essential purposes for prevention and treatment purposes.

Sudden occurrences of musculoskeletal injuries are classified as acute injuries that most often arise from specific athletic movements. [7,18,19] Strains and sprains combine with fractures and dislocations to form the basic injury categories during calisthenics exercises. [7,13] Muscle strains and ligament sprains frequently occur in the lower limbs as a result of high-intensity calisthenics, which require jumping or unexpected movement transitions. [20]

The knees experience special vulnerability during calisthenic movements. Squats along with lunges generate high amounts of pressure on the knee joint, which can result in sprained ligaments. [8,21] Athletic injury research indicates that grappling with jumping mechanics leads to harmful sprains and patellar tendon damage when athletes maintain improper alignment or have inadequate techniques in athletic motions.

The practice of calisthenics leads to multiple shoulder injuries regardless of which exercise is performed, particularly during push-ups and dips. [11] Acute injuries frequently happen in the rotator cuff or as shoulder dislocations because performers fail to stabilize their joints properly during strength training activities. [22] Explosive exercises lead to frequent ankle injuries as well as injuries to the hip joint. [6,7,13,21] Acute ankle sprains and fractures from jump squats together with other plyometric exercises become likely outcomes due to improper landing technique on uneven surfaces. During jumping actions and landings, the forces transmitted through the ankle joint become higher, which raises the risk of damage to this joint.

The necessity of trained instructor intervention for proper techniques to minimize injuries should not be underestimated because research shows supervision from experienced personnel dramatically lowers the injury frequency. [23]

Exercisers should perform structured warm-up activities as a preventive measure against acute injuries during calisthenics practice. Acute injuries show reduced occurrence rates when athletes perform organized warm-up and cool-down procedures, according to studies. [24] To prevent injuries, people should keep their training progressively advanced as exercise difficulties and difficulty levels increase, while focusing on correct form. [9,10]

## OVERUSE SYNDROMES

The repetitive activities in calisthenics cause stress and strain to specific muscle groups, joints, and connective tissues, which develop into long-term syndromes. Overuse injuries appear differently than acute injuries because they grow slowly while reducing physical activity capabilities. [13,20,25]

The majority of calisthenics overuse injuries arise when trainees elevate their workload without achieving appropriate development in strength or conditioning abilities.

The lower body regions experience most of the overuse injuries that occur during calisthenics training. [13,20] High-repetition movements coupled with plyometrics along with the nature of calisthenics activities produce shin splints (medial tibial stress syndrome) and leg or foot stress fractures. [7] Depictive impacts generated through jump squats as well as deep lunges cause extensive bone strain together with stress to the surrounding soft tissues. [26]

The upper extremities have a high risk of developing the overuse condition cumulative trauma disorders when performing repetitive calisthenics exercises. Those who perform numerous push-ups together with weight-bearing exercises on their hands may develop a condition like carpal tunnel syndrome that creates wrist and hand pain alongside weakness and numbness. [27]

Joint pressure from sustained activities leads to the development of bursitis, which becomes a chronic condition. The bursa in the shoulder area becomes inflamed as a result of shoulder movement friction, leading to a condition called subacromial bursitis during repeated movements in calisthenics. [28]

## HEALTH BENEFITS

### PHYSICAL

Comprehensive involvement in calisthenics exercises generates remarkable positive effects on cardiovascular health because participants improve their aerobic capacity and cardiovascular endurance. Participating in calisthenics delivers cardiovascular benefits through two main factors: high-intensity exercises that raise heart rate and promote circulation in the body. Long-term involvement with intense exercise practices yields positive impacts on cardiovascular system functioning, which lowers cardiovascular disease risks and minimizes health problems from being inactive. [4,29]

Calisthenics turns out to be an excellent method for improving both muscular strength and endurance attributes. [4,30] Muscle groups become stronger while age-related muscle

deterioration decreases when individuals complete push-ups, pull-ups, squats, and lunges exercises. Research has shown that resistance training through calisthenics exercises plays a critical role in preserving muscle mass and strength benefits among senior citizens and elderly individuals. [3] Muscular endurance benefits from this type of training approach, which enables people to handle their everyday tasks more easily and function more efficiently. [31] Through exciting full-range exercises, calisthenics helps both joints and flexibility improve, respectively. Physical activities that combine stretching with strengthening techniques enable people to achieve flexibility that works as an injury prevention strategy and supports functional movement during aging. [3] Human movement becomes better through practicing different calisthenics actions that help with carrying out daily work and overall physical ability. Extended reach and deep squat movements serve as effective ways to boost both joint health and flexibility of the body. [32]

The practice of calisthenics functions very well to help people manage their weight and lose body fat. Calisthenics exercises that require multiple joints as well as repeated movements boost workout metabolisms, which assists people in reaching and maintaining their desired weight levels [33,34]. Even though calisthenic movements affect metabolism, the positive effects on muscle definition and fat reduction combination result in improved body composition and better overall health benefits. [1]

## MENTAL

Practicing calisthenics brings positive effects on mood and helps decrease symptoms of anxiety and depression. Science reveals that medium-intensity workouts based on calisthenics result in major enhancements to psychological health, mostly among the older adult population. [35,36] A study established that physical exercise, which includes calisthenics, boosts mental health conditions by slowing depression symptoms and boosting satisfaction and peaceful feelings. When exercise triggers endorphin release, it serves as a key factor in mood enhancement, so calisthenics functions well as a tool to control negative emotions and reduce anxiety. [37]

Better sleep quality results from practicing calisthenics because it is crucial for mental health maintenance. The combination of heart rate increases and physical tiredness through certain exercises produces better sleep efficiency alongside shorter time required for falling asleep, thus resulting in better sleep quality for individuals. Expert research indicates that older adults experience better sleep quality as a result of participating in scheduled physical exercise, which includes calisthenics. [36,38,39]



People who practice calisthenics develop mental strength, through which they handle stressful or challenging circumstances more effectively. Evidence indicates that maintaining an active lifestyle enhances stress management abilities, together with the development of resilient coping mechanisms. Completing advanced calisthenic exercises builds self-confidence as well as self-efficacy that enhances both psychological wellness and personal perception. [36]

### 3. Conclusions

Calisthenics, despite the low risk of injury, offers numerous positive health effects on physical and mental health. With calisthenics, people can improve muscle strength and cardiovascular endurance, as well as flexibility and mobility, which results in a better level of physical fitness and a better quality of life. Health and functionality remain good during aging with calisthenics because the exercises help people maintain independence and protect them from functional limitations. It should not be forgotten that regularly performed such training is associated with an improvement in a person's mood, better quality of sleep, and a lower risk of depression. To ensure only positive effects of calisthenics on health, it is important to remember the potential risks associated with incorrect execution of exercises. Intensification of training load combined with repetitive strain injuries are the main factors in the development of injuries observed during calisthenics training. The combination of unhealthy methods, insufficient recovery, and inadequate warm-up contribute to overload injuries during calisthenics exercises. To avoid injuries and maintain full health, it is essential to use structured exercise programs combined with strict implementation of correct technique, as these methods reduce training risks and create better safety conditions.

### **Disclosure**

#### **Author's contribution:**

Conceptualization: Wiktor Werenkiewicz, Bartłomiej Czarnecki

Methodology: Wiktor Werenkiewicz, Dominika Kryś, Aleksandra Boral,

Software: Julia Koczur, Michał Górski

Check: Wojciech Kurkiewicz, Wiktoria Pniok

Formal analysis: Joanna Brzoza, Wiktoria Pniok

Investigation: Dominika Kryś, Julia Koczur

Resources: Julia Koczur, Wiktoria Pniok

Data curation: Aleksandra Boral, Michał Górski

Writing -rough preparation: Wiktor Werenkiewicz

Writing -review and editing: Bartłomiej Czarnecki, Joanna Brzoza

Visualization: Wojciech Kurkiewicz

Supervision: Joanna Brzoza

Project administration: Wiktor Werenkiewicz

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