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YouTube as a Source of Information About Physical Exercise During COVID-19 Outbreak

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Abstract

Context: Physical inactivity levels in the course of the corona virus disease 2019 (COVID-19) outbreak increased significantly. Our aim was to address how the information related to the physical exercise and COVID-19 posted on YouTube reaches the general public during COVID-19 outbreak.

Evidence Acquisition: For this, research was carried out crossing the terms covid 19 and physical exercise in the YouTube database. The search was conducted only in the English language and was established/closed on April 26th (2020) to June 26th (2020) in order to observe the dynamics of video production on YouTube.

Results: The main terms and concepts mentioned in the analysis of YouTube videos were COVID-19, pandemic, quarantine, social isolation and distance, physical activity, physical exercise, home-based physical exercise, physical inactivity, sedentary lifestyle, and mental health. The information was posted and supported by renowned health and physical exercise experts and entities. The recommendations for physical exercise in the current scenario focused on programs that require little equipment and space (carried out indoors and at home) and at low cost in an attempt to maintain and improve physical and mental health from different population groups.

Conclusions: Information about COVID-19 and exercise was growing and progressive throughout the pandemic on YouTube. However, care and guidance are needed in using the information provided by YouTube as a source of reference for the practice of physical exercise during the COVID-19 outbreak.

Keywords: Coronavirus, Pandemic, SARS-CoV-2, Physical Exercise, YouTube

1. Context

Corona virus disease 2019 (COVID-19) outbreak drew attention to the discussion of issues, factors, and concepts related to the field of public health and the importance of health promotion and education to behave in internal and external environments (1-6). COVID-19 outbreak it also caused a kind of "frenzy and gold rush" with diverse information and content produced every day in different areas of knowledge. For example, in the fields of health, social, political, economics, work, and education, whether in the academic and scientific context or for the general population (1-6). Moreover, COVID-19 outbreak drew attention to the discussion on the importance of a healthy lifestyle and care for different diseases (e.g., obesity, hypertension and diabetes) and special conditions (e.g., pregnancy) (1-6).

In the context of content production, amid the outbreak of COVID-19, information was disseminated and produced independently or with the approval of renowned health entities in the field of health, science, and education (2-7) and that were broadcast during the period of quarantine and social isolation on digital platforms that became COVID-19's "knowledge universities". In this

context, for information to gain social reach, the "online environment and the virtual world" became essential for the transmission of information related to health and quality of life during the COVID-19 outbreak (8) whether this information is scientific (Google Scholar and PubMed) or intended for the general public (Google and YouTube).

Although the massive production and dissemination of daily information and contents about COVID-19 is considered good, in terms of health promotion and education, there is the dissemination of a lot of false and inaccurate information (fake news), which leaves people confused and without direction, mainly on online communication channels aimed at the general population such as YouTube. Kocyigit et al. (8) pointed that besides any high-quality visual YouTube videos, there were substantially low-quality videos about rheumatic disease that could cause misleading information to spread rapidly during the COVID-19 pandemic. On the other hand, the authors warn that doing a screening of videos from trustworthy sources such as universities, academics, and physicians is a safer option to access accurate information about rheumatic diseases. Moreover, Yuksel and Cakmak (1) reported that although YouTube videos are easily accessible sources of COVID-19 information for pregnant women and have a view rates, generally the videos have a low quality and trustworthiness.

Thus, the search for reliable information to deal with the COVID-19 outbreak, as well as literacy and health education, became essential in the midst of the pandemic. This includes the context of physical activity as amidst the pandemic people became less active and the mental health of the population worsened.

Although it is necessary to respect the #StayatHome campaign, this period of social isolation increase depression, anxiety (9, 10), physical inactivity, and sedentary habits (2-7). According to the World Health Organization (WHO) (11), regular physical activity is proven to help prevent and treat noncommunicable diseases such as hypertension, heart disease, stroke, obesity, diabetes, and cancer. Regular physical activity also can improve mental health, quality of life, and well-being (12, 13). Physical inactivity was already a pandemic in the midst of another pandemic that is COVID-19. In some countries, levels of physical inactivity can be as high as 70%, due to changing transport patterns, increased use of technology, cultural values, and urbanization. Depending on the country, despite the #StayatHome is still an important safety and security measure it limits the practice of a series of physical activities in open and closed environments (e.g., parks, gyms, beaches, and clubs) (4-19). That is, COVID-19 outbreak just made this even more aggravated.

2. Objectives

Therefore, the aims of this narrative review are to present: (1) relevant results found in the YouTube database about COVID-19 and physical exercise; (2) main principles and concepts suggested and extracted from the analysis in the speech of health professionals or entities specialized in physical exercise on YouTube; and (3) description of the main types of physical exercises recommended by health professionals or entities specialized in physical exercise on YouTube.

3. Evidence Acquisition

A search was performed using the terms “covid 19” AND “physical exercise” in the YouTube database. The search was conducted only in the English language and was established/closed on April 26th (2020) to June 26th (2020) in order to observe the dynamics of video production on YouTube as well as the number of accesses to videos. Exactly two months. When the video title met the research aim, the description, content, and report/speech of the video were analyzed in English subtitle mode. All videos were watched more than once. All references and access links were extracted and are available in Table 1. This research, in general, involved one year (02/2020 to 02/2021) of analysis and reading. At the end of this period (one-year), a search was also carried out in the PubMed database, with the terms “covid 19” AND “YouTube”, to verify the availability of articles that studied YouTube as a source of education and health promotion information about COVID-19.

4. Results

4.1. Information on YouTube Database

Our YouTube search revealed 534 videos. After screening and selection, 28 videos were included. Table 1 shows the relevant videos found in the YouTube database about COVID-19 and physical exercises included in this review and the dynamics of accesses in exactly 2 months in absolute values and percentage of increase in accesses. Appendix 1 presents a complete analysis of the YouTube videos included in this review (n = 28). Table 2 shows the main principles and concepts extracted from the analysis of the statements of health professionals and specialized health entities from the included YouTube videos. Appendix 2 presents the description of the main types of physical exercise recommended by health professionals and health entities extracted from YouTube videos. The descriptions of the physical exercises were taken from the Google database. For this the expression "EXERCISE NAME"

Table 1. Relevant Videos Found in the YouTube Database About COVID-19 and Physical Exercise. The Number of Accesses of the Videos Was Verified After Two Months (April 26th/June 26th).

Legend - Video Number (Source)	Number of Accesses (April 26th/June 26th)	% Increase (+x%) Two-Months	YouTube Link
1. Health institutional	25.414/38.075	+33.2	www.youtube.com/watch?v=p9Dw-4ycMQQ
2. Self-employed professional (YouTuber)	1.537/2.477	+37.9	www.youtube.com/watch?v=N0Hd6_QrjLY
3. Health institutional	1.564/1.877	+16.6	www.youtube.com/watch?v=xlhLkpSXTro
4. Self-employed professional (YouTuber)	1.254/1.992	+37.0	www.youtube.com/watch?v=F4mcbi9tD-M
5. Health institutional	278/418	+33.5	www.youtube.com/watch?v=i53AeL-z-Io
6. Self-employed professional (YouTuber)	1.392/1.920	+27.5	www.youtube.com/watch?v=7ziFpgaZTs0
7. Global health institutional	27/83	+67.4	www.youtube.com/watch?v=E1NiFkBgcgA
8. Self-employed professional (YouTuber)	324.181/428.880	+24.4	www.youtube.com/watch?v=lYLgVTVZrN4
9. Self-employed professional (YouTuber)	2.177/2.446	+10.1	www.youtube.com/watch?v=N8csqzN3ahQ
10. Journalistic institution	18.080/25.814	+29.9	www.youtube.com/watch?v=D0IArk5yq3U
11. Health institution	1.008/4.357	+76.8	www.youtube.com/watch?v=COyEDxl5N2A
12. Self-employed professional (YouTuber)	61.689/253.704	+75.6	www.youtube.com/watch?v=oC8_QCY8ZE0
13. Self-employed professional (YouTuber)	114.014/186.854	+39.0	www.youtube.com/watch?v=sji5Vk2g0xI
14. Self-employed professional (YouTuber)	741.680/1.208.741	+38.6	www.youtube.com/watch?v=AE_FeKpc_lk
15. Self-employed professional (YouTuber)	12.219/13.568	+9.94	www.youtube.com/watch?v=xem9SdZ3qHU
16. Health institution	28.529/29.669	+3.8	www.youtube.com/watch?v=cgsRaUsJ6uM
17. Self-employed by government authority	48.204/55.939	+13.8	www.youtube.com/watch?v=LAERi_3GZtM
18. Self-employed professional (YouTuber)	43.338/61.520	+29.5	www.youtube.com/watch?v=hoHJlaIAc10
19. Journalistic institutional	73/80	+8.7	www.youtube.com/watch?v=prBzGaT4eHk
20. Health intuitional	1.274/4.693	+72.8	www.youtube.com/watch?v=5GZDaQ3Zn70
21. Self-employed professional (YouTuber)	56.371/146.735	+61.6	www.youtube.com/watch?v=oRkXa2HIhes
22. Journalistic institutional	982/1.198	+18.0	www.youtube.com/watch?v=C_NYZ219l8g
23. Self-employed professional (YouTuber)	9.971/15.573	+35.9	www.youtube.com/watch?v=AaWxm4HCR50
24. Journalistic institutional	2.072/2.141	+3.2	www.youtube.com/watch?v=ZjZvZP-qhnM
25. Health institutional	860/2.535	+66.0	www.youtube.com/watch?v=qRWO7PYO3LY
26. Self-employed professional (YouTuber)	110.809/226.996	+51.2	www.youtube.com/watch?v=zukBOIPRstA
27. YouTube channel	6.219/12.970	+52.0	www.youtube.com/watch?v=nBYXtCLlldE
28. Health institutional	5.173/8.913	+41.9	www.youtube.com/watch?v=afnvxIM7FRM

Abbreviation: COVID-19: Corona virus disease 2019.

(as extracted from YouTube and presented in Appendix 2) AND the word (DESCRIPTION) was crossed. As a criterion, in general, the first description of the exercise provided in the Google search was used. Finally, Table 3 presents the main conclusions of the articles included about YouTube and COVID-19 through a survey conducted in PubMed after a year of studies.

5. Discussion

In relation to the aims of this narrative review, it is possible to summarize:

(1) YouTube video content: It was possible to verify that the information and content posted were supported by renowned experts and health entities.

(2) main principles, suggested concepts, and extracted from speech analysis: The approach was broad regarding the concepts and terms used in the context of physical activity and sport vs. COVID-19.

(3) description of the main types of physical exercises: In general, the recommendations considered physical exercises requiring little equipment and space and performed indoors and at home and at low cost. Furthermore, the use of exercises where the overload was the body weight itself was proposed.

Note: Information always related to the context of COVID-19 and physical exercise and aimed at the general public and health professionals.

Our results from the analyzes of the YouTube videos showed that home-based exercise was a safe way to perform physical exercise during the COVID-19 outbreak. However, it needs to be prescribed and remotely supervised by a coach/physical education/health professional, when necessary. It should be noted that the

conditions that practitioners perform physical exercise in domestic environments are quite different with regard facilities and available resources (e.g., treadmill, cycle ergometer, kettlebell, dumbbells, TheraBand, and bars).

In addition, it is undeniable that during the COVID-19 outbreak, the guidance practice of physical exercise was carried out, most of the time, via the internet through digital platforms, for example, Facebook, Instagram, Zoom Meetings, Cisco Webex Meetings, Stream Yard Live Streaming Studio, and Google Meet.

In fact, there are many information being transmitted around the world on different online platforms, in an almost disruptive way. We found that even researchers and institutions renowned as Centers for Disease Control and Prevention (CDC) (7) and WHO (34) have used the virtual learning environment to disseminate information and guidance on the COVID-19 pandemic, including health information, quality of life, and physical exercise.

As for the most relevant concepts (pointed by scientific sources and those aimed at the general public) in the COVID-19, health, and physical fitness scenario, it is possible to highlight the concepts of physical activity and physical inactivity (35-37). The general recommendation around the world is for people to stay at home. Although this recommendation is essential to control the spread of the COVID-19, it can have deleterious effects on physical and mental health, quality of life, and physical activity levels as well as increasing physical inactivity and sedentary behavior (screen time).

The WHO (34) pointed out that the COVID-19 outbreak forced many people to stay at home, which increased sitting time and, despite more free time, made it more difficult to maintain and/or start a physical exercise routine. The physical inactivity became even more severe during the COVID-19 outbreak, mainly for the most vulnerable group, which are the elderly. It is extremely important that people of all ages and fitness levels are encouraged to be as active as possible and maintain this healthy habit during and after the pandemic. In this sense, people have been alerted through campaigns, such as the WHO, that propagate the slogan “be active” with the aim of helping people to become physically active. The proposal is interesting and simple, "take a break" from sitting and perform five minutes of light intensity physical activity in the home environment, for example, walking, dancing, and stretching. The benefits of the practice of physical activity indicated by the WHO are reduction of blood pressure, maintenance and control of body mass and reduced risk of heart disease, stroke, type 2 diabetes, and some types of cancer, conditions that can increase the susceptibility to COVID-19 as well as the evolution to the more severe version of the disease. For the elderly, physical activity improves bone and muscle health, balance and joint flexibility, which helps prevent falls and injuries, as well as socialization (albeit virtually) and levels of anxiety and depression.

The second and third aims of the present review were to search relevant information in YouTube database about COVID-19 and physical exercise. Our results showed that videos were very much focused on disseminating safety and health procedures regarding the spread of the coronavirus as well as pointing out the benefits of physical exercise for general physical fitness and mental health. Also, a surprise that we consider positive was that physical exercise proposals on YouTube videos seems to be aligned with scientific sources. This could somehow be related to renowned health entities in the field of public health, such as CDC (4-7) and WHO (2, 3, 11, 34) created channels on YouTube.

Another focus of our study was to bring to discussion the main principles and concepts suggested and the description of the main types of physical exercises recommended by health professionals or entities specialized about physical exercise in the context of COVID-19 on YouTube. Overall, it was possible to verify most of the information was based in the recommendations and guidelines from WHO, CDC, National Institutes of Health, and American College of Sports Medicine. These same entities used YouTube to disseminate their information and recommendations in order to reach the general public or even health professionals.

The main types of physical exercise indicated (and its variations) were abdominal (bicycle) crunches, back extension, bridge walk, burpee, glute bridge, hamstrings curl, jogging/running in place, jumping jacks, lunges, mountain climber, plank, push-up, squat, stair climbing, and triceps dip. That is, a mixture of predominantly muscle strength, aerobic, and calisthenic physical exercises performed in the form of circuit training with periods of body warm-up and cool-down and including stretching exercises (and in some cases breathing exercises), and requiring little equipment (mainly body weight) and relatively little space in the environment domestic. Thus, traditional physical exercises were recommended and based on the recommendations of renowned entities.

As an example of tradition form of physical exercise, calisthenics exercises are again gaining popularity. Calisthenics exercises can improve muscle strength and aerobic capacity (38, 39). Yamauchi et al. (40) showed that a calisthenic exercise program improved lower limb muscle strength and power in elderly individuals; however, the initial training status seems to be important for progressive increases in physical fitness. This result is in line with the findings obtained from our analysis of the YouTube videos.

Regarding the concepts presented by the YouTube videos analyzed, we could identify concepts such as, passive and dynamic stretching exercises (flexibility); aerobic and endurance exercises (cardiorespiratory capacity), balance exercise (postural control and muscle strength), core exercises (postural stability and muscle strength), high-intensity circuit training (cardiorespiratory capacity and muscle strength), high intensity interval training (cardiorespiratory capacity and muscle strength), home-based physical exercise, and weight bearing exercise (muscle and endurance strength). In summary, YouTube videos are based in common subjects of the physical exercise science (35, 37, 41-44).

In addition, the information conveyed in the videos has always been guided by the importance of the worldwide #stay at home campaign and look for alternatives to perform the physical exercise routine in the home environment. This brings a new concept that probably should be applied during and after of the COVID-19 pandemic the so-called home-based physical and hybrid exercise with virtual and online physical training guidance and prescription. We will live in new times and challenges for exercise science applied to combating the physical inactivity pandemic and all its direct and indirect consequences (individual and collective), that is, the social, economic and health costs (2-6, 13, 35, 37). Undoubtedly it is necessary to follow the mantra which is "#Exercise is medicine" and "#Be active" (2-6, 12).

Currently, YouTube is an extremely relevant source of information about health, physical exercise, and COVID-19. With regard to the quality of the information, subjectively, but also based on everything that was read and studied, YouTube, in general, meet the expectations and needs of the general public and health professionals from different areas of knowledge. Obviously, always with critical thinking and analysis. The new communication models, through YouTube, open up a new space in the health field whose content can cause engagement comparable and even superior to that of digital media specialized in health communication. The COVID-19 outbreak accelerated the transformation of the health and education communication, creating new challenges for the industry, media, education institutions, and independent professionals related to the demands of the health care market (45).

Li et al. (20) showed that the most viewed YouTube videos on COVID-19 contained misleading information, reaching millions of viewers worldwide. As the current COVID-19 pandemic worsens, public health agencies must better use YouTube to deliver timely and accurate information and to minimize the spread of misinformation. Although YouTube generally is a useful source of medical information on the COVID-19 pandemic, increased efforts to disseminate accurate information from reputable sources is desired to help mitigate disease spread and decrease unnecessary panic in the general population (27).

A limitation of the use of YouTube as a source of physical exercise guidance would be that caution was needed considering the aspect of scientific exercise prescription (46). It should be highlighted that the exercises presented in social media such as YouTube should not be considered as physical training programs. The keyword in exercise prescription is the "individualization", i.e., a training program is adapted to the specific characteristics of an individual (e.g., sex, age, health status, and physical fitness level) (47-49). There are many training principles that should be implemented in exercise prescription including the "progression load" (50, 51) making the YouTube characterization of exercise as beginner or advanced seeming oversimplified. On the other hand, YouTube videos can be used as excellent sources of physical exercises for health professionals who have the necessary scientific and practice background to use YouTube, as an alternative, for exercise prescription.

According to Dwyer et al. (52) it is necessary to respect social distancing and continue to practice physical activity during and after the outbreak of the COVID-19 pandemic, safely, for the benefits to physical and mental health. Personalized training and specific recommendations for training at home are essential. In addition, exercise providers and practitioners are promoting home exercise on electronic platforms such as YouTube, Facebook, Twitter, phone or tablet exercise apps, and videoconferencing-type software to show how physical activity done at home can be performed. Obviously not without limitations due to lack of space and equipment. The use of technology to interactively promote physical activity, as well as to record physical parameters that can indicate fitness level (e.g., pedometers and other wearable devices) are promising tools to improve and measure exercise done at home.

The chaos generated by the COVID-19 pandemic has made the sport and physical activity science to some extent set up a "war operation" in attempt to promote a safe way to practice physical exercise. Currently, the so-called Home-based exercise seems one of the safes ways. However, in this dynamic scenario (imposed by the pandemic) some countries (even though there are regional variations) have progressively left the social isolation and quarantine. Also, according to new local rules, some regions have progressively opened sports facilities, gym, and parks.

Finally, researchers; renowned entities in health, physical activity, and sport; entrepreneurs and managers; and even the general public, are making a chain of actions

and propositions, despite the governments (absent in many situations and cases), to collaborate with the dissemination of knowledge and thus help people around the world cope with this difficult time. Undoubtedly, the practice of physical exercise is a tool that can help to face COVID-19 and an unprecedented legacy will be left for future generations.

As expected, given the volume of information and video production on YouTube, the first scientific articles on the use of YouTube as a tool for recommending and prescribing physical exercise began to be published (30-33). In other words, health literacy, based on health care and the acquisition of healthy habits such as physical exercise, with YouTube as a strategy, can be a powerful tool as long as it is used within ethical principles and with content with solid scientific basis.

Supplementary Material

Supplementary material(s) is available here [To read supplementary materials, please refer to the journal website and open PDF/HTML].

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Footnotes

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Table 2. Main Principles and Concepts Extracted from the Analysis in the Speech of Health Professionals or Entities Specialized in Physical Exercise on Included YouTube Videos.

Term	Principle/Concept
Active (dynamic) stretching (flexibility)	Dynamic flexibility is the full range of motion of a given joint achieved by the voluntary use of skeletal muscles in combination with external forces. Generally, involves moving a limb through its full range of motion to the end ranges and repeating several times.
Aerobic exercise	Any activity that uses large muscle groups, can be maintained continuously and is rhythmic in nature. Examples of aerobic exercise include cycling, dancing, hiking, jogging/long distance running, swimming and walking.
Agility	The ability to change the position of the body in space with speed and accuracy.
Balance	The maintenance of equilibrium while stationary or moving.
Balance exercise	Include dynamic movements that challenge the center of gravity such as tandem walking and circle turns.
Ballistic stretching	Includes rapid, alternating movements or 'bouncing' at end-range of motion; however, because of increased risk for injury, ballistic stretching is no longer recommended.
Cardiorespiratory (endurance) capacity	The ability of the circulatory and respiratory system to supply oxygen during sustained physical activity.
Cool-down	Cooling down after your workout allows for a gradual recovery of pre-exercise heart rate and blood pressure. Cooling down may be most important for competitive endurance athletes, such as marathoners, because it helps regulate blood flow. Cooling down doesn't appear to help reduce muscle stiffness and soreness after exercise, but more research is needed.
Core exercise (conditioning) and core stability	Core conditioning refers to exercises that strengthen the muscles in the lower back, stomach, and pelvic area. Strengthening the core promotes good posture but also for daily life, for example, reaching up to a shelf and lifting a child. Improves posture, which contributes to a trimmer appearance (poor posture can give even a woman with well-toned abs a little "pot"). Moreover, developing core muscle strength can boost the effectiveness of workouts and reduce the risk of injuries that sideline our efforts to stay in shape. The current drive behind core conditioning comes in part from studies conducted in the 1990s showing that before they move an arm or leg, people with healthy backs (in contrast with those suffering from low back pain) automatically contract their core muscles, especially the transverse abdominal muscles, which wrap from the sides of the lower back around to the front. Experts concluded that well-coordinated core muscle use stabilizes the spine and helps create a firm base of support for virtually all movement. The role of the core is also central to the Pilates method, Joseph Pilates, referred to the core as the "powerhouse".
CrossFit	It is recognized as one of the fastest growing high-intensity functional training modes in the world. This strength and conditioning program is used to optimize physical competence in ten fitness domains: (1) cardiovascular/respiratory endurance, (2) stamina, (3) strength, (4) flexibility, (5) power, (6) speed, (7) coordination, (8) agility, (9) balance, and (10) accuracy. CrossFit training is usually performed with high-intensity, functional movements called "workout of the day". In these training sessions, high-intensity exercises are executed quickly, repetitively, and with little or no recovery time between sets. With the focus on constantly varying functional movements, CrossFit training uses the main elements of gymnastics (e.g., handstand and ring exercises), weightlifting exercises (e.g., barbell squats and presses), and cardiovascular activities (e.g., running or rowing) as exercise tasks.
Distress	The term 'distress' is frequently used in nursing literature to describe patient discomfort related to signs and symptoms of acute or chronic illness, pre- or post-treatment anxiety or compromised status of fetuses or the respiratory system. 'Psychological distress' may more accurately describe the patient condition to which nurses respond than does the term 'distress'. Psychological distress is seldom defined as a distinct concept and is often embedded in the context of strain, stress and distress. Distress occurs when stress is severe, prolonged, or both.
Empowerment (community empowerment)	Refers to the process by which people gain control over the factors and decisions that shape their lives. It is the process by which they increase their assets and attributes and build capacities to gain access, partners, networks and/or a voice, in order to gain control. Community empowerment refers to the process of enabling communities to increase control over their lives. "Communities" are groups of people that may or may not be spatially connected, but who share common interests, concerns or identities. These communities could be local, national or international, with specific or broad interests.
Exergame	It is defined as digital games that require bodily movements to play, stimulating an active gaming experience to function as a form of physical activity.
Flexibility	The range of motion available at a joint.
Health	It is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.
High intensity interval training (HITT)	It is characterized by relatively short bursts of repeated vigorous activity, interspersed by periods of rest or low-intensity exercise for recovery.
High-intensity circuit training (HICT)	HICT using body weight as resistance. The approach combines aerobic and resistance training into a single exercise bout lasting approximately 7 minutes. Participants can repeat the 7-minute bout 2 to 3 times, depending on the amount of time they have. As body weight provides the only form of resistance, the program can be done anywhere.
High-intensity functional training (HIFT)	It is an exercise modality that emphasizes functional, multi-joint movements that can be modified to any fitness level and elicit greater muscle recruitment than more traditional exercise.

Interval training	This type of training involves repeated bouts of high intensity effort followed by varied recovery times. This type of training can be accomplished using body weight, resistance bands, free weights, medicine balls or weight machines.
Muscle endurance	The ability of muscle to continue to perform without fatigue.
Muscle recovery	As a physically active individual, recovery is key to preventing injuries and allowing the body to rebuild itself after the stress of exercise. Our muscles, tendons, ligaments and energy stores require recovery, repair and replenishment to perform at our best during the next exercise bout.
Muscle strength	The ability of muscle to exert force.
Online physical exercise	A method of physical exercise practice in which sessions are broadcast/conducted by the Internet (through social networks like Facebook and Instagram and video search sites like YouTube by professionals specialized in physical exercise), without the participant needing to attend a gym and sport club and without the need to go to a park. The development of modern technology and the Internet has enabled the explosive growth of online physical exercise around the world. This is the field of physical fitness related to heathy focused on people who are not physically present in the traditional places of physical exercise are described as a process where the source of information and practice is separated from the participants in space and time. The Internet has become the main communication channel for the development of online physical exercise.
Outdoor and indoor environment	Open (something that happens or is used outside a building or home) and closed (something that happens or is used inside a building or home) and environment, respectively.
Passive stretching/static stretching	Passive stretching is a technique in which you are relaxed and make no contribution to the range of motion. Instead, an external force is created by an outside agent, either manually or mechanically. Static stretching involves holding a position. That is, you stretch to the farthest point and hold the stretch. Adults should do flexibility exercises at least two or three days each week to improve range of motion. Each stretch should be held for 10 to 30 seconds, to the point of tightness or slight discomfort. Repeat each stretch two to four times, accumulating 60 seconds per stretch.
Physical mobility	Optimal physical mobility, defined simply as being able to safely and reliably go where you want to go, when you want to go, and how you want to get there, is a key component of healthy aging. Physical mobility refers to movement in all of its forms, including basic ambulation, transferring from a bed to a chair, walking for leisure and the completion of daily tasks, engaging in activities associated with work and play, exercising, driving a car, and using various forms of public transport.
Plyometric exercise	Increase neuromuscular coordination by training the nervous system and making movements more automatic during activity (training effect). This is known as reinforcing a motor pattern and creating automation of activity, which improves neural efficiency and increases neuromuscular performance.
Public health	It is defined as "the art and science of preventing disease, prolonging life and promoting health through the organized efforts of society". Activities to strengthen public health capacities and service aim to provide conditions under which people can maintain to be healthy, improve their health and wellbeing, or prevent the deterioration of their health. Public health focuses on the entire spectrum of health and wellbeing, not only the eradication of particular diseases. Many activities are targeted at populations such as health campaigns. Public health services also include the provision of personal services to individual persons, such as vaccinations, behavioral counselling, or health advice.
Quality of life	An individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment.
Stress (emotional stress)	Animal's ability or inability to cope or adapt to changes in its immediate environment and experience. Stress responses are normal reactions to environmental or internal perturbations and can be considered adaptive in nature. The concepts of stress and distress can be distinguished from that of welfare, in that an adaptive and beneficial stress response may occur against a backdrop of a transient negative emotional state.
Tabata	A term that is often used synonymously with HIIT, was first described by the Japanese scientist Izumi Tabata in 1996. Tabata training include a variety of modes and exercises performed in the classic 20-10 pattern (i.e., 20 seconds of all-out effort followed by 10 seconds of rest).
Warm-up	Warming up helps prepare your body for aerobic activity. A warm-up gradually revs up your cardiovascular system by raising your body temperature and increasing blood flow to your muscles. Warming up may also help reduce muscle soreness and lessen your risk of injury.
Weight bearing exercise	Exercise helps build bone and weight-bearing exercise is particularly helpful in this task. weight-bearing exercise includes any activity in which your feet and legs carry your own weight. here are some examples of weight-bearing exercise that can help you build strong bones: walking; running; jumping; jumping rope; dancing; climbing stairs; jogging; aerobic dancing; hiking; inline skating/ice skating; racquet sports, such as tennis or racquetball; and team sports such as soccer, basketball, field hockey, volleyball, and softball or baseball.

Table 3. Main Conclusions of the Included Articles About YouTube and Corona Virus Disease 2019 (COVID-19).

Author	Article Type	Topic	Main Conclusions
Li et al. (2020) (20)	Original	Source of information	Most viewed YouTube videos on COVID-19 contained misleading information. As the current COVID-19 pandemic worsens, public health agencies must better use YouTube to deliver timely and accurate information and to minimize the spread of misinformation.
Basch et al. (2020) (21)	Original	Preventive behaviors and transmission	With over 2 billion users, YouTube is a media channel that millions turn to when seeking information. Thus, accurate information and guidance about personal behaviors that can reduce exposure to coronavirus are among the most important elements in mitigating the spread of disease.
Basch et al. (2020) (22)	Original	Educating and behaviors	YouTube can be an effective way to communicate with the public, especially to those who have lower levels of reading literacy and who may be inclined to search for information on YouTube. Greater efforts are needed to more fully realize the potential of YouTube for educating the public about COVID-19 transmission. This study demonstrates the incredible reach of YouTube and the potential value of partnership to mobilizing the public to reduce mortality from the COVID-19.
Hernandez-Garcia and Gimenez-Julvez (2020) (23)	Brief report	Prevention	Information from YouTube in Spanish on basic measures to prevent COVID-19 is usually not very complete and differs according to the type of authorship.
Dutta et al. (2020) (24)	Original	Source of information	The reliability and quality of the content of most videos about COVID-19 was found to be unsatisfactory. Videos with misleading content were found in different languages, and sometimes garnered a higher percentage of views than those from credible sources. The share of videos contributed by Government and Health Agencies was low. Medical institutions and health agencies should produce content on widely used platforms like YouTube for quality medical and epidemiological information dissemination.
Szmuda et al. (2020) (25)	Classic paper	Source of information	The quality of YouTube videos on severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and COVID-19 is poor. However, authors listed the top-quality videos as effective tools for patient education during the pandemic.
Atac et al. (2020) (26)	Original	Source of information	Since there is no peer-review system on YouTube, people can almost release every type of video. During the extraordinary situations such as the pandemic, the videos of official health authorities and international institutions should be more visible on YouTube.
D'Souza et al. (2020) (27)	Original	Source of information	Although YouTube generally is a useful source of medical information on the COVID-19 pandemic, increased efforts to disseminate accurate information from reputable sources is desired to help mitigate disease spread and decrease unnecessary panic in the general population.
Laurent et al. (2020) (28)	Original	Source of information	YouTube represent a novel and fast-growing way to share information and discuss about trending topics worldwide.
Andika et al. (2021) (29)	Original	Source of information	YouTube is an increasingly important source of medical information during the COVID-19 pandemic. Most of the videos were useful, however due to the public nature of the platform, misleading information may also be easily disseminated. Independent users are more likely to post-misleading videos.
Parker et al. (2021) (30)	Original	Source of information	Users of the digital platform are more likely than non-users to meet the guidelines for moderate-vigorous physical activity and muscle-strengthening exercises during COVID-19 stay-at-home restrictions in April and May 2020, i.e., when governments established stricter security measures. Digital platforms can play an important role in engaging in physical activity as access to physical activity facilities at the beginning of the pandemic was very restricted.

McDonough et al. (2021) (31)	Original	Source of information	With national COVID-19 restrictions still in place and uncertainty regarding post-pandemic physical activity environments and behaviors, a remote physical activity intervention provided by YouTube can promote clinically significant improvements in moderate to vigorous physical activity levels. (muscle strengthening and aerobics physical activity practice) as well as sleep efficiency, intrinsic motivation, and decrease perceived barriers to physical activity.
Kadakia et al. (2022) (32)	Original	Source of information	The proportion of accessible videos for people with disabilities remains low relative to current demands related to the COVID-19 pandemic. Videos adapted for people with disabilities to improve their physical fitness and physical and mental well-being are rarely found on YouTube, that is, it is urgent to increase access to information and digital resources for this audience.
Tripicchio et al. (2021) (33)	Original	Intervention program	A digitally enhanced 6-week home physical activity intervention offered to parents and youth was feasible during the summer of 2020, with youth reporting improvements in self-efficacy and physical activity amid the COVID-19 pandemic. The program format consisted of deliveries of "physical activity kits", including physical exercise equipment and information leaflets; asynchronous sports and fitness videos posted on a private YouTube channel; and support text messages for health and fitness coaches. Summer programs are essential to reduce disparities in access to physical activity among vulnerable young people, and have the potential to coping barriers for young people amid the COVID-19 pandemic.

Abbreviations: COVID-19, corona virus disease 2019; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.