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Autogenic and Audiovisual-Self Training for the Biomotor Abilities of Professional Boxers During Covid-19: A Literature Study

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Abstract -- Boxing is a popular contact sport that is in demand by many. Physical distancing and social distancing due to Covid-19 have caused various championships to be delayed due to environmental changes imposed by Covid-19. It causes the willingness and enthusiasm to practice the trainers to decrease. Physiologically, the strength and explosive power of the muscles will decrease, which is preceded by a decrease in the number of myofibrils, reduced muscle volume (disuse atrophy), then stiffness and limited motion of the joints occur. A person's motor abilities will decrease after five - seven days if they do not do the exercises as usual. Maximum strength, explosive muscle power and mental training must be appropriately trained and prepared. Qualitative descriptions with literature studies which analyze various theories put forward by experts on strength, maximum strength, explosive muscle power, and anxiety which can affect the peak performance of professional boxers in achieving maximum performance. The conditions of environmental change due to the Covid-19 pandemic have forced the development of training methods and techniques through studies based on sports science and sports technology that are innovative, adaptive and realistic. Professional boxers must maintain their motor skills and cope with stress through audiovisual training (audiovisual self-training) and autogenic training regularly and programmed. Maintaining and increasing muscle strength, muscle explosiveness, and maintaining an ideal body weight according to class in boxing are essential things besides other internal and external factors.

Keywords*-disused atrophy, maximum strength, audiovisual self-training, autogenic training.*

I. INTRODUCTION

Technological innovations are increasingly influencing the sports industry for global competitiveness, various contexts including gaming experiences, consumers and spectators. Technology in the field of sports is becoming more critical in understanding how to develop a comprehensive strategy regarding innovation management, especially in response to the changing environmental conditions imposed by Covid-19 to provide adequate services through a more realistic approach (Ratten, 2020: 1). Vanessa Ratten made three significant contributions to technological innovation and the sports management literature namely 1) Expanding and integrating different research topics to provide a more comprehensive perspective; 2) Move beyond a static view of the sports technology process with a more dynamic and flexible approach; 3) Move the focus of literature outside of the organization to include other levels of analysis such as athletes, community, and society.

The ability to choose stimuli and understand the reactions of the environment and other people is essential in many aspects of life, and in sports, for example, it has a significant role in winning games. These abilities underlie perceptual-cognitive skills that cover a range of cognitive functions, such as

attention, visual discrimination, anticipation, problem solving, and decision making. In order to achieve their goals, each athlete must be able to turn their attention to the most useful points (e.g. parts of the body) to select and estimate useful information from the environment to understand opponents and teammates. To do this, athletes must focus, analyze and recognize subtle kinematic indices long before any action is taken. Combat / martial arts sports, such as boxing, karate, taekwondo and judo are not exempt from this claim. As open skill sports, they are defined as interceptive sports, in which athletes must coordinate and interact with external opponents either with or without objects. This sport is characterized by sudden changes in the environment in which every athlete must adapt to new situations at every moment (Russo & Ottoboni 2019: 60).

Maximum strength such as muscle power or explosive power (combined strength and speed), endurance (musculoskeletal and cardiorespiratory resistance, both anaerobic and aerobic), speed (including speed endurance and maximum speed including agility), coordination (perfect coordination) and flexibility (full range of flexibility) are the main elements of physical fitness that an athlete needs to pay attention to (Bompa & Buzzichelli, 2019: 7). Thus strength, endurance, and speed are abilities that athletes must have in order to be successful in performance (Bompa & Haff, 2009: 259).

Russo and Ottoboni (2019: 60) stated that in addition to strength, endurance and speed, the ability to process is very important in making the right decisions to win the match. Exposing a part of their own body and inviting the opponent to hit it, while they hide that they will unleash a counterattack. In the last 40 years, researchers have studied extensively whether exercise training can improve cognitive-perceptive skills, both in specific sports and in genetics, with clear evidence of how skill affects brain function. Thus, expertise can influence the specific and general cognitive skills of athletes.

Professional boxers need motor abilities consisting of strength, maximum strength, and explosive muscle power to reach peak performance in order to win the competition. A significant factor in boxing is the ability to hit the opponent. Straight, uppercut and hook are punches that are very deadly to the opponent when done with a technique with the right muscle explosive power by exerting full strength (Can, 2020: 721). Mike Tyson, a world heavyweight boxer, is greatly feared for his deadly hook. The power of straight punches, uppercut and hook is needed by a boxer to knock down his opponent. Therefore, in the training program, it is necessary to carry out an analysis of physical abilities, mental readiness, mastery of techniques, and tactics applied when training and competing, in addition to other supporting factors such as environment, infrastructure, funding, and guidance systems.

Age-related development of the human species indicates that various biological capacities usually peak at different stages of an individual's life. The exercise physiology literature suggests that peak physiological function occurs just before the age of 30. The degeneration process is a natural process that occurs in every individual, characterized by the loss of the ability of cells and tissues to repair and replace themselves and maintain typical structure and function. In the process of ageing/degeneration, anatomical changes will occur in the body's organs over time (Amarya & Sabharwal, 2018).

Knowledge of peak performance age in elite sports can provide coaches and scientists with valuable information for developing long-term training plans and help measure athletes' progress toward their performance targets. Such information can also be useful for athlete selection decision-makers for major competitions and for national sports organizations tasked with allocating funds and resources based on the athlete's chances of achieving future medal winner success (Allen and Hopkins, 2015: 2).

Not only physical, technical, and tactical aspects that support athletes' achievement, but also psychological aspects. It cannot be underestimated because they play a significant role in sports performance, therefore psychological/mental training (mental training / autogenic training) at the stage of general preparation, preparation specifically, pre-competition and major competitions should be awarded to athletes.

II. METHOD

The method used in writing this article is a qualitative description with a literature study which analyzes various theories put forward by experts regarding the factors of strength, maximum strength,

explosive muscle power, and anxiety that affect the peak performance of professional boxers during the Covid-19 pandemic to achieve maximum performance supported by empirical facts in the field.

III. DISCUSSION

Professional boxers are boxers who fight for a certain amount of pay. A professional boxing match is a match that pays a particular nominal value. Boxers' fees vary widely, depending on the level and popularity of the boxer. It is not sure that a boxer who becomes a world champion gets a higher salary than a boxer who is not a world champion. The Filipino boxer, Manny Pacquiao, in some of his matches, is not world champion and does not fight for the world title, but the pay is many times higher than that of Indonesian boxer Chris John who is world champion. It is because Pacquiao's popularity is way above Chris John's. McCrory et al. in Can (2020: 727) state that amateur boxing is different from professional boxing for several reasons, including motivation to compete, different rules, and equipment, but most importantly there is greater exposure to injury in professional boxers (longer fights, more boxing experience, smaller and lighter boxing gloves, a more significant score reward for a shot that injures an opponent, a longer career after an amateur career). A knockout is a rare event in amateur boxing, for example, the 2001 world amateur championship was only six knockouts out of a total of 366 fights. Further, some studies show that a single hit from a professional heavyweight boxing champion can deliver impact forces of up to 6,320 N (0.63 tonnes). In comparison, an equivalent hit would be delivered by a wooden hammer with a mass of 6 kg (13 lbs) if swung at a target. A qualified physical condition is an essential requirement for increasing an athlete's performance. One of the essential physical components to support the other components is muscle strength. Bompa and Buzzichelli (2019: 233, 261) state that strength is defined as the ability of the neuromuscular system to generate strength against external resistance. The maximum strength that an athlete can demonstrate depends on seven main concepts, namely the number of motor units recruited, the speed of unit motor coding, motor unit synchronization, stretch-shortening cycle, degree of neuromuscular inhibition, type of muscle fibres, degree of muscle hypertrophy. Harsono (2017: 47) states that strength is energy to fight a resistance or the ability to generate tension. Thus strength is an ability that is closely related to the process of muscle contraction.

Muscle is an active means of movement; it performs movements independently and moves the organs where it is located. Skeletal muscles are the most massive muscles in our body, moving the skeleton so that our body can move. Five physiological characteristics support Muscle function, they are: 1) Contractability - being able to shorten from its standard size; 2) Extensibility - being able to extend from its standard size; 3) Elasticity - being able to return to its initial state after shortening or extending; 4) Conductivity - properties able to conduct electric current (impulse), and 5) Plasticity - the ability to return to its original shape after the external force exerted is lost, for example when a muscle is pressed flat, after releasing it returns to its original shape immediately. The ability of muscles like this cannot be separated from their adequate structural support. Skeletal muscles have a fibrous structure resembling a network of electric cables. The most extensive form is known as muscle or flesh. The mass is a collection of muscle bundles, and the muscle bundles are an arrangement of a single thick muscle fibre. The single muscle fibre is composed of many myofibrils; inside myofibrils, there is a functional muscle unit called sarcomere (Wahid, 2018). Muscle contraction occurs because there is a stimulus both from within and from outside. The stimuli are transmitted via nerve cells to the control centre in the brain or spinal cord. If the stimulus creates an action potential, then the muscular (muscle) response can occur in the form of muscle contraction. Kisner and Colby (2012: 158) state that muscle strength is a broad term that refers to the ability of the contractile tissue to produce tension and strength based on the load exerted on the muscles. More specifically, muscle strength is the most significant measured force a muscle or muscle group can exert to overcome resistance or resistance. Thus, muscle strength is the ability of muscles to withstand maximum loads. Bompa and Buzzichelli (2015: 25) state that maximum strength is the highest strength that can be generated by the neuromuscular system during contraction. Physiologically, muscle strength is directly proportional to the volume/size of the muscle, meaning that the greater the muscle volume, the more muscular the resulting contraction to perform a movement. The resulting movements are the result of activation of the motor units in the muscles (Can, 2020: 723). The motor unit is one motor neuron with all

the muscle fibres it supplies. The number of muscle fibres per motor unit and the number of motor units per muscle vary (Guyton & Hall, 2007). Magill and Anderson (2017: 80) state that one motor unit can innervate 700 muscle fibres. 1500-2000 muscle fibres produce coarse and robust movements. Thus, the more motor units recruited, the more muscular the muscle contraction so that the resulting movement is more muscular (Kisner & Colby, 2012: 159).

Bompa and Haff (2009: 263-265; Bompa and Buzzichelli, 2019: 233-235) state that the maximum muscle strength is influenced by seven factors, namely: 1) Motor unit recruitment - As more motor units are activated, the amount of force generated by the muscle increases. Recruitment usually occurs in a regular pattern from smaller to larger motor units. Henneman and colleagues established what is known as the Henneman principle of measure, showing that the size of the motor unit determines activation. Larger motor units have a higher activation threshold and are activated after the smaller motor units. The larger motor unit is activated in response to a higher external load. However, the motor unit recruitment pattern is affected not only by force exerted but also by the speed of contraction, the type of contraction, and the metabolic state of the muscles; 2) Motor unit rate coding - The coding value is related to the burning frequency of the motor unit. One of the unique aspects of speed coding is that the force generated by the muscle increases without recruiting additional motor units. Van Cutsem and colleagues suggested that the coding rate played an essential role in determining the rate of voluntary contraction. It can be seen in several investigations showing that a higher combustion rate of the motor unit is associated with a higher rate of power development. Explosive high power output exercises (e.g. plyometrics, weightlifting, squats) have the potential to change the motor unit rate coding because they tend to increase the motor unit burn rate; 3) Motor unit synchronization - Motor unit activated in response to low-intensity muscle action with a short dynamic twitch resulting in an asynchronous motor unit activation pattern. Asynchronous motor unit combustion occurs as a result of one motor unit being disabled while the other is active.

In contrast, synchronization of motor units occurs as a result of the simultaneous activation of multiple motor units, and it has historically been suggested to produce the increased power output. Synchronization of the motor unit plays a role in strength development during rapid muscle contraction because synchronizing the motor unit can exert its most significant influence on the performance of activities that require simultaneous activation of several muscles at the same time, such as running, where during the propulsion (push-off) phase the gastrocnemius muscle, soleus, glutei, hamstrings and quadriceps all participated; 4) Stretch shortening cycle - A stretch-shortening cycle (SSC) is defined as the combination of eccentric and concentric muscle contractions. The stretch-shortening cycle can be considered a plyometric muscle action because the eccentric muscle action (muscle lengthening) occurs before the concentric muscle action (muscle shortening). The most well-known effect of a stretch-shortening cycle is increased performance (concentric muscle action) during the final phase of the cycle. The performance enhancement resulting from a stretch-shortening cycle is most likely due to the storage of elastic energy during the eccentric phase, activation of the stretch reflex, and optimization of muscle activation. Several investigations have suggested that strength training increases maximum strength as a result of an increased ability to activate a stretch-shortening cycle; 5) Neuromuscular inhibition - Neuromuscular inhibition can occur as a result of nerve feedback from various muscle and joint receptors which can reduce force production. For example, it appears that the organ tendon Golgi, which operates as a protective mechanism, prevents the build-up of dangerous muscle forces during maximum or near maximal effort. If the neural activation pattern of these protective mechanisms is altered, disinhibition can occur, and the power-generating capacity can be increased. Support for this argument can be seen in the work of Aagaard and colleagues, in which 14 weeks of heavy-duty strength training significantly reduced the neuromuscular inhibitory response. The resulting reduction in inhibition may partly explain some of the increases in power generation capacity seen as a result of training; 6) Muscle fibre type - Cross-sectional studies show that strength and power athletes have a high percentage of type II muscle fibres (fast-twitch) (53% to 60%). It is important because the muscle fibre type characteristics of an athlete play an essential role in the athlete's ability to demonstrate maximum strength and power generation capacity. The distribution of muscle fibre types of an athlete also appears to be significantly related to the athlete's vertical jumping ability. In contrast, athletes who participate in endurance sports generally have a higher

percentage of type I (slow-twitch) muscle fibre due to higher levels of maximum oxygen consumption and lower maximum strength-generating capacity. Thus, athletes who have a higher type II muscle fibre, pick.

Bompa and Haff (2009: 268), divide strength as follows: 1) General strength is the strength of the overall muscle system; 2) Specific strength, defined as the strength that exists in certain muscles that are involved explicitly in specific movements or branches (considered as the prime mover); 3) The speed-strength (speed-strength / explosive power) is the result of the integration of two capabilities, namely strength and speed; 4) Maximum strength (maximum strength) is the strength or the highest force that can be displayed by the neuromuscular system during the maximum contraction performed consciously; 5) muscular endurance, defined as the ability of the muscles to perform relatively strenuous activities over a long period; 6) Absolute strength, defined as the ability of an athlete to exert maximum power without considering his body weight; 7) Relative strength is the ratio between absolute strength and body weight.

Factors that can affect muscle strength include: a) Intermuscular coordination - It is the interaction performed by several muscle groups during activities, especially physical activities that require strength; b) Intramuscular coordination - Strength can also be affected by intramuscular coordination, or in other words depending on the function of the nerves of the muscles involved in carrying out the task of physical activity; c) Reaction of muscles to nerve stimulation - The muscle will react to nerve stimulation by 30% of the total potential possessed by the muscle concerned; d) Joint angle - Maximum strength will be achieved if the joint is physiologically involved in the outer range position (straight position or near straight position) and mechanically in the middle range position (90-degree position).

Bompa (1999: 1) states that five main theories are affecting strengthening exercises, namely 1) bodybuilding - exercises related to increasing muscle size, carried out six to 12 repetitions until fatigue arises; 2) high-intensity training (HIT) - requires a high training load throughout the year, strength can be achieved in 20 to 30 minutes and is resistant to high volume, long-lasting and continuous strength training; 3) Olympic weight lifting - significant effect at the beginning of strength training; 4) power training throughout the year, some coaches believe that strength training should be done from the first day of training to the main championship; and 5) periodization of strength - strength training for sports should be based on the specific physiological requirements of the sport and should result in the development of power and muscle endurance. Thus, the main characteristic of strengthening exercises is high resistance to low repetition.

The physiological adaptations to a strength training program can be categorized as either neurological or morphological. Neurological adaptations include factors such as changes in motor unit recruitment patterns, motor unit synchronization, motor unit burn rate, and reflex activation. Morphological changes are associated with changes in overall muscle size, muscle hypertrophy, transitional muscle fibre types, and changes in muscle architecture. The level of contribution of these two categories to adaptation can be influenced by many factors such as training status, type of exercise used in the training program, genetic makeup, age, and sex (Bompa & Buzzichelli, 2019: 235).

Research Ruddock et al., (2016: 81) with the title, Strength and Conditioning for Professional Boxing: Recommendations for Physical Preparation. This study aims to review the physiology of strength and condition of professional boxers as a trainer's basic knowledge, including preparation. The results showed that the adaptation of physiological characteristics is needed by a professional boxer to be successful in performance. Strength and specific training are done between 8-12 weeks before competing. Medical aspects and potential health risks must be considered when training and competing. The development of hand speed by inducing favourable adaptations to the series-elastic component and the neuromuscular system is a critical variable in the strength training recipe for the professional boxer. There is no comprehensive research source in the implementation of sports science to prepare professional boxers. To date, there are no complete scientific reviews or practical recommendations for preparing professional boxers for training and competition. Research by Neha, Ajita, and Rajdeep Kaur (2010: 1) entitled, Comparison of selected physiological variables among different weight-category Indian elite male boxers. This study aimed to compare the selected physiological parameters among different weight categories of boxers (light, moderate and heavyweight). The results showed that there was a significant difference in the

anaerobic ability index between light and heavy boxer categories. For that, we need to increase the anaerobic strength of boxers in the heavyweight category.

Bompa and Buzzichelli (2015: 25) state that power is the ability to carry out explosive movements in the shortest possible time, which is the result of the integration of maximum strength and speed. The power of the arm muscles is also the ability of the body to allow the muscles of the arms to work exclusively. Boxers in making strong movements or punches need the right muscle explosive power. Muscle explosive power is the ability of the muscles to use the maximum force exerted in the shortest possible time. Likewise, Kisner and Colby (2012: 159) state that the explosive power of a muscle is a combination of strength and speed, where strength is the power or stress that can be generated by a muscle in a contraction with a maximum load, while speed is the ability to perform movements in a row. -order in the shortest possible time.

Two main factors can affect muscle explosiveness, namely intramuscular factors and neural factors. Intramuscular factors consist of cross-sectional area, muscle structure, available energy, muscle fibre type. In contrast, neural factors consist of increased agonist activity, neural contribution as a benchmark of strength development, premovement silence, motor unit recruitment, selective activation of agonist's muscles in a group—muscle, as well as coordination of movement patterns and skills (Can, 2020: 724).

Boxing sports involve many muscles, both as an agonist, antagonist, synergist, and fixator group in performing movements during training and competition. These muscles contract both concentrically and eccentrically in producing blows aimed at the opponent. In addition to the role of these muscles, studies of biomechanics including the angle of strike, angle of muscle pull, and distance/range of strokes are also very much needed in producing a strong and on target shot to bring down the opponent (Dlis, 2020: 77).

A boxer in a straight, uppercut and hook strokes, must pay attention to the angle of pull of the arm mobilizer muscles, especially the triceps brachii, biceps brachii, and pectoralis major muscles when contracting eccentrically or concentrically (Can, 2020: 724). Besides, factors that are no less important are the activation of the stabilizer muscles for proximal joint stabilization and the magnitude of the angle of the tension of the muscles during the stroke. The tensile muscle angle is the angle formed by the line of muscle pull and its longitudinal axis (Kisner & Colby, 2012). Mechanically the muscle strength/pull is more significant at an angle of 90 degrees in a lever system (middle range), whereas physiologically the muscle strength is most significant in the longitudinal position (outer range). Muscle strength is reduced if the angle of the tension of the muscle is less than 90 degrees, but if the angle of the tension of the muscle is greater than 90 degrees, the joint becomes unstable. Likewise, the strike angle must combine the footsteps with a trunk rotation when making the stroke. Straight, uppercut and hook are strokes intended to knock down an opponent when done with full strength and the right muscle power and correct technique including the angle of the strike. Therefore, the strength of the muscles of the arms and upper and lower limbs must be appropriately trained because they have been proven to be the key to success (Nikolaidis, Clemente, Busko, and Knechtle, 2017: 5). Biomechanical characteristics and motion analysis in a boxer are inseparable from the joint as a fulcrum (fulcrum), muscle as a driving force (effort), bone as a structure / moving tissue, capsuloligamenter as a component that strengthens and stabilizes joints and other soft tissues around joints such as nerves, blood vessels, bursa, and skin. A good movement pattern in forming the angle of the hit and the reach of the blow requires good joint stability and mobility as well as being supported by an effective and efficient muscle tensile angle to produce a well-targeted and robust shot.

Based on some of the definitions and descriptions above, muscle strength is the ability of the neuromuscular system to generate strength against external resistance by taking into account the number of activated motor units, the angle of muscle tension, and joint stability. Likewise, maximum strength is the maximum strength that the neuromuscular system can display during a maximum conscious contraction. Meanwhile, explosive muscle power is the maximum ability of the muscles to carry out activities/movements with a maximum load in a particular unit of time (integration of strength and speed). Thus, the greater the number of motor units that are activated, the greater the force of muscle contraction produced.

Anxiety can arise at any time; one of the causes is excessive and prolonged tension. There are two types of anxiety symptoms, namely somatic, which is characterized by anxiety, difficulty concentrating,

complaining quickly, while cognitive is characterized by trembling, excessive sweating, rapid breathing, increased pulse inappropriately, feeling nauseous, and diarrhoea (Bebetsos, 2013: 2). As a result of this psychosomatic disorder, a boxer will experience stress (overtraining) which is marked by an increased pulse rate, increased number of breaths and body temperature, decreased bodyweight, pain, increased stomach acid, weakness, changes in behaviour and decreased enthusiasm so that ultimately they do not concentrate, and not focus on training or competing (Can, 2020: 728). Research by Munshi et al., (2020: 3) with the title, Repeated Stress Induces a Pro-inflammatory State, Increases Amygdala Neuronal and Microglial Activation, and Causes Anxiety in Adult Male Rats. The purpose of this study was to determine the effect of chronic stress on circulating immune parameters using repeated social defeat stress (RSDS) models of adult male rats. This study used the RSDS to explore how recurrent social stresses impact peripheral immune balance by measuring peripheral immune precursors and mature T cells and various serum cytokines. The results showed that stress could recruit the immune system to alter the function of brain regions critical to emotion. These changes explain the comorbidity of various inflammatory conditions associated with chronic stress and the psychological disorders triggered by chronic stress.

Anxiety and stress are emotions that everyone experiences. One of the psychiatric symptoms that occur in athletes is anxiety or anxiety. Anxiety disorder is a severe form of mental disorder that causes significant problems and has a disabling effect (Kleinman, 2012). Important events before, during, and at the end of a match in sports are greatly influenced by the level of anxiety of sports actors, whether athletes, coaches, referees, or spectators. Psychological disorders in the form of anxiety and stress are often experienced by a boxer before, during and after a match. Shadows cause feelings of anxiety before the match, and during the match, this happens because of psychological pressures (Tangkudung, 2018; 376). Research by Tazegul et al., (2015: 22, 25) with the title, Comparison of Continuous Anxiety Level of Some Individual Fight Athletes. This study aims to determine and compare the level of anxiety sustained by athletes associated with boxing, weight lifting, kickboxing and wrestling. The results showed that many factors negatively affected the athlete's performance. One of them is high anxiety. Therefore, psychological support and mental training should be provided to athletes, especially athletes with high levels of anxiety. Boxers often experience anxiety due to various factors, including irregular training programs and the absence of matches as a result of the Covid-19 pandemic, which requires physical distancing and social distancing. It forces a change in the environment and training patterns that must be adhered to, both boxers, coaches, managers, boxing organizations and boxing lovers' societies. There are several ways to overcome anxiety, namely by relaxing through stretching and listening to music, visualizing by showing (watching the best videos), and motivating yourself (self-talk) by activating the subconscious optimistically and optimally. Continuously (Tangkudung, 2018: 384).

IV. CONCLUSION

From the theories and research and discussions that have been put forward, it can be concluded that during the Covid-19 pandemic, physical exercise independently must be carried out according to the training program agreed upon between the boxer and the coach even though there is no match schedule. It aims to maintain the physiological properties of muscles and joints, maintain and increase muscle strength and motor abilities. This independent physical exercise can be carried out in a gym, in the wild (on the beach, in mountainous areas) or with audiovisual assistance while still applying health protocols related to Covid-19. During the Covid-19 pandemic, excessive anxiety and stress should be avoided because it can reduce the body's immune system; therefore, mental training called mental/autogenic training is needed. Thus the role of coaches, management, and organizations is vital to support the existence of a professional boxer during the absence of a match during the Covid-19 period, in order to remain excellent in maintaining peak performance to achieve maximum performance as long as the boxer is in the golden age or period, namely between 16-30 years.

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