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ORIGINAL ARTICLE

ASSESSMENT INSTRUMENT FOR BASIC HOOK PUNCH TECHNIQUES FOR BOXING ATHLETES AGED 16-30 YEARS

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ABSTRACT

Background of study: The hook punch is one of the deadliest punches in boxing. But at the same time, hook punches also require skill from the boxer. This study then aims to produce and test the basic techniques of hook punch boxing athletes aged 16-30 years. **Methods:** The method used is experimental quantitative research by making a basic technique of hook strokes which refers to the concept of motor learning, beginning with the stimulus-receptor to the response-effector and muscle memory through a questionnaire that experts and practitioners validate before being used. The subjects in this study were male amateur and professional boxing athletes aged 16-30 years in Jakarta. Instrument trials were carried out in two boxing gyms with 20 athletes. **Results:** The results showed that the validity and reliability tests obtained Cronbach's Alpha value for each basic technique of hook stroke was greater than 0.60, and the r-table (product-moment) value was 0.444 <0.60. **Conclusion:** Then it can be concluded that the basic technique of the hook stroke is declared reliable and feasible to use.

Keywords: Hook Punch Instrument; Stimulus-Receptor; Response-Effector.

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INTRODUCTION

A hook is a punch in which the arm is pulled at a 45-degree angle from the elbow joint, using force from the hips and shoulders and moving the center of gravity toward the opponent's center. This punch is perfect for typical aggressive boxers who attack quickly, play tight, and are riskier than straight punches. A hook used to hit the opponent's chin will result in a higher risk of being knocked out than anywhere else on the body. This is also inseparable from the boxer's position and stance, whether orthodox stance (natural position) or southpaw stance (left-handed position)[1].

The hook punch is one type of deadly punch in boxing which is done by linking the arms when a boxer throws a punch, done with the right or left hand. The target of this punch is often aimed at the temples or lower jaw to knock down the opponent. This shot requires maximum speed and muscle strength, proper muscle explosive power, an angle of muscle pull, and an effective and efficient target-hitting angle[2].

Qualified physical condition is essential in making this shot at winning a match. In boxing, an efficient punch requires a combination of the athlete's force, speed, and stability. Thus, performance in boxing is a combination of strength, speed, and stability [3].

A boxer, in making a hook punch, must pay attention to the angle of attraction of the mobilizing muscles as arm and shoulder movers, especially the biceps brachii, triceps brachii, pectoralis major muscles, supraspinatus and deltoid muscles, upper leg muscles (quadriceps femoris, hamstring) and lower leg (gastrocnemius, tibialis anterior), muscles of the torso (trunk), abdominal muscles, and muscles of the flexor group of the wrist and fingers, when contracted concentrically or eccentrically. Besides that, factors that are no less important are the activation of the stabilizer muscles to stabilize the proximal joint and the magnitude of the angle of attraction of the muscles in a punch [4].

The muscles that play a role in a hook shot include the dominant muscles in the head and neck area, the upper trapezius, and the right and left sternocleidomastoid muscles. The muscles in the shoulder and elbow areas include the rotator cuff muscles (supraspinatus, infraspinatus, subscapularis, teres minor), deltoid, pectoralis, rhomboids, biceps brachii, triceps brachii, brachialis, brachioradialis, as well as the muscles of the wrist and hand such as extensor carpi radials, flexor carpiulnaris, flexor and adductor muscles of the fingers[5].

Meanwhile, the muscles in the lower limbs are the iliopsoas, gluteus maximus, gluteus Medius, hip adductor groups (Gracilis, obturator externus, adductor brevis, adductor longus, adductor magnus muscles), quadriceps femoris, hamstring, gastrocnemius, tibialis anterior, and toe flexor muscles. Likewise, in the trunk and abdomen are muscles, trapezius, latissimus dorsi, serratus anterior, rectus abdominis, transversus abdominis, internal and external Obliqus abdominis right and left as well as the extensor back muscles [6].

Based on the brief explanation above, the researcher then intends to make a test for the

basic hook technique instrument for boxing athletes aged 16-30 years.

METHOD

The research method used is quantitative experimental research. This method is carried out by making a basic hook technique that refers to the concept of motor learning, starting with the stimulus-receptor to the effector-response and muscle memory. The research data was then obtained through a questionnaire/questionnaire, which was validated by boxing experts and practitioners (trainers) before being used[7].

RESULT AND DISCUSSION

Motor Learning and Muscle Memory: Motor learning is a change resulting from new practice or experience in responding. This often involves increasing the fluency and precision of movements, necessary for complex and complex movements but also crucial for calibrating simple movements, such as reflexes, as body and environmental parameters change over time. Motor learning research often considers the variables that contribute to the formation of motor programs, namely the underlying motor behavior, the sensitivity of the error detection process, and the power of movement schemes[8].

Motor learning is "relatively permanent" as the ability to respond appropriately is acquired and maintained. As a result, temporary processes that influence behavior during training or experience should not be considered learning but instead temporary performance effects. Thus, the main components underlying the behavioral approach to motor learning are the structure of the practice and the feedback provided. Of these, the former relates to time manipulation and organizing practices for optimal information retention, while the latter relates to the effect of feedback on movement preparation, anticipation, and guidance[9].

The integration of motor control research that developed towards the end of the 20th century continues today. More research in motor control and learning is being published today than ever before. The research was carried out by researchers with wider diversity and knowledge than before[10].

A movement in the body results from stimulation received by receptors located throughout the body, both exteroceptive and proprioceptive (kinesthetic). Each receptor provides more than one type of sensory information, for example, muscle spindles give information on joint position, muscle speed, muscle tension, and orientation of the limbs concerning gravity. Unlike vision and audition, which present a special sense, kinesthetic includes a complex combination of inputs from various receptors that must be integrated by the central nervous system[11].

The function of the senses is essential in the movement's success because motion results from processing information absorbed by the human senses. Success in high-level skills depends on how the individual can detect, receive, and utilize sensory information. Information for skills arises from several basic sources, although most of this information comes from the environment[12].

The ability to choose stimuli and understand the environments and other people's reactions is essential in many aspects of life. In sports, for example, he has a significant role in winning the game. This ability underlies perceptual-cognitive skills that cover a range of cognitive functions, such as attention, visual discrimination, anticipation, problem-solving, and decision-making. To achieve the goal, each athlete must be able to turn their attention to the most valuable points (e.g., parts of the body) to select and estimate helpful information from the environment to understand opponents and teammates[13].

To do this, the athlete must focus, analyze and recognize subtle kinematic indices long before any action is taken. Martial sports, such as boxing, are not exempt from this requirement. As an open-skill sport, martial arts are defined as interceptive sports, in which athletes must coordinate and interact with external opponents with or without objects. This sport is characterized by sudden environmental changes where each athlete must adapt to new situations every moment [14].

Recent findings in biology show that another memory is no less critical than brain memory, namely muscle memory, which is located throughout muscle tissue. Brain memory is formed from knowledge, while muscle memory is created by practice. Muscle memory consists of a network that wraps a network of muscle cells (white), this is what is called myelin. The human body's myelin layer is white, so it is often called the "white matter" of the brain [15]. As an insulator, myelin increases the speed of information flow (in the form of impulses) and spreads it throughout the muscle tissue. The thicker this layer, the more efficiently information circulates, and the faster and more automatically humans make their movements. Muscle memory is the ability to reproduce specific movements without conscious thought, which is acquired from repeating these movements. In simple terms, it can be said that muscle memory is the memory of the body's muscles for activities that have been carried out[16].

This muscle memory helps you regain strength and muscle mass more quickly than when you first practice. This makes it easier to relearn old skills that you may not have done in a long time, even after weeks of inactivity. Thus, muscle memory results from motor skills learned and not muscle growth. Malcolm Gladwell said to get muscle memory, which takes about 10,000 hours of practice to master a skill[17].

Hook Punch in Boxing: In making hook shots in boxing, it is necessary to apply the concept of motor learning which begins with the presence of a stimulus-receptor to an effector-response, as follows:

a. Head and neck position, the direction of gaze, torso (trunk), fists, and wrists (stimulus-receptors).
b. The initial angle of the shoulder joints, elbows, and the position of both knees (starting position).
c. Distance/width and position of both feet (based).
d. Footwork (excellence with automation).
e. Stability, the center of gravity (CoG) transfer, and body weight transmission.
f. Rotation of the trunk and hips and shift of the forefoot when hitting (flexibility).

g. Balance during and after releasing the punch (balance).
h. Position of both arms when hitting and after hitting (single and double cover).
i. The distance, the angle of hitting the target, and the accuracy of the hit (effector response) [18].

From the description above, a concept map of the hook stroke can be made as follows:

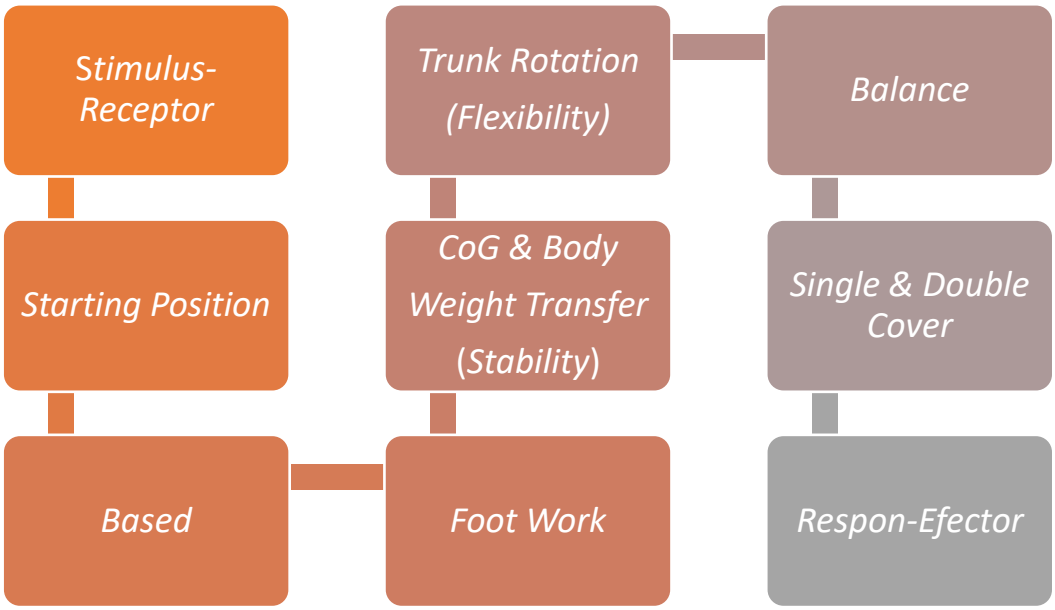

Figure 1. Hook Shot Concept Map

Based on the concept map above, in the movement of hitting the "hook," the position of the head and neck always follow the direction of the opponent's movement while the direction of the eye is fixed on the opponent and the target of the punch to be delivered (stimulus-response). The abduction angle of the shoulder joint and the angle of flexion of the elbow joint are consistently maintained at 45 degrees (middle range) [19]. The direction of movement and the steps of both legs/legs always follow the opponent's movement with the right leg/leg in the forward position for left-handed boxers (southpaw), while conventional/orthodox (non-left-handed) fighters with the left leg/leg in front. The knee joint is in a semi-flexed (slightly bent) position, while the position of soles of the feet is in a diagonal position with a normal base, which is shoulder-width apart to maintain body balance when making movements [20].

When hitting a hook, the body leans to the side (diagonal position with the target), and body weight is transmitted to the leg that is in front (left foot for orthodox types and right foot for left-handed types) simultaneously with the movement of the right or left hand to throw the hook to the target accompanied by rotation (rotation to the left or right) of the trunk/body and hips and transfer of body weight (center of gravity) towards the target [21]. When hitting, the focus is more on the

foot that is in front while the back foot is in a raised heel position (heel off) where the forefoot remains attached and rotates on the based surface, then followed by the movement of the back foot towards the front side so that the resulting punch is powerful while maintaining balance. Thus, the position of the left foot and left hand is in front for conventional/orthodox boxers, while the right foot and right hand are in front for left-handed (southpaw) boxers [22].

Muscle explosive power, target hitting angle, hitting range/distance, and hitting accuracy, are taken into account to produce maximum punching power to knock the opponent down. This hook is usually preceded by a jab or straight punches to open up the defense (double cover) from the opponent [23]. Likewise, punches to the stomach serve as bait and trick opponents into looking for opportunities and gaps to release hook punches toward the intended target.

When throwing a hook at the opponent, the boxer must immediately return to the double cover position so that loss of control does not occur and there is no gap for the opponent to hit back[24].

Making an Assessment Instrument for Basic Techniques of Hook Punches

An assessment instrument called the "Hook Punch Basic Technique Assessment Instrument" is needed to assess a hook punch in boxing, which has passed the reliability and validity tests. The experts include (1) Prof. Dr. Adang Suherman, M.A from Universitas Pendidikan Indonesia (UPI) Bandung as a sport pedagogy expert; (2) Dr. Jajat Darajat Kusumah Negara, M.Kes from UPI Bandung as an expert in exercise physiology, neurophysiology, and measurement; (3) Atmonobudi Soebagyo, MSEE., Ph.D. from Universitas Kristen Indonesia Jakarta as an electronics expert (control system); (4) Little Home as Head Trainer of Kelompok Petinju Jalanan (KPJ) Bulungan Boxing Camp Jakarta; and (5) Andi Reza Reviandi (Physical Trainer, Head Coach F45 Training Senopati).

The assessment instrument for the basic hook stroke technique can be seen in the table below:

No	Basic Hook Punch Technique	Dimensions	Indicator	Score	
1	2	3	4	T	W
1	*Starting position (stimulus-receptor)*		1. Head position 2. Direction of view 3. Trunk position 4. Fist position		

		Information: 1. Head and neck relaxed/neutral 2. Look straight ahead and focus on the opponent (target point) 3. The position of the trunk leaning forward 4. Position your fists diagonally and at eye level 5. Neutral/straight wrist position (not bending)	5. Wrist position		
		 6 | 7 | 8 | 9 6. The initial position of the shoulder joint 45° abduction 7. The initial position of the elbow joint is 45° of flexion 8. The position of the front knee is semi-flexed (slightly bent) 9. The position of the rear knee is semi-flexed (slightly bent)	6. The starting position of the shoulder joints 7. The starting position of the elbow joint 8. Front knee position 9. Back knee position		
		 10 | 11 10. Feet shoulder-width apart 11. Position both legs diagonally, front and back	10. The width of the feet 11. Position both legs		

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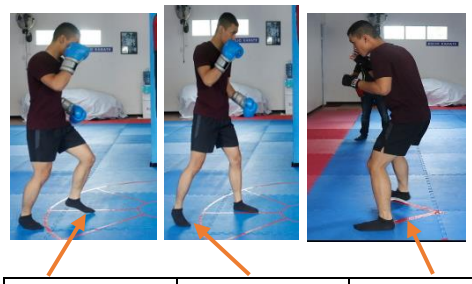
<td> 
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Information:

Movement of both legs, front and back
The position of the back foot is resting on the forefoot and always diagonal
Move both legs to the right and left
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Movement of both legs
Position of the hind legs
Move your feet to the right and left
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<td rowspan="2">Execution of strokes (propulsion)</td>
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Information:

The dominant focus on the front knee
Forefoot back foot attached (toe position)
The rear legs rotate on the base
There is body movement for CoG transfer and body weight transmission to the point/target hit
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Pedestal position
Position of the hind legs
Movement/ rotation of the hind legs
Body CoG position
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<td><ol start="5">
Rotation of the trunk and hips
Movement of the forelegs
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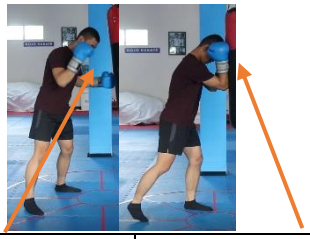
		5. There is a rotation of the trunk and hips 6. There is a simultaneous shift of the front foot to the side			
		 7 | 8 | 9 7. There is a displacement of the hind legs towards the front of the side 8. Keep both feet parallel and diagonal 9. Focus on the forefoot of the hind leg	7. Movement of the hind legs 8. Position both legs 9. Back footstool		
4	Single and double cover	 1 | 2 Information: 1. When hitting the single cover hand position 2. After hitting both hands in the double cover position	1. Hand position when hitting 2. The position of both hands after hitting		

5	Hit distance hit angle, and hit accuracy (effector response)	 1 | 2 | 3 | 4 Information: 1. Close/short distance (< 50 cm) 2. Small angle: <90 degrees (to get a mechanical advantage, namely the mechanical advantage in the lever/lever system) 3. Accuracy of static target shots on the bag attached to the sensor device 4. Accuracy of dynamic target hits on the head guard, which is attached to sensors on the right and left lower jaw Notes: a. Static targets (bags) where sensors are attached (right-left). The subject hooked the bag two times, starting with jabs with the criteria: if it hit the target one time or did not hit the target, the score was 1 (wrong), and if it hit the target two times, the score was 2 (true). b. The dynamic target (during sparring) is in the right-left jaw area where sensors are installed: the subject does sparring for 1 round with the criteria: if the hook hits the target less than two times, then the value is 1 (wrong), if it hits the target more than two times then the value is 2 (true). c. Shot accuracy (whether or not a hit on the target/sensor) can be seen on the android monitor.	1. Distance to hit the target 2. The target angle 3. Static target hitting accuracy 4. Dynamic target-hitting accuracy		

Table 1. Assessment Instrument for the Basic Technique of the Hook Shot

Description: T - True with value = 2, W - Wrong with value = 1

This basic technique of hook stroke has been tested for its reliability level using Alpha Cronbach with SPSS 26 application calculations with the following test results:

NO	Basic Hook Punch Technique	*Alpha Cronbach*
1	Head and neck position, eye gaze, torso (trunk), fists, and wrists (stimulus-receptors)	0.874
2	The starting position of the shoulders, elbows, and knees (starting position)	0.848
3	Position and distance/width of both feet (based)	0.606
4	Footwork (excellence with automation)	1.000
5	Focus on hitting (stability) and transmission of body weight (center of gravity/CoG transfer)	0.765
6	Trunk and hip rotation and forefoot displacement during hitting (flexibility)	1.000
7	Balance during and after releasing a punch (balance)	0.918
8	Position of both hands when hitting and after hitting (single and double cover)	0.877
9	Hit distance, target hit angle, and hit accuracy (effector response)	0.746

Table 2 Cronbach's Alpha Value of the Basic Hook Punch Technique

Based on the test results where Cronbach's Alpha value for each basic technique of hook stroke was greater than 0.60, and the r-table (product-moment) value was 0.444 <0.60, the basic technique of hook stroke was declared reliable.

The use of Cronbach's Alpha based on the reliability coefficient category is as follows:

Reliability Coefficient	Information
0.80 < 1.00	Very high reliability
0.60 < 0.80	High reliability
0.40 < 0.60	Moderate reliability
0.20 < 0.40	Low reliability
-1.00 < 0.20	Very low reliability

Table 3. Reliability Coefficient

Likewise, based on the results of an analysis of experts' opinions about the instrument for assessing the basic technique of hook strokes, the essential instrument for hook strokes can be used to determine the hook strokes of boxing athletes.

The results of the validation and opinions of experts/experts stated that:

a) Theoretically, it fulfills scientific principles because the instrument is based on relevant concepts/theories.
b) In practice, it has fulfilled the basic postures and movements in boxing, especially those related to hook punches.

c) The assessed aspects are easy to observe and measure.
d) Easy to apply.

Score	Criteria
81-100	The basic hook technique is very good
61-80	The basic hook technique is good
41-60	The basic hook technique is quite good
21-40	The basic hook technique is not quite good
0-20	The basic hook technique is not good

Table 4. Instrument Assessment Criteria

CONCLUSION

The basic technical instrument for hook hitting in boxing is based on the concept of motor learning, starting from the stimulus-receptor to the response-effector. This instrument has been tested on 20 research subjects. The results of using this instrument are valid and reliable and fulfill scientific principles. Therefore, this instrument can be considered feasible for boxing athletes.

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