

Zbigniew Czajkowski

Varieties of Sensory-Motor Responses in Fencing

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POLEMICS

ZBIGNIEW CZAJKOWSKI

Master Class Fencing Coach, Academy of Physical Education, Katowice (Poland)

Correspondence should be addressed to: Zbigniew Czajkowski, ul. Fałata 16a/9, Bytom 41-902, Poland, Phone +48 32 282 57 56

E-mail: z.czajkowski@interia.pl

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A tennis player may have highly efficient techniques but may lack skill in tennis because he does not perceive the right moment to use those techniques. A skilled footballer, or any other games player, must take action which is appropriate and therefore the skill involves interpreting the needs of the situation and making the right decision, as well as carrying out the necessary movements. In games, decision making is a vital part of the skill.

Barbara Knapp

Key words: tactics and psychology in fencing and in other combat sports, component part of sensory-motor responses, perception and choice of action in fencing bout

Abstract

All branches of sport have many common traits and also many different ones. Some branches of sport have only one closed (intrinsic) sensory-motor skill (weight lifting, field-and-track events), no direct opponent, no tactics. Some branches of sport have many closed (intrinsic) sensory-motor skills (figure skating, artistic gymnastics), no direct opponent and no tactics. The accuracy and beauty of predicted movements in those sports are assessed by the judges. Fencing and other combat sports, games and team games differ considerably: many open (extrinsic) sensory-motor skills, facing directly the opponent, great importance of tactics. In fencing it is not only important, how to execute a given fencing action (sensory-motor skill), but even more important is, how to apply chosen action in a bout. Important are technical-tactical and tactical abilities. In fencing sensory-motor skills – various fencing actions (offensive, defensive, and counter-offensive) are mostly applied in a bout as sensory-motor responses: simple motor response, choice motor response, differential motor response, sensory-motor response to a pre-signal, sensory-motor response to a moving object, switch-over response (change of decision while executing a foreseen action), intuitive response.

Introduction

*At every instant the motor activity must be related by, and appropriate to the external situation. . . what is learned is not a series of individual acts. . . what we learn at tennis is not a set of strokes but how to **make** strokes appropriate to the moment.*

Barbara Knapp

Many physical exercises, movements, strokes, and actions which are the form and content of various disciplines of sport, display certain traits which are characteristic of conscious, voluntary

activity. Such activity occurs in the form of sensory-motor skills which often are applied as sensory-motor responses. This is especially important in branches of sport with many open sensory-motor skills and tactical abilities – fencing and other combat sports, games and team games. General structure of SMR (sensory-motor responses) is presented on Fig. 1.

Simple sensory-motor response is a reply in which man knows or foresees a stimulus which is about to occur and, for which, man prepares an adequate action in a specific way in advance. Take, for example, the sprinters start. The athlete knows the aim of his movements, he knows the

way of executing them, and he knows stimulus. He is waiting for the stimulus – signal – which is the pistol shot. To this known signal, he responds with a well-known, well-learned, and often repeated movement – the start. Another example of simple sensory-motor response: in a sabre lesson, the fencing master commands, “On my opening – change of position from *quinte* to *seconde* – you execute direct cut to head”. The beginning of the fencing master’s movement acts as a signal for the execution of the cut to the head.

The structure of sensory-motor response consists of three periods:

1. Preparatory period, i.e. waiting for the stimulus.
2. Latent or central period (by some authors called “reaction”).
3. Executory or final period, in which the chosen and prepared action is executed (Fig. 1).

The latent period lasts from the appearance of the stimulus to the beginning of the action. It takes a very short time but it influences greatly the speed and way of execution of a chosen movement or action. Although the athlete remains immobile, highly dynamic and important processes take place in his brain cortex.

The latent period may be divided into:

1. Sensory part – reception of the stimulus (signal).
2. Associative part – realisation that *this* is the stimulus for action.
3. Motor part – excitation of the motor area of the brain cortex and a flow of motor impulses (motor commands) along the nerves to the appropriate muscles.

The executory (or final) period is the time from the beginning of the movement (action) to its completion. It is visible and therefore may appear, to a superficial observer, to be the most important phase. **It should be understood, however, that the actual movement is prepared by, and depends on, the first and second periods of sensory-motor response.**

A sensory-motor response is a sensory-motor skill (motor habit pattern), executed and applied as a sensory-motor response to a stimulus. **Figure 1** depicts a simple model of a sensory-motor response.

Fig. 1. A General Model of a Sensory-Motor Response

Time of sensory-motor reaction		
Preparatory Period	Latent Period	Executory Period
		(execution of a given stroke)

The preparatory period lasts from the signal, “attention” (or situation which causes an increase of attention), to the appearance of the stimulus. The latent period lasts from the appearance of stimulus to the beginning of movement. The executory period lasts from the beginning of movement to its completion. The time

of motor response comprises the latent period and the time of the movement execution.

Many authors only distinguish and describe only the simple and compound (choice) sensory-motor response (SMR). I think we should distinguish seven varieties of sensory-motor responses: simple SMR, choice SMR, differential SMR, SMR to a moving object, switch-over SMR, SMR to a pre-signal, and intuitive SMR. All these varieties play a key role in fencing and other combat sports, as well as in sport games and team games. In fencing, they form the basis of various technical-tactical capabilities, such as: distance assessment and choice of footwork; recognition of the threatened line; choice between a parry and stop-hit; choice of the appropriate parry; intuitive choice of an action; the ability to change one’s intention, during a foreseen action, as a reply to the opponent’s unexpected movement; etc.

In competition, apart from physical abilities, co-ordination abilities, sensory-motor skills and responses, extremely significant also are: tactics, various aspects of attention (level of attention, range of attention, divisibility of attention, direction of attention, shifting of attention, external and internal attention), perception, level of arousal, as well as achievement motivation and competitor’s self-confidence. As I often say to my pupils: Nothing is as simple, as it may superficially appear. In discussing sensory-motor responses it is important to mention that a fencer responds differently to various stimuli. The fastest reaction is to kinesthetic stimuli (internal), than auditory stimuli, tactile stimuli, and lastly – visual stimuli. In fencing the combination of visual and tactile stimuli plays a significant role. Many various tests, conducted in Department of Fencing in Academy of Physical Education in Katowice showed that fencer’s reactions are much faster than the reactions of athletes of branches of sport with closed motor skills. They are also faster to specific stimuli (movement of weapon) than non-specific stimuli (e.g. non-specific visual signal).

Simple Sensory-Motor Responses

Once a fencer has learned the mechanisms of basic fencing movements, the activity loses its primary, total physical requirements and becomes more of a mental exercise. Concentration, self-control, and quick decision command muscles and reflexes for successful scoring.

Michel Alaux

The essence of a simple sensory-motor response is: a known, foreseen stimulus followed

by a known, foreseen response. For example, in a laboratory, on the appearance of a red light, you must press a button; in a fencing lesson, when the coach announces: "On my step forwards (known expected stimulus), you execute a direct attack with lunge" (foreseen response); in a fencing bout, when one expects or provokes a given movement by the opponent and reacts to it with a previously foreseen and planned action. **Figure 2** shows the structure and essence of simple sensory-motor response.

In a simple motor response, the process of reaction is not very complicated. There is only one well-known stimulus – signal – to which one replies with one well known foreseen movement. In the preparatory part of simple response, two important psychological processes occur:

- a. waiting for the expected stimulus (signal) and
- b. preparing the reply, i.e. motor programme of a foreseen action.

1	A	2	B	3	C
↓		↓		↓	
Waiting for an expected stimulus. Preparing an appropriate movement.		a b c			Execution of a foreseen movement.

1 – Signal, "attention", "be ready", or change of external situation which causes a higher demand of attention.

2 – The appearance of the expected stimulus.

3 – The beginning of the movement/action.

A – Preparatory period.

B – Latent (central) period.

C – Executory (final) period.

a – Sensory part of the latent period (noticing the stimulus).

b – Associative part of a latent period (recognising the expected stimulus – "This is the stimulus we were waiting for!").

c – Motor part of the latent period (sending executory motor impulses to muscles).

Fig. 2. A Model of Simple Sensory-Motor Response

Careful observation and laboratory experiments yield three main types of simple motor responses, based on the differences in the preparatory period, which have an impact on the latent and executory periods of SMR and – above all – on the duration of the latent period.

1. Sensory type of SMR

The athlete concentrates, above all, on perceiving the signal (e.g., the sprinter waiting for the pistol shot or a fencer waiting for the expected movement of his opponent's blade).

Waiting for the signal stimulates parts of the brain cortex responsible for analysis of auditory

stimuli (sprinter) or visual and tactile stimuli (fencer). Other areas of the cortex – including the motor areas – are faintly active or slightly inhibited. The athlete, concentrating all his attention on waiting for the signal, is not well prepared for a speedy, energetic and well-co-ordinated execution of a given action since, as stated above, the motor areas of his brain cortex are slightly inhibited.

2. Motor type of motor response

In the motor type of sensory-motor response, the athlete's (fencer's, boxer's, etc.) total attention during the preparatory period, is concentrated on preparing the execution of the foreseen action. The excitation which occurs in the auditory or visual receptors is very quickly transmitted to the part of the brain where analysis is made, and from there it proceeds to the association centres. When it comes to the motor area of the brain cortex (the motor programme already well-prepared), the impulses are sent very quickly through to the effector organs, i.e. muscles. These types of sensory-motor response, however, have a certain drawback as they, not infrequently, may involve errors. The athlete, by mistake, may take another stimulus for the one he is awaiting. That is why a premature start, or premature actions of the blade, may occur. For example: a fencer who is waiting for his opponent's attack and has prepared a parry-riposte (anticipated defensive action), mistakes a slight movement of his opponent's blade for the commencement of the attack and prematurely reacts with a parry.

3. Intermediate types of SMR

The intermediate type of SMR occurs, when there is a certain equilibrium of excitatory and inhibitory processes in the sensory and motor parts of the cortex. The fencer divides his attention between carefully watching for the appearance of the stimulus and preparing the motor programme of the expected action. The latent period of such types of sensory-motor response takes from 140 to 150 milliseconds. This is the best variety of simple sensory-motor response.

Examples of simple sensory-motor responses:

- During practice: a) the coach says: on my step forwards, execute direct attack with lunge; b) on my attempt to take your blade, derobe; c) on my direct attack, parry and riposte (coach tells what kind of attack will perform and what parry defensor should apply).
- During a bout: a) a fencer notices and expects certain movements of his opponent and reacts accordingly, e.g. on the opponent's expected step forwards he executes direct attack; b) when the opponent extends his arm (weapon in line), the

fencer executes a beat and direct thrust; c) on opponent's attempt to bind his blade the fencer derobes (attack by disengagement).

Choice Sensory-Motor Response

Choice sensory-motor responses are those which involve the possibility of multiple varied stimuli and many, or at least several, varied replies, i.e. we don't yet know which of the stimuli will appear nor with which reply (which action) we should react to a given stimulus, because to each stimulus there may be a varied number of sensory-motor responses. As I explain to my students: "We know all the answers – we just don't know which question will be asked."

Choice sensory-motor responses are very important and they occur in all combat sports (e.g. fencing, boxing, judo, wrestling) and in sport games (e.g. tennis, badminton, basketball, soccer, volleyball).

A fencer acquires a vast repertoire of various sensory-motor skills (motor habit patterns) of different fencing actions – offensive, defensive, counter-offensive – and, meeting his opponent on the piste, he usually knows what he should use, what style of fighting he should prepare against his opponent. A fencer will base his general plan of action on his experience of previous fights against his opponent, or by observing his style of fencing. But what he does not know, and cannot know, is which action at a given moment his opponent will apply. He, therefore, must observe his opponent's movements, maintaining his general preparedness (very important!) for action and must be ready for an opponent's movements. This is why choice sensory-motor responses should not resemble a motor type of simple sensory-motor responses. One should not concentrate on preparing a motor programme of a given action because one does not know what the opponent will do – to every movement of the opponent, one must respond with a different counter-action.

The difference between the two types of SMR (between simple and choice SMR) can be illustrated by the following example. A fencer notices that his opponent, as a preparatory movement, frequently uses a reverse (circular) beat. He resolves to derobe by counter-disengagement on the next beat (simple sensory-motor response used in a bout – a known stimulus with one foreseen reply).

While preparing a defensive action, a fencer resolves: "If my opponent attacks by a simple movement, I will parry. If he attacks using a compound attack, I will stop-hit," (choice sensory-

motor response). If the fencer has no idea what his opponent will do and, on the opponent's action, he chooses the appropriate counter-action. It is a choice sensory-motor response. A great amount of unpremeditated and unforeseen movements in a bout, and multiple training exercises, requiring the selection of a stroke by the pupil, are examples of choice sensory-motor responses.

The structure of a choice sensory-motor response is more complicated as it differs considerably from a simple sensory-motor response, in both the preparatory and latent periods. In simple sensory-motor response, a fencer already knows in the preparatory period what action he will execute in the executory period; in choice sensory-motor response, the fencer chooses his reply, only after the appearance of the signal (stimulus) and only then, in the latent period, does he choose the appropriate motor programme.

In the preparatory period of choice sensory-motor response, there are two important processes: a) a high level of attention and perception, trying to assess the development of the tactical situation and, above all, the opponent's movements, and b) a general readiness for action (not just waiting for the foreseen signal, like in a simple motor response, but trying to be prepared for any situation).

In the latent period of choice sensory-motor response, the following parts can be distinguished:

- **Sensory part:** noticing the (unforeseen) stimulus.
- **Selecting the stimulus** from others, while acting at the same time: i.e., a fencer receives a constant stream of stimuli – watching his opponent's legs, weapon action, movement and general behaviour and, to some degree, various external factors in his environment – and yet selects one particular movement which will be important to him as a signal for sensory-motor response.
- **Recognising the selected signal** (closely connected with the previous part): the fencer classifies the selected signal as belonging to a certain group of actions, which is usually connected with the secondary signalling system and formulates it in internal speech. This, of course, is not expressed in words but it is rather a split-second realisation of his opponent's intention (perception on a higher – conceptual-functional – level; not only seeing, feeling, etc., but understanding what is going on¹).

¹ Perceiving on a lower – sensory-motor – level means that we see (for example, a line of Hebraic script) or hear (for example, a foreign language) but do not understand. A higher – conceptual-functional – level of perception means that we do not only see, hear, and feel something, but that we understand it, can explain it, and give a name to it.

- **Differentiating stimuli and selecting the motor programme of a chosen action:** the fencer has to distinguish one given signal from among others, sometimes similar, while acting at the same time. This is very important for understanding a tactical situation and the opponent's intention, his plans and, above all, for **choosing an adequate stroke.** After recognising the opponent's movement, the fencer chooses the appropriate counter-action and selects, from a long-time memory store, the appropriate motor programme.
- **Motor part of the latent period of choice sensory-motor response:** mobilisation and activation of the motor area of the brain cortex and sending of appropriate motor impulses to the effector organs, i.e. muscles.

Figure 3 presents a model of choice sensory-motor response.

	1 ↓	2 ↓
Watching the opponent; a high level of attention and perception; watching for stimuli.	a b c d e	Performing a chosen stroke.
General readiness for action.		

1 – The appearance of an important stimulus (signal).

2 – The beginning of the execution of a chosen stroke.

a – Sensory part of choice sensory-motor response – reception of the stimulus.

b – Isolating the stimulus from among others acting at the same time.

c – Identification of the stimulus – qualifying it to a given group of actions.

d – Perception of a given stimulus, in connection with other stimuli, acting at the same time; assessment of the situation and understanding the opponent's intentions; choice of appropriate action; programming execution of the action.

e – Motor part of choice sensory-motor response – sending motor impulses from brain to muscles.

Fig. 3. A Model of Choice Sensory-Motor Response

In short, the latent period of choice sensory-motor response features the following parts:

- a. Sensory part.
- b. Selection of stimulus.
- c. Recognition of stimulus.
- d. Choice of stroke.
- e. Motor part of latent period of sensory-motor response.

Due to the more complicated structure of the latent period of choice sensory-motor response,

its time increases and is usually slightly more than 300 ms. In a well-known activity, a choice sensory-motor response lasts a comparatively short time and, in elite fencers the latent period of the choice sensory-motor response is very short, and often it is nearly as short as a sensory type of simple sensory-motor response.

It is worth remembering that simple sensory-motor responses and choice sensory-motor responses vary in different individuals. There are fencers with very fast simple sensory-motor responses and slow compound sensory-motor choice responses, and vice versa. There are also fencers with both slow simple and slow choice sensory-motor responses, as well as fast simple and fast choice reaction (e.g. Jerzy Pawłowski).

Of course, an ideal fencer should possess fast simple and fast choice sensory-motor responses as, for instance, Jerzy Pawłowski of Poland, Olympic sabre champion and winner of many medals in Olympic Games and World Champions. In his brilliant bouts, he took advantage of simple, choice, and other varieties of motor responses. However, one can achieve very high results, indeed, with average simple and high choice sensory-motor responses – provided one can adapt one's fencing style and tactics as the occasion requires. A very good example of a fencer whose great assets in fencing were very highly developed choice sensory-motor responses was Jacob Rilsky of the USSR, who was three-time world sabre champion. Also, one may be very successful with fast simple sensory-motor responses and average choice sensory-motor responses: Polish foilist Witold Woyda, who won two gold medals at the Olympic Games in Munich and won many medals at World Championships and Olympic Games, based his tactics, to a large extent, on extreme speed of simple sensory-motor response and great speed of movement (in other words, very short time of simple motor response).

Simple and choice responses must be carefully distinguished from simple and compound actions. A compound action may be a simple sensory-motor response – for example, when a fencer executes a compound attack on a signal which he was expecting, such as a "one-two" (attack by feint of disengagement-disengagement) executed on his opponent's expected pressure on the blade. Choice sensory-motor response may result in a simple action selected from several possible movements in answer to unforeseen stimulus. For example: stop-hit against opponent's compound attack.

Fencing masters, stressing the importance of speed in fencing often use the expression "speed of reaction" and "speed of execution" or "speed of

movement”. It is obvious that, by “speed of reaction”, they really mean the latent period of sensory-motor response, and by “speed of execution” they mean time of executory period of sensory-motor response.

Differential sensory-motor response

In this kind of response one has to differentiate – and act accordingly – between stimuli which are very similar to each other. For example, when a sabreur executes correctly cut to head, one has to parry. If he executes attack incorrectly, by exposing his forearm, one has to execute stop-hit to arm. A false attack (preparatory action) we ignore, the real attack we parry.

Sensory-motor response to a moving object

Surprisingly enough, it is not only important in tennis, soccer, volleyball, etc., but also in fencing. One has to assess the trajectory and speed of a given object – soccer ball, tennis ball, epee, etc. – and reacts at the right appropriate moment – not too early, not too late. This is why, in fencing, change of rhythm and, especially, acceleration of the final part of an attack is so important and constitutes a very important factor of taking the opponent by surprise (timing, à propos).

Switch-over sensory-motor response

Change of a preconceived action, during its execution, as a reaction to the opponent’s unexpected movement. For example, an epee fencer begins his attack trying to hit opponent’s leg and suddenly he notices his opponent’s stop-hit. He changes his action and executes counter-time (parrying stop-hit and riposting).

Sensory-motor response to a pre-signal

It is reacting not to the opponent’s movement, but to a “pre-signal” – a certain gesture or change of position made by the opponent, betrays his intention. A known Soviet scientist Salchenko², by very cleverly chosen tests, showed that experienced fencers very often react not to a real movement but to a pre-signal.

Intuitive sensory-motor response

A sensory-motor response based on “statistical intuition”. It is very strange but most experienced fencers choose the actions intuitively (without analysis) and the choice is based on hundreds of similar situations in training and competitions.

I have learned about this kind of response some years ago in Budapest from eminent Hungarian fencing master Laszlo Borsodyi. Exercises for intuitive reaction he called “lottery”. To honour him, I called it “lottery à la Borsodyi”. Some years ago in Olympic Center in Warsaw I conducted many tests of intuitive reaction with our eminent foilists, medallists of Olympic Games and World Championships Witold Woyda, Egon Franke, Ryszard Parulski, Zbigniew Skrudlik and others. To my great surprise, majority of tests showed hundred per cent correct intuition. The lowest result was still very high: 80% of right choice of action.

Figure 4 presents the essence of sensory-motor response to a pre-signal. All varieties of sensory-motor responses are concisely presented in **Table 1**.

1 ↓	2 3 ↓ ↓	4 ↓
Waiting for the movement of the attack. Preparing the parry.		Executing the movement (parry).
Preparatory period	Latent Period	Executory period

1. Signal, “attention”, or change of situation which stimulates the fencer’s attention and vigilance.
2. Appearance of pre-signal (change of position, unwitting betrayal of opponent’s own intention).
3. Appearance of “proper” stimulus (in this case, the opponent’s attack).
4. Beginning of movement; the fencer – sometimes not fully consciously – begins to parry, as a sensory-motor response to the pre-signal, before his opponent really starts the attacking movement.

It is obvious that when a fencer reacts to a pre-signal, he starts his movement earlier than it would have been, had he reacted to the “real” stimulus. It should be noted that the beginning of the movement is earlier, though the latent period takes the same time, because the latent period starts sooner – before the “real” signal.

Fig. 4. A Model of Sensory-Motor Response to a Pre-signal

Being surprised is a privilege of children. Yet – in spite of my “advanced” age (born 5th February 1921) – it never ceases to astonish me that many coaches, in individual lessons and other exercises, pay attention to, and teach, only how to quickly

² Salchenko I.N., *Dvigatielnyje vzaimnodiejstvija sportsmienov*, Kijew 1980, Zdorovja

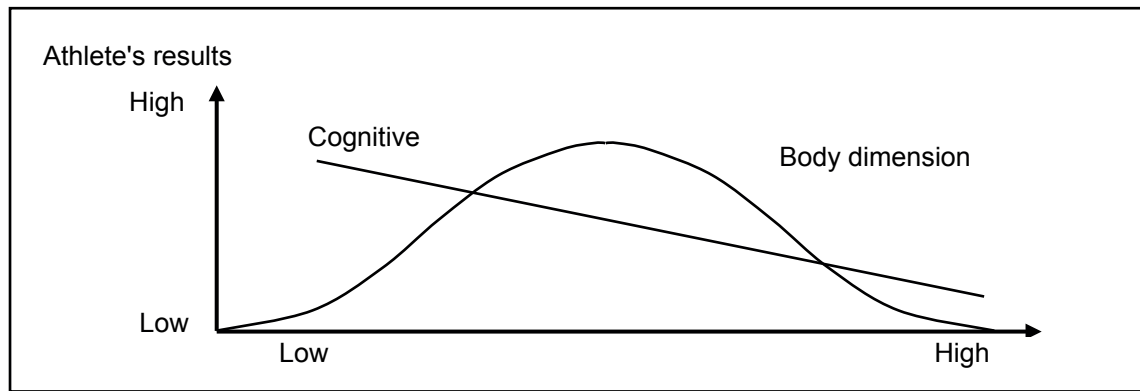


Fig. 5. Influence of cognitive aspect of fear and arousal on athlete's results (according to A.V. Cox, *Sport Psychology – Concepts and Applications*, 1980).

and correctly execute a given fencing stroke. They are completely oblivious to the fact that the speed, accuracy, and success of a fencing action depends not only on the executory period, but also – and to large extent – on the preparatory and latent periods of sensory-motor response. A very accurate, fast, and well-chosen fencing action is not good and not effective if it is started too late (bad perception, long latent period of sensory-motor response). A fast and accurate movement, started early, but inappropriately chosen, is also to no avail. If, for example, my opponent executes an attack – cut to head with a lunge – and I take, very early, quickly, and beautifully, parry two (wrong choice of action), I will, of course, be hit. A well-chosen and early-started action – even if it is slightly slow – may be successful (fast reaction – short latent period).

So, it is obvious (and obvious things – as I use to say – often are the most difficult to be noticed) that the fencing master and the pupil should pay attention to all three periods of sensory-motor response, i.e., early and correct perception of stimulus, fast choice of the appropriate action, and early, fast and correct execution of the action and also very important is the level of arousal (according to the first Yerkes-Dodson Law)

Final conclusions

To look is not the same as to see, to see is not the same as to perceive. We perceive, really – on a higher, conceptual-functional level – only what we know, understand well and can give name to.

Zbigniew Czajkowskii

Various branches of sport have many similar aspects, and many branches of sport show big differences. There are branches of sport with one sensory-motor skill with the aim to achieve best possible results: faster, higher, longer, without

direct opponent and tactics (field-and-track events, swimming, etc.).

There are branches of sport with many sensory-motor skills (figure skating, artistic gymnastics) and no direct opponent, in which athletes perform many actions (many closed sensory-motor skills). The judges watch the performance and assess beauty, accuracy of way of executing of various movements. There is no reaction here.

In fencing and other combat sports, games and team games there are many sensory-motor skills applied in competitions as sensory-motor responses. Athlete faces an opponent and there is a great influence of tactics and sensory-motor responses. In these sports is not enough to execute fast movement. It has to be chosen taking into account of tactical situation and opponent's actions. In these branches of sport sensory-motor skills (sensory-motor habit patterns) are often applied as sensory-motor responses. The importance of sensory-motor responses is obvious. In these sports is very important the optimal level of arousal and high level of perception and various aspects of attention (level of attention, the range of attention, divisibility of attention, constant changes of attention from internal to external and from inside to outside).

Very important factor in fencing and other combat sports may be state anxiety and fear (being afraid to loose and coach's disapproval, loosing the grant, not being chosen for team etc.).

Now we come across very important question: how anxiety and fear influence efficacy of action. In case of fear the arousal acts according to the first Yerkes-Dodson Law: too low arousal and too high arousal have bad influence; optimum arousal helps to achieve good results. And this is a body aspect of fear. There is also cognitive aspect of fear, which has very bad influence. The more fear, the worst results. This is shown in Fig. 5.

Table 1. Main Varieties of Sensory-Motor Responses

Variety of sensory-motor response	Essence of a given variety of sensory-motor response	Situation in a lesson	Situation in a bout
Simple sensory-motor response	Known signal (stimulus) – known response: known and foreseen action as a reply to the opponent's expected movement.	Execution of a given stroke, as a response to the coach's previously announced movement.	The fencer expects certain movements from the opponent, and waits for it, having a prepared motor programme of the response; it is preparatory period of SMR.
Choice sensory-motor response	Unknown signal – response in accordance with meaning of signal: the pupil does not know what signal/stimulus will appear and, to each one, he replies appropriately ("We know all the answers, but we don't know which question will be asked.").	Choosing from previously announced and previously unannounced actions.	The fencer responds with different actions, in reply to the opponent's unexpected offensive movements. He adapts the movement of his offensive actions to the opponent's defensive actions; foreseen and partly foreseen actions.
Differential sensory-motor response	Differentiating very similar stimuli.	For example: false preparatory attack, the pupil disregards – real attack, he parries; correctly executed cut to head, he parries – to cut to head with elevated hand, he replies with stop-cut.	The fencer assesses whether an attack is real or false, simple or compound, whether the cut is executed correctly or with exposed arm.
Sensory-motor response to a moving object	Perceiving and anticipating the trajectory and speed of a moving object (in fencing, the opponent's moving weapon).	Learning and perfecting orientation in space and time.	The fencer foresees the path of the opponent's weapon and reacts in the appropriate time; for example, parry or beat – not too early and not too late.
Switch-over sensory-motor response	Change of original intention while executing a foreseen – first or second intention – action, in reply to the opponent's unexpected movement.	The pupil practises foreseen attacks (or other actions) and the coach, from time to time, changes his predicted movement; the pupil must then change his action in response to the unexpected movement.	For example: the fencer wants to hit the opponent with feint attack, but the opponent – contrary to expectations – instead of parry, executes a stop-hit; the fencer then changes his original intention and applies counter-time.
Sensory-motor response to a pre-signal	The pupil does not react to a "real" signal/stimulus, but to a pre-signal (e.g., preliminary movement, change of position, unwilling betrayal of the opponent's own intention).	For example: attack on the coach's "careless" movement, betraying the desire to start an attack.	For example: the fencer executes a fast attack at the moment when his opponent by an unnecessary movement, betray his own intention of launching an attack.
Intuitive sensory-motor response	A response based on "statistical intuition".	Exercises "lottery à la Borsodyi".	The fencer takes decisions, not so much based on observation or very penetrative perception of the opponent's movement, but based on not-fully conscious intuitive mental-emotional processes, shaped by hundreds of similar situations in practice and competition.

I am finishing my article stating that in teaching, learning, improving, applying sensory-motor responses one must pay attention (the coach and the athlete) to all their aspects. Efficacy of fencing actions used applied in training and competition bouts depends not only on the executory period, but also to a large extent on preparatory and latent periods.

Quod erat demonstrandum.

Odmiany reakcji czuciowo-ruchowych w szermierce

Streszczenie

Różne dziedziny sportu mają wiele cech wspólnych, ale też występują między nimi znaczne różnice. I tak w niektórych gałęziach sportu występuje jeden nawyk czuciowo-ruchowy zamknięty (wewnętrzny) i nie ma bezpośredniego przeciwnika (konkurencje lekkoatletyczne, pływanie). Są też dziedziny sportu, w których występuje wiele różnych nawyków czuciowo-ruchowych zamkniętych i też nie ma bezpośredniego przeciwnika (gimnastyka artystyczna, jazda figurowa na lodzie). W tych sportach zawodnicy wykonują przewidziany, zaplanowany ciąg ruchów, starając się o jak najlepsze ich wykonanie, a sędziowie oceniają jakość wykonania, dokładność, stopień trudności i piękno ruchów. W strzelectwie znaczenie zdolności wysiłkowych (fizycznych) jest minimalne, a ważnym czynnikiem jest skupienie uwagi i zborność ruchowa. W szermierce i innych sportach walki sytuacja jest bardziej złożona i trzeba dostrzegać w ułamku sekundy kiedy, które i jak wykonać wybrane działanie, a dokonuje się to walcząc bezpośrednio z przeciwnikiem. W tych dziedzinach sportu – w przeciwieństwie do wielu innych dziedzin – stosuje się nawyki czuciowo-ruchowe otwarte (zamknięte) walcząc bezpośrednio z przeciwnikiem, który ukrywa swoje zamiary i stara się zaskoczyć nieoczekiwanym działaniem. Dlatego działania szermierza, nawyki czuciowo-ruchowe otwarte (zewewnętrzne) w walce często są stosowane jako odpowiedzi czuciowo-ruchowe. Wielu trenerów i autorów wyróżnia tylko trzy czy cztery odmiany odpowiedzi czuciowo-ruchowych. Ja dostrzegam i wyróżniam oraz opisuję siedem odmian odpowiedzi czuciowo-ruchowych.

Obserwując walki szermierzy (zapaśników, pięściarzy czy gry sportowe) my widzimy tylko ich działania, ale nie dostrzegamy, że działania te związane są z postrzeganiem, różnymi właściwościami uwagi i wyborem różnych działań dostosowanych do sytuacji i zachowania przeciwnika. Jak już zaznaczyłem, działania szermierzy często są stosowane jako odpowiedzi czuciowo-ruchowe. W odpowiedziach czuciowo-ruchowych można wyróżnić trzy okresy: 1 – okres przygotowawczy (obserwacja przeciwnika, ocena sytuacji, gotowość do działania, wypatrywanie istotnych bodźców, gotowość do działania); 2 – okres utajony – dostrzeżenie istotnego bodźca (ruchu, zachowania przeciwnika), rozpoznanie go, wybranie odpowiedniego przeciwdziałania i podniety wykonawcze do mięśni; 3 – wykonanie wybranego działania. Osobiście wyróżniam siedem odmian odpowiedzi czuciowo-

ruchowych, których zastosowanie w walce wymaga skupienia, podzielności, wybiórczości i przeczutności uwagi i szybkiego, trafnego doboru własnego działania.

Można wyróżnić następujące odmiany odpowiedzi czuciowo-ruchowych:

Odpowiedź czuciowo-ruchowa prosta. Na znany, przewidziany ruch odpowiadamy odpowiednio dobranym, przewidzianym działaniem. W pierwszym okresie wyczekujemy spodziewanego bodźca; w drugim okresie występuje dostrzeżenie spodziewanego bodźca, podjęcie decyzji wybranego działania i wysłanie podniety wykonawczych do mięśni; w trzecim okresie następuje wykonanie spodziewanego działania.

Odpowiedź z wyborem. Nie wiemy, co wykonamy, jakie działanie wykona przeciwnik. W drugim okresie (utajonym) rozpoznajemy działanie i zamiar przeciwnika, wybieramy odpowiednie przeciwdziałanie, wysyłamy podniety wykonawcze do mięśni. W trzecim okresie wykonujemy wybrane działanie. Odpowiedź różnicowa. Odpowiedź różnicowa polega na odróżnieniu działań bardzo do siebie podobnych i o wybraniu odpowiedniego przeciwdziałania. Na przykład przeciwnik-szablista wykonuje poprawne natarcie cięciem na głowę, bronimy się zasłoną piątą i dajemy odpowiedź. Jeżeli jednak przeciwnik w natarciu zgina ramię i wynosi szablę wysoko do góry, stosujemy przeciwnatarcie (cięcie wyprzedzające na jego przedramię).

Odpowiedź na poruszający się przedmiot (ruch broni, lot piłki itp.). Musimy ocenić ruch, drogę oraz szybkość działania przeciwnika i wykonać odpowiednie przeciwdziałanie (np. zasłona) nie za wcześnie (bo przeciwnik może ją zauważyć i przeciwdziałać) i nie za późno (bo przeciwnik zada nam trafienie).

Odpowiedź ze zmianą zamiaru w toku działania. Zawodnik wykonuje przewidziane działanie (liczy na odpowiednie zachowanie przeciwnika) i nagle dostrzega, że przeciwnik reaguje nie tak, jak on przewidział. Zmienia wówczas swój zamiar, np. szpadzista wykonuje zaplanowane natarcie na udo. Nagle spostrzega, że przeciwnik chce go trafić pchnięciem wyprzedzającym na rękę. Nacierający zmienia swój pierwotny zamiar i paruje przeciwnatarcie przeciwnika, czyli stosuje nieprzewidziane przeciwtempo.

Odpowiedź na sygnał wstępny mającego nastąpić działania. Szermierz reaguje nie na ruch właściwy, na przykład początek natarcia przeciwnika, ale na sygnał wstępny, kiedy przeciwnik jakimś ruchem (zmiana postawy, ugięcie ramienia, jakiś przyruch) zdradza swój zamiar. Wybitni szermierze często stosują tego rodzaju odpowiedzi czuciowo-ruchowe, nie zdając sobie z tego sprawy.

Odpowiedź intuicyjna. Szermierz wybiera działanie na podstawie „intuicji statystycznej” opartej na setkach podobnych sytuacji występujących w walkach ćwiczebnych i w zawodach. W zakończeniu autor opisuje bardzo ważne zagadnienia, tj. wpływ przy wysokiej motywacji osiągnięć nadmiaru pobudzenia, niepokoju, lęku i strachu na jakość i skuteczność działania. Podkreśla przy tym, że w sytuacjach strachu jakość i skuteczność działania zawodnika jeśli chodzi o pobudzenie i motywację działa zgodnie z prawem Yerkesa-Dodsona, natomiast poznawczy czynnik strachu działa zawsze ujemnie – im większy strach, tym gorsze działanie.