

L'attentività nel processo di presa di decisione
particolarmente negli sport di squadra,
per evitare problematiche
funzionali e biomeccaniche per una prestazione di qualità

The Decision Making Process based on the Attention,
particularly on Team Sports to Avoid Perceptual Functional
and Biomechanical Deficits for a Quality Sport Performance

Riccardo Izzo

Corresponding Author - riccardo.izzo@uniurb.it

Vincenzo Biancalana

Ciro Hosseini Varde'i

Claudia Palpacelli

School of Health and Sport Science, DISB, University of Urbino Carlo Bo, Urbino (Pu)

ABSTRACT

The fundamental mistake in the normal evolution of the motor learning process and sports' movements and consequently on its related performance is mainly physiological. In the normal dynamic of learning, and even more in biomechanically complex gestures learning, such as many specific technical-sports gestures, error or better errors are without any doubt an integral part of said acquisition process. Often, in these cases, we use to focus only on the purely mechanical elements of the gesture itself and rarely, simultaneously, giving weight, as we have been advocating for a long time, to the element that then becomes decisive in terms of success or failure of the gesture chosen in a performative sense, which is the decision-making, in its complexity. What operators sometimes, however, do is to omit or neglect the cognitive aspects related to the attention process, which therefore produce most of the students' errors. That error, even if it is usually detected and modified by technicians during the normal didactic method, on the basis of mechanical or physical-athletic, results to be often superficially addressed in psycho-pedagogical terms. The aim of this paper, therefore, is to focus our attention on those elements which we believe may determine significant learning ability and the resulting very significant high percentage of athletes performance, namely those related to attentional capacity and quality.

L'errore fondamentale nella normale evoluzione del processo di apprendimento motorio e degli sport gestuali e di conseguenza nelle sue prestazioni correlate è principalmente fisiologico. Nella normale dinamica dell'apprendimento, e ancora di più nell'apprendimento gestuale biomeccanicamente complesso, l'acquisizione di specifici gesti tecnico-sportivi passa dall'errore

o meglio dagli errori, che sono senza dubbio parte integrante di detto processo di acquisizione. Spesso, in questi casi, ci concentriamo solo sugli elementi puramente meccanici del gesto stesso e raramente, dando peso a diversi fattori e meno a quello che maggiormente si rende decisivo ovvero il decision-making nella sua complessità. Ciò che gli operatori del settore fanno è omettere o trascurare gli aspetti cognitivi legati al processo di attenzione, che quindi producono la maggior parte degli errori degli studenti. Tale errore, anche se di solito viene rilevato e modificato dai tecnici durante il normale metodo didattico, sulla base di un approccio meccanico o fisico-atletico, risulta spesso affrontato superficialmente in termini psicopedagogici. Lo scopo di questo elaborato, è quindi quello di focalizzare la nostra attenzione su quegli elementi che riteniamo possano determinare un significativo incremento della capacità di apprendimento e di conseguenza di migliorare la prestazione degli atleti, in particolare quella relativa alla capacità e alla qualità dell'attenzione.

KEYWORDS

Decision-Making, Sport Performance, Attention Level, Inattentive Blindness.

Decision-Making, Performance Sportiva, Livello Attentivo, Cecità Attentiva.

1. Introduction

William James¹, one of the founding fathers of psychology, in a definition of the attention concept which dates back to more than a century ago (1890), but which is still very significant said: "Everyone knows what attention is. It is the intense and clear mind awareness of a thought, or a flow of thoughts among those apparently possible". Attention is concentration and consciousness based. It implies ignoring some facts in order to effectively interact with others ... ". "When the outer worlds strikes our senses, the number of objects or events whom we can pay attention to at once it is very little" (Williams, 1890). Why our cognitive system, that is the set of mental processes that take place in our brain, should need to make a selection on the input information? The need of attention stems from the fact that the human being, which has a limited capacity for information processing, has to manage a too high amount of sensory information to be able of being aware of it all. But how do we learn to discern which is the important information at a given time? A key aim of the research on attention is indeed to try to answer to this question. Attention can be considered as a multidimensional cognitive ability, composed of several components, hierarchically organised. In the work that follows we will focus specifically on the aspects that characterize selective attention and the complementary phenomenon of focalization. The various theories that will be exposed on the functioning of the attentional processes attempt to provide explanatory hypotheses about the existence, functioning and collocation of a filter mechanism of "filter" (a kind of funnel or "bottleneck"), which selects the relevant

1 Professor of philosophy and psychology at the American University of Harvard, was president of the "Society for Psychic Research" from 1894 to 1895.

information to us within the flow of perception, in order to make them available at the most sophisticated levels of processing. As to the process of stimuli selection, different theories have been developed about the location and the permeability of the “sensory filter”. Explore and address these issues allows us to give them critical applicability within an infinite number of situations and, in particular, to explain and understand the dynamics of the game and the tactics that are implemented by the players in team sports. Every action, every decision afterwards physically implemented is the result of a series of processes undertaken by the player and of countless variables which interact with each other and influence his choice. It is therefore essential to be at first aware of the existence of these trends, to understand the various interactions and to comprehend how these could act on the cognitive processes of the subject. The education of an elite player, in order to be considered complete and therefore in order to arise to a beneficial sport performance, not only must pursue a great physical and technical training, but also a conscious tactical ability and effective mental skillfulness, in order to allow a better adaptation to changing game situations. Every sport requires specific physical and mental abilities and among these, the ability to focus and to concentrate at key moments of a competition may prove crucial to achieve a good result (Bagnara, 1993). It’s clear therefore, how in sports attention is generally considered an important mental prerequisite of the performance. The purpose of this paper is precisely to study and investigate what are the mental processes that underlie attention, and how they operate in different situations.

2. Different Types of Attention and Related Specific Functions

The concept of attention appears to be a multidimensional construct due to its peculiarity of enabling the most diverse phenomena explanations and thanks to its high applicability to various situations, it allows us to investigate and explore the wide range of sport dynamics (fig. 1).

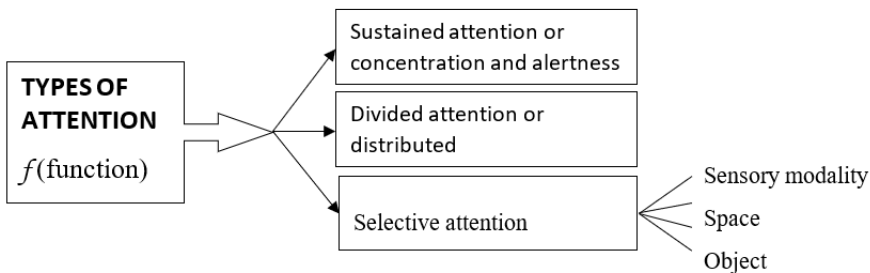


Fig. 1 – Classification of the different types of attention on the basis of the function (Izzo, Palpacelli, 2013)

2.1. Sustained attention or concentration

We speak of sustained attention (or vigilance) referring to the ability to maintain over time a sufficient level of attentional detention of a stimulus or an infrequent critical event, aperiodic, which occurs without notice. In general there is a positive correlation between the duration of the task and the decline of performance in terms of increased reaction time, false alarms and omissions. The first systematic

studies on supervision were led by Mackworth, at the request of the Royal Air Force (RAF), who devised the clock test (1976), a circular video where you could see a black clock alike hand turning. The tested subject had to press a button whenever he recognized the critical signal, that was the hand that made two shots in a second rather than one, which signified changes in the flow of repetitive information. There are several factors that can adversely affect performances on supervision tasks: for example, the use of degraded signals whose amplitude and duration are just above the threshold of perception; an high rate of stimuli presentation (greater than 24 events per minute) or, on the other hand, a low one (with very rare target stimuli); an increased time and space uncertainty. We can witness, instead, an improvement in performance if the signals are presented in the quadrant of the high probability display, compared to those presented in the other three low probability quadrants; furthermore, while the performance in the low-probability quadrants worsen over time, in the high probability one remains steady. It has, moreover, a greater speed and accuracy of responses when stimuli are presented on a regular basis and a performance improvement due to the increased intensity and duration of the signal. To explain the observed phenomena during surveillance tasks different theoretical approaches have been proposed. According to the "Theory of activation", an optimal level of performance requires an optimal level of "arousal", mediated by the reticular formation and by the non-specific thalamo-cortical system: an increase or decrease of this optimal level causes a deterioration in the performance. This arousal level can be lowered, for example, by the constant repetition of the same stimulus or of similar stimuli due to the accommodation phenomenon. Motivation plays a decisive role on the level of supervision too. The relationship between the level of activation or "arousal" (expressed in the x-axis) and the efficiency of the subject (expressed in the y-axis under the form of performance quality) was represented by Yerkes and Dodson with an inverted U-bend (fig. 2).

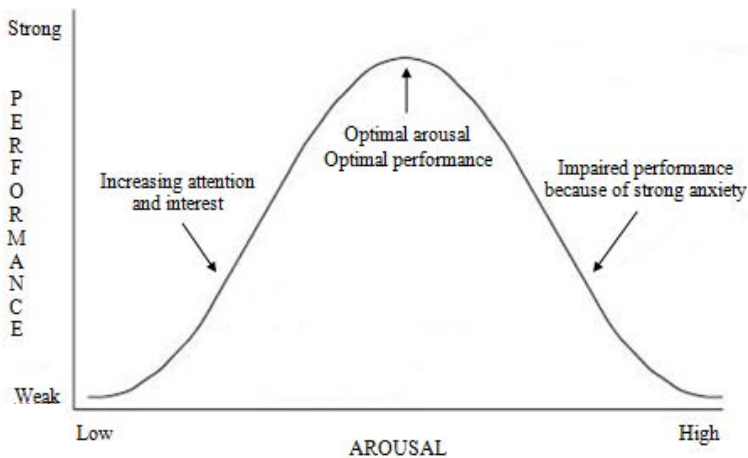


Fig. 2 – Law of Yerkes and Dodson, or law “of the inverted U”. Modified Izzo, Palpacelli 2013

According to the “Expectation Theory” high-probability events are processed faster than low-probability ones. This assertion is evidently reflected in tactic actions carried out during team sports. The more experienced players, indeed, demonstrate a greater ability to read a situation and a higher percentage of effi-

cient and effective tactic choices with a lower reaction time (TR). This is also crucial in the ability to reduce errors arising from pretended acts which may be carried out by opposing players, to whom the more experienced players can better respond thanks to a ready and correct understanding of the game. A direct consequence of it is a greater or lower probability in the action outcome in one way rather than another. In addition to that, along with the intensity and the biological importance, are the three necessary stimulus characteristics in order for it to be selected with an higher probability. Finally, according to the “Detention of the Signal Theory”², the critical stimuli are detected by the observer as emerging from the background noise, which varies randomly. It is important to note that there is a bi-directional influence between attention and sport.

2.2. Divided Attention

Divided attention (or distributed or multi-channeled) is the ability to maintain simultaneously two or more attentional focuses, so that the subject is asked to control two or more sources of information at the same time (Kahneman, 1973), distributing on several tasks his attentive resources (Coull, 1998) in a complex environment and considering attention as a resource and as a resources dislocation capability. The typical experimental situation in the study of divided attention is that related of the dual task; the result of which is usually observed in this situation is that the performance of the two tasks is worse than the one obtained by the same person when engaged in two tasks separately. But the interference between the two tasks varies depending on the difficulty of the tasks, of their similarity (pacing mode, mental operations, answer mode), and from practice with the two tasks (the interference is reduced with the practice in one of the two tasks as a result of automation of its). The different theories that can be defined “structural,” explain the performance in multiple tasks, referring to a rapid shift of attention between different tasks. The theorists of “ability”, however, emphasize the divisibility of cognitive resources between different tasks contemporaries and the ability to assign in a graduated manner part of the resources to each task, with different approaches. The Kahneman’s model³ is particularly important because it represents an attempt to unify the two theories. He says that the human operator has a limited capacity for performing mental activities, so that, with increasing demands, there is a corresponding increase in the amount of resources mobilized; when the first exceeds the second performance of the subject is no longer appropriate to the application and we get an interference between the tasks. We can distinguish between interference capability, which is non-specific and depends only on the demands of both tasks, and structural interference, which is specific and depends on the degree to which the tasks incumbent on the same mechanisms. So, in the case of situations that require to perform multiple tasks simulta-

- 2 The theory of the detention of the signal, in English SDT (Signal Detection Theory), is used by psychologists to be measured whenever the mode by which a person makes decisions under conditions of uncertainty. The SDT states that the person who makes the decision does not behave as a passive receiver of information, but as an active “decision-maker” that processes complex judgments under conditions of uncertainty and revises the data sent to it.
- 3 Daniel Kahneman is an Israeli psychologist, he integrated integrates the results of psychological research into economic science.

neously, do not count only the amount of resources allocated to each task, but also the structures or cognitive processes that they involve. The observation of these effects gives reason to exist with the “theory of multiple resources”, whose main exponent is Wickens (1980). These theories do not provide for the existence of a single set of resources allocated to one or more tasks, but of more sets of resources, each with its own characteristics, which can be allocated independently. We find examples of divided attention in many real-life situations: driving a car, walking down the street, cooking and of course sports (athletes must be able to effectively handle the ball and the opponents). Despite the obvious need to distribute the ubiquitous attention on multiple objects in our daily life activities, prior to the study of 2013 (Furley et al.) no one had explored significantly what are the staring strategies that optimize the focus to two objects spatially separated. In situations like these, assuming that the two objects require simultaneously attention, the observer could either stare an object and detect the other in the periphery, or gaze between both stimuli. The above study has implemented an experimental protocol to investigate what is the optimal staring strategy which maximizes attention to two spatially separated objects. The results showed a better performance when subjects stared between the two objectives. In sports, the knowledge that the coaches have about the limited capacity of information processing by the players, and the consequent inability to implement every aspect of what happens during the game, means that their workouts will focus also on continuously provide players with tools to reduce the complexity of the game by studying situations or remedial action, or giving direct instructions to ensure that the attentional focus of the players is directed to certain aspects of the situation (Williams, 1999). These instructions may lead to a so-called “set attentional” (Most et al., 2005), which guides the attentional focus of the players during the game. While this intent training allows you to carry out some actions brilliantly, it often happens that the other players who suddenly are unmarked not being passed the ball because they are not “seen” because not provided the tactical scheme studied previously in the training. This scenario shows how the instruction of the coach, whose purpose would be to help the player by reducing the flexibility of attention, actually, may have a negative impact on decision-making tactics.

2.3. *Selective Attention*

Selective attention is the generic term referring to those mechanisms that allow you to select only some of the many details that come to our senses, and has become a central theme in cognitive psychology and, more recently, also in cognitive neuroscience. The world in which we live is generally rich in stimuli but our processing capacity is limited and we can overstate and elaborate only a small part; so we have a selection system that isolates only some stimuli and clear (ie, reduces the value of perception) all others. In sports games selective attention is a double edged sword. On the one hand defines an asset, as it allows players to eliminate possible distractions and noise, but on the other describes it as a curse for all those situations which require the player to simultaneously distribute his attention. This is one reason why research on attention in sports games should take account of the lights and shadows of attention, that is, both its positives than negatives. But, so far, in the science of sport has paid little attention to the dark side of attention (Abernethy et al., 2007). The study of selective attention was initiated by Cherry (1953) who tried to understand how it is that among the many stimuli from the outside world, the subject will select some (attended messages) leaving

invalidate other (unattended messages). The proof of this is given by a phenomenon known as “Cocktail party” where you can shift the focus to the conversation in which we are interested, although there are several ongoing that could interfere. From the definitions and the analysis outlined here of selective attention, a concept that emerged in the years and through various studies by different authors has evolved and changed, giving rise to different approaches and theories: the “Filter”. If we consider the processing of information as a continuous process that goes from the basic characteristics of the stimulus to its recognition and finally the issue of the response to it, then one of the most important theoretical problems of identifying the point at which is the selection information, then identifiable with the location of the filter. In this respect, the theories on attention are arranged along a continuum ranging from the theories that propose an early selection information (based on sensory input) to those offering instead a late selection (following the completion of preparing the stimuli to which we are exposed).

2.3.1 *The theory of early selection of Broadbent*

An example of a model that proposes an early selection of information to be processed is the “Theory of the filter Broadbent” (1958), one British psychologist who has long studied these phenomena by assuming the presence of a sensory filter that selects the main message and withholds the other to process subsequently. This structural theory, in which it is assumed that the perceptual capacity is limited, derived from data obtained with dichotic listening⁴, first used by Cherry, whose results have suggested an immediate filtering of sensory information after registration and before processing perception. Broadbent says that the stimuli through the sensory channels, arriving at the sensory system (system S), where they are analyzed in parallel on the basis of their physical characteristics elementary; then there is a central mechanism, the selective filter, which selects early stimuli that may have access to the perceptual system (System P) limited capacity where they are analyzed in a serial fashion (processing more advanced and sophisticated). The information that does not pass the system P remains only for a short time in the system S, ie prior to the encoding semantics, in the form of simple physical characteristics, after which the track not coming decade perceptually processed and not moving from short-term memory (MBT) to long-term memory (MLT); (fig. 3). In this perspective, the focus is viewed as an “all-or-nothing phenomenon”. The main information are chosen on the basis of the physical characteristics of the stimulus or according to other criteria such as favoring the message produced by a known voice etc.. Thus, the hypothesized mechanism is a single channel and sequential. However Broadbent has not been able to explain the phenomenon of the “cocktail party”, described above, the peculiarity of which would indicate that there is more of a selection level of the incoming stimuli. Some subsequent studies have shown the limits of the model of Broadbent, demonstrating that there is a processing of significance for the information coming from the “channel not attentional”. Moray (1959) asserted that we can “catch” our name

4 English dichotic listening technique that consists in the simultaneous presentation of the two ears of material auditory, verbal and musical tasks of perception, attention and memory.

spoken in the ear if not careful, discriminating and directing our attention to this information. Mackay (1973) showed how words that do not pay attention, pronounced ear “not careful”, affect the interpretation given to the ambiguous messages received in the other ear (canal attentional).

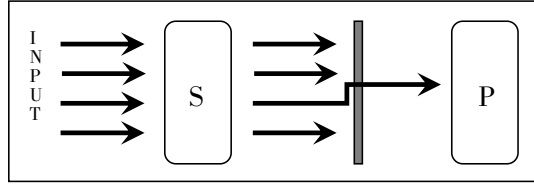


Fig. 3 – Theory of everything or nothing Broadbent. Modified Izzo, Palpacelli 2013

2.3.2. The theory of filter attenuated by Treisman

In agreement with the experimental evidence that showed occasional information processing of stimuli also not expected, Treisman (1960, 1969) proposed the “Theory of the filter attenuated”, a modified version than that of Broadbent, according to which the filter would be limited attentional to reduce and not to delete the information available in the stimulus-channel attentional; In addition, under certain conditions, this information would be mitigated and reduced enough to activate the units in the mental lexicon (a kind of storehouse of known words). Within the mental lexicon exist a state of facilitation of some units that increase the likelihood for certain meanings (such as your name), to be activated and then received (effect “Cocktail Party”). Such a state of facilitation may eventually be modified by instructions received or expectations of the subject, an aspect that is of great importance in the actions of team sports. Before being able to pay attention to objects in the environment it is necessary to extract the characteristics of the constituents (shape, color, depth and motion); this extraction process seems they preattentive, operating outside of awareness. Treisman formulated a theory important in this regard: “Theory of Integration Features”, depending on which they emerge spontaneously (pop-up or emergent effect), and are then combined to form the configuration of objects. The author then shows two different successive stages of perceptual processing: the first in which the physical properties would be extracted of all incoming stimuli, processing these parallel to preattentive level; the second in which the integration occurs the characteristics thanks to a focused analysis of the stimuli, through which the individual identifies objects in a serial manner (Fig. 4).

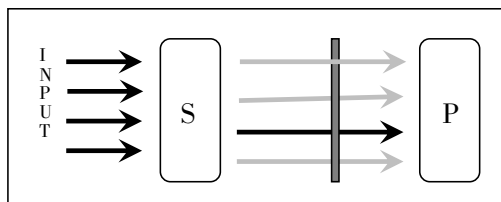


Fig. 4 – The theory of filter attenuated by Treisman. Modificato Izzo, Palpacelli 2013

The selective filter protects this second stage the possible overload, passing to it only those stimuli, including those entering the first phase, which exhibit a particular property. This view is reflected and support in trials visual search, from which emerges as the increase of the number of features necessary to identify an object, among others, also corresponds to an increase of the TR used to properly perform the task (Fig. 5). Unlike the model of the “all or nothing” Broadbent, to Treisman introduces the concept of threshold of consciousness, which is not exceeded by the stimuli attenuated by the filter and therefore do not have access to higher processing levels. However, if the stimulus to be ignored is particularly important or relevant to the subject, even a partial activation may be sufficient to reach the threshold of consciousness. Through his studies, Treisman tried to prove that the meaning is a very important element to be taken into account to understand the mechanisms of attentional process; and has managed to bring out the importance and the different meanings of the concept of “threshold”, which can not be defined in absolute terms. It is clear that the physical threshold, the intensity of the acoustic signal can be measured with a certain objectivity and it is also easy to understand that a stronger signal is more likely to become the main vehicle of the message; is much more difficult to define the concept of a “threshold of meaning”, since the possibility that a word may be recognized and could become a target on which to divert the selection depends on many factors including the expectations of the subject, its confidence with lexical that element, the subjective interest in the subject and so on.

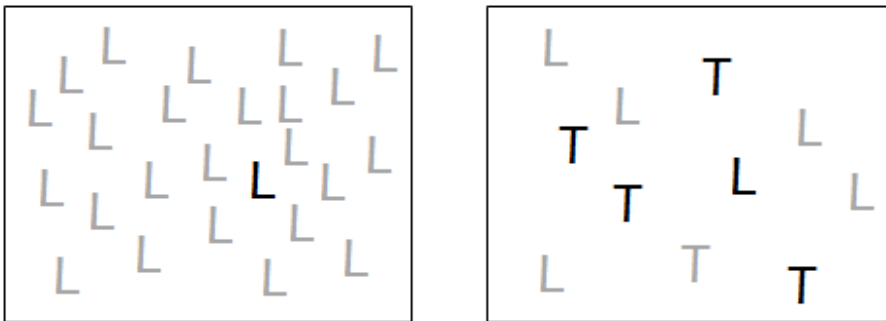


Fig. 5 – Visual search tasks of a target stimulus characterized by a characteristic and by the combination of two features. Modified Izzo, Palpacelli 2013

2.3.3. Theory of late selection of Deutsch and Deutsch

Unlike Treisman, that of Deutsch and Deutsch (1963) is in effect a more radical proposal than the model of Broadbent. They postulated that there is no filter and that the entire processing of the stimulus takes place automatically and independent of the attention selective, which would intervene only to control access of the stimulus to consciousness, to the memory and response systems. The effects of attention would then only the product of the interaction between the coefficients of importance and afferent information. This theory of the late selection thus clear that all the information, it is important that those irrelevant ones, always reach

higher and processing systems are processed up to semantic encoding (fig. 6). Deutsch and Deutsch evidently based their theory on the assumption that the mechanisms of selective attention are based on the processes of response selection, and that the selective filter thus acting only belatedly (selection phase of the response).

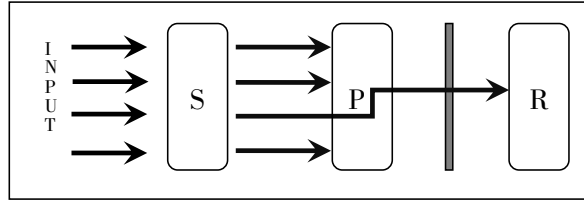


Fig. 6 – Theory of the filter belated Deutsch and Deutsch. Modified Izzo, Palpacelli 2013.

3. Moving and Control of Attention

As part of the experimental study of attention is crucial to ask how it is measured the performance of a person during a test. In addition to the latest and most sophisticated techniques that monitor the brain activity of a person engaged in a given task, to study cognitive processes are still widely used than more traditional techniques that allow us to measure directly the behavior of the subjects, as the measure of reaction time and accuracy of responses.

3.1 Attention as a facilitator in the perception of objects and events

Several authors have developed several experimental paradigms for the study of attention and to demonstrate how this facilitates the perception of objects and events. In addition to the “visual search paradigm” of Treisman (1982), already mentioned above, in the study of spatial attention a fundamental contribution comes from Posner (1980), which was one of the first to use the paradigm the “suggestion” space (spatial cueing, which later became known as the paradigm of Posner) to study the shift of attention. In his experiments on the subject, placed in front of a computer monitor, was invited to maintain steady gaze on the central cross (the fixation point), the sides of which were subsequently submitted two squares. The task consisted in detecting as fast as possible, by pressing a key, the appearance of a stimulus target (the target) within one of the two squares. Before the appearance of the target, however, an arrow appeared above the fixation point, suggesting, with a high percentage of probability (80%), the most likely location where the target would appear. The subject was then asked to shift the focus in the suggested location. Each subject was subjected to a few hundred of experimental tests, in most of which the target appeared in the square indicated by the suggestion (tests ‘valid’), while in the remaining (tests ‘invalid’) the target appeared in the other square (fig. 7).

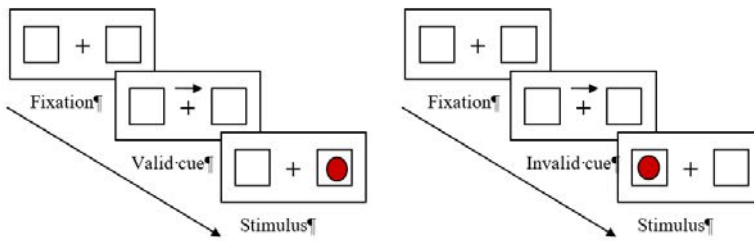


Fig. 7 – Endogenous Cues (Posner). Modified Izzo, Palpacelli 2013.

A computer recorded the TR of the subject to the appearance of the target. The data show that in the case of correlation cue-target (valid test) reaction times were depressed, while in the opposite case (invalid trial) increased. We speak therefore of benefit on the response and cost. The explanation of this phenomenon lies in the fact that the presentation of the cue directs attention selecting in advance a region of space. Following the results of this and other experiments, the focus has been metaphorically described as a beam of light (the spotlight of attention) that moves in the environment, going to illuminate different regions of space at different times. In light of the data obtained from studies in the literature, it is our view important to implement a contextualization of these results in the field of sport, thanks to which it seems plausible to say that the instructions of the coach to produce the same effect, and that the player will revenues attentional advantage in those situations in a game that is expected and a disadvantage in the unexpected. On the basis of what has been said so far seems therefore clear that the focus is moving along the spatial coordinates. There is also a different hypothesis, according to which the focus does not move and is not distributed in space, but rather is based on objects (object based). In this regard, the experiments were conducted in which subjects were submitted to two figures of overlapping objects, thus occupying the same spatial location. The task of the subjects was to bring two features of objects. In one condition, the two features related to the same subject, in another two different objects. The experiment showed that the performance of the subjects were more accurate when the two features related to the same object than when it referred to two different objects, even though they occupy the same positions.

3.2. The control of attention

If you can direct attention in space, what are the factors that control its distribution in the visual field? What determines where and when to pay attention to one of the various objects in the scene that we see? If we examine the paradigm of Posner described above, the viewer's attention is directed voluntarily (endogenous) as a result of the appearance of an arrow in the center (representing the cue). Using the same type of paradigm, it was also possible to demonstrate how attention can also be directed automatically (exogenous), that is independent of the will of the subject. The different modes of orienting of attention will be closely linked to the different type of cue, as demonstrated by the experimental protocols. The automatic orientation subtends to the appearance of a stimulus salient, which in the paradigm of Posner is represented by a short light signal in correspondence of one of the two regions of space (fig. 8).

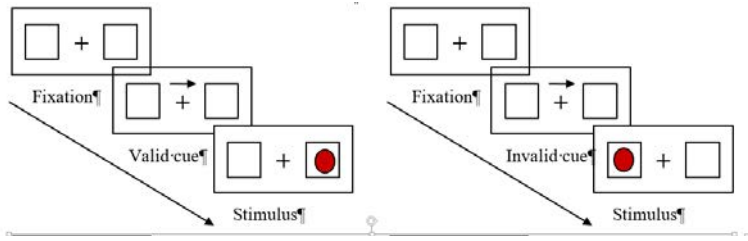


Fig. 8 – Exogenous Cues (Posner). Modified Izzo, Palpacelli 2013

Such a stimulus would capture the viewer's attention automatically, causing an unintentional movement of this is deductible by the different TR. The paradigm of Michael Posner has also demonstrated the possibility that attention can be drawn automatically, even independently of the movement of the eyes and head (covert attention). It should however not think the orientation exogenous attention as present in the absence of the other (voluntary) and vice versa, but it must be contemplated also the possibility of an interaction between the two factors. If we look for a red item among green elements is evident that our research will be driven by both attentional components, automatic (saliency) and voluntary components (knowledge of the objective of the research). However, in everyday life, it happens very often that some elements might capture our attention while we are trying something voluntarily. In this case, the factors breakers and those volunteers are vying for control of attention and therefore becomes interesting to know how it behaves attention in these situations. According to the recent "theory of contingent capture" means a purely automatic orientation does not exist. The results of some experiments seem to show that a distractor is able to capture attention only if it is in some way similar to the target, that is, only if some of its features fall within the objectives of the research subject. To take a simple example, if the target that I have to look for is a red disc in the midst of other green disks, the presence of a disk of blue color may unintentionally catch my attention. Conversely, the presence of any element different in form, such as a square between the discs, would not produce such unintentional movement of attention. As is clear from these simple examples, it is important to understand and explore what are the neural mechanisms underlying attention. First of all, it should be specified as to focus attention on a particular stimulus in the neural processing modules in an entire network of cortical areas, facilitating perceptual processing and perceptual awareness of these stimuli or events. The registration of a sensory input takes place thanks to the strength and variability of the neural response. The attention, in order to improve the detectability of the target stimuli, acts by increasing the signal of the selected stimuli, for example by increasing the contrast. In addition to the facilities, the focus also allows you to filter out irrelevant distractors that compete for limited neural resources, suppressing the interference, especially when they seem close to a target stimulus. When there is a strong action of the distractor interference, there is a consequent increase in the activity of the frontal and parietal areas (as measured by functional magnetic resonance imaging (fMRI). This activity suggests that the frontal regions serve to bias the competitive interactions between the stimulus targets and distractors that accompany it. The literature highlights four key processes for attention: "working memory", "top-down sensitivity control", "competitive selection" and "automatic bottom-up filtering for salient stimuli." Each process provides a specific and essential contribution to

the focus (fig. 9): this involves the voluntary control of the first three processes, which operate in a recurring cycle and involves cognitive factors (eg. Previous knowledge, expectations, objectives of the individual), while the bottom-up adjustments are automatic and related to environmental factors (unexpected or salient stimuli). Working memory (WM) is a highly dynamic memory that operates over periods of seconds and temporarily stores selected information for detailed analysis; the information contained within it serve as a basis for decision making and planning of complex behaviors and, more importantly, control the top-down signals that modulate the sensitivity of neural representations that contribute to these representations (Miller et al., 2001); the competitive selection is the process that determines what information to have access to working memory (Duncan, 1984); the sensitivity control is a top-down process that governs the relationship of the signal strength of the various information channels that compete for access to working memory; filtering salient stimuli improves automatically the answers to these inputs rare, with a sudden or significant emotional valence.

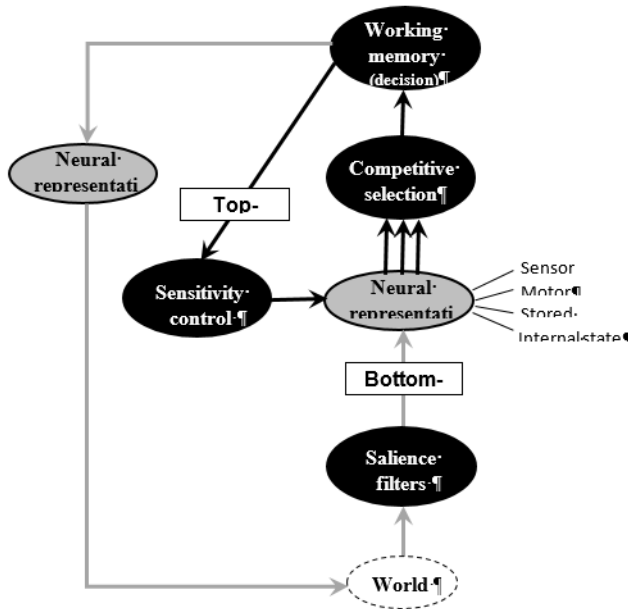


Fig. 9 – The four basic components of attention. Modified Izzo, Palpacelli 2013⁵

- 5 The processes that contribute to the attention ellipses are shown in black. The information of the outside world (the dotted ellipse) are transmitted by the nervous system and are processed by “salience filters” that respond differently to stimuli rare or important (bottom-up). A competitive selection process selects the stimulus with the highest signal strength for entry into the circuit underlying working memory. Working memory can direct top-down bias signals that modulate the sensitivity to stimuli that are processed in working memory. The selection process may also direct top-down bias signals that reflect the outcome of the competitive selection. Working memory and competitiveness direct eye movements for the selection and orientation of other behaviors that modify the effects of the world on the nervous system of the animal. The voluntary attention involves working memory, the top-down control of sensation, and the competitive selection that operates as a recurring cycle (dark arrows).

Within the context of attentional, working memory not only has the duty to accept, store and manipulate information, but also generates signals that improve the quality of information (Miller, 2001). For example, directing the gaze (eye movement) toward the target stimulus, working memory optimizes the resolution of visual information about the object (Andersen et al., 2004). The same principle applies to the orientation of other sensory systems (hand, somatic sensation). A second strategy to improve the quality of information is to modulate the sensitivity of neural circuits that convey information. Such a top-down mechanism can improve the signal to noise ratio in all domains of information processing: sensory, motor, internal state and memory. The top-down bias signals activate both a local inhibitory circuitry (decreased sensitivity of neurons involved in stimulation parameters not related) that an excitatory (increasing the sensitivity of neurons involved in the stimulus expected). Not all the information you need to be modulated by top-down bias signals to gain access to working memory (Egeth et al., 1997); some properties of the external world can evoke exceptionally strong neural responses that can win access to working memory (Remington et al., 2001). This access to the WM driven by the stimulus itself (bottom-up) is mediated by the component of attention called "Salience Filters". The nervous system responds automatically to these salient stimuli with unusually strong responses and / or distributed responses of large populations of neurons. This leading role, however, is temporary, less than a few hundred ms (Bisley, 2003); once it enters the salient information in working memory, its importance will be evaluated and compared with that of other information already available and being developed. At this point, the information that will be considered more important to retain control of the WM and will serve as the basis for the subsequent top-down sensitivity control (Miller, 2001) Another peculiarity of these highly salient or unexpected stimuli is to be able to trigger top-down modulations of sensitivity even before the neural activity representing that stimulus enters the working memory; can in fact trigger of saccadic eye movements within 120 ms after the onset of the stimulus. From what has been so far, the conceptual framework summarizing sees the attention as the result of a set of distinct but inter-related processes, whose interaction derived neural adjustments that lead to taking the final decision. The fact that the control of attention underlies the interaction of several factors, voluntary and involuntary, between their different but equally crucial and mutually influenced, gives us significant insights that can be transferred and applied in the fields of team sports. During the play action, while also using other senses, 80-90% of the information that we process and to take the final decisions come from our eyes. The ability to focus our attention endogenously on an area of the field (such as the area that we have to defend or that to locate as useful space to penetrate), or on a particular (such as the joint angles of coxo- femoral and those of the knees, as well as the exact position of the feet of the opponent to be overcome), determine the possibility of creating a considerable advantage spatial, temporal, and then tactical, such as to allow the implementation of a performance effectively. The importance of these details play in the success of the game and in the training of more on elite player though, deserves a particular interest and study, even contemplating the nature and significance of the results and the consequences that certain information and directions tactics by the coach involved.

4. The Dark Side Of Visual Attention

If until now we have focused on the benefits that attention gives the performance, investigating the cognitive processes that allow you to deal with the different sit-

uations effectively; will be presented following a series of experimental paradigms that illustrate and highlight how the limits or the absence of attention can drastically affect the conscious perception of stimuli and events. In particular, will be exhibited so-called “perceptual deficit functional”, that is experimentally induced through appropriate manipulations able to make ineffective at the moment the selection attentional, and in any case, fundamental aspect, not caused by any type of neurological disease or trauma involving the area of the cerebral cortex (eg. “neglet”), but which may occur normally in “healthy” subjects. The focus of attention can be a double edged sword in the sport, because if on the one hand allows me to ignore unimportant information and practical action, on the other hand it can also lead to failure vision and awareness of functional data the provision. A study of Haensel 2002 has just highlighted how precise instructions of coach during match play time may prevent the player to feel important inputs such as a free companion to whom you can pass the ball.

4.1. Change blindness

The change blindness is described by Simons (2005) as the inability to consciously detect significant changes in the scene when these events take place in conjunction with other visual events disorder, resulting in a temporary transition stage. Experiments have shown that people are unable to changes, both in the case where the change takes place in a central location of the scene, that a peripheral device. Thanks to this paradigm, Rensink and colleagues were able to identify the attention as the crucial element in the manifestation of this phenomenon. The interposition of a gray screen between the two images would prevent in fact that differentiator drive automatically the attention on it and permits its detection. At a time when the focus cannot be drawn automatically into the position in which the change occurs, you will need to explore every element of the scene in a supposedly serial. If there is attention focused on the parts of the image that change, the subjects remain as blind to the change. Conversely, if the exploration stage attention is paid to the parts that change, the change will be apparent, surprising as those who, previously, had not detected.

4.2. Attentional blink

To demonstrate the importance of attention in perception has been studied a second phenomenon that is unable to correctly discriminate an event when our attention is focused on something else temporarily. Specifically, this phenomenon occurs when the subjects attempt to identify two visual targets presented in rapid succession; This condition usually cause impossibility to see the second target if it appears within 500 ms from the first. The phenomenon of the psychological refractory period provides a good explanation of the processes that take place when a fake is immediately followed by another movement. It is precisely the capitalization which often determines in sport the decisive implementation of the behavior of pretend. In the example of basketball, the player is studying a single action on the basis of the attitude of the opponent, relatively complex, involving first the execution of a movement that would seem like a throw (pretend), then, taking advantage of the destabilization caused in opponent, stops the execution of the shot, and then develops the complete execution of the movement wanted to (throw), playing all three actions in quick succession. As soon as the defender

executes the answer to sham (jump to stop the ball) takes the second stimulus (shooting), but the defender is now unable to inhibit its response to mock and correct programming of the response.

4.3. *Inattentional blindness*

This third paradigm falls in the study of sub-process of attention qualified as distributed attention. This is central in many sports games, and the confirmation of this comes from the observation of those situations where it is the coach who complain to a fellow player who was in possession of the ball had not seen a player completely free and that he had not passed the ball, even though he was right in his vision. The player accused justifies his choice claiming not to have seen the player who was in a favorable position. Is precisely in the scenario just described that fits what in literature is called "Inattentional Blindness Paradigm" (the phenomenon of inattention blindness). According to this paradigm, if the attention of the viewer is directed to another object, often an unexpected object (critical stimulus) is not perceived consciously, although at the moment is in the visual field. Conscious perception, then, seems to require attentional processes (Mack et al, 1998). The attentional blindness can in general be considered as a factor in the limited capacity of human information processing.

5. Discussion

The analysis carried out in the course of this work presented a direct relationship between the behavior of imitation in the sport and the ability to consciously perceive the various game situation. These are in fact two aspects that influence each other. A proper understanding of the game allows you to run the fake in the conditions of time and space tactically correct. On the other hand, thanks to a correct reading of the situation in the field, the opponent can "guess" the move of the player, and therefore can not make mistakes. But we must not overlook the fact that a well-conducted sham can cause the opponent to see what they really do not go to realize ... etc.. What in fact happens to each of us in everyday life, that is to ignore much of the information / stimulus that occur on our retina, we find it, in an amplified dynamic situations in sports gaming. When we speak of attention, inevitably we refer also to the aspects inherent to this and that characterize it, components which, inter alia, all have obvious relevance to the practice of sports. The first component is that of supervision, ie the ability to distinguish the presence of absence of an expected signal. Another component is the one of the selection, that is, the ability to process some information in a particularly efficient manner at the expense of others. A final component of attention is the mental commitment. From the data reported in the literature, and especially the reflections arising from them, we can say how much the experience, and the variety of situations experienced by the player may affect its ability to focus attention on stimuli to functional performance and, consequently, on the choice and selection of the correct technical gesture-motor, so as to make it efficient. The other side has emerged as the coach himself can somehow restrict a decisive negative and the field of view of the student by sending extremely limiting instruction at the tactical level. Various studies published in the literature provide us then, not only of the precise information on the timing of the execution of a mock effective, but also valuable guidelines about the methodology of training, aimed to the maturation of quality players.

6. Conclusions

Our perceptual system during the evolution was completed in such a way as to be able to filter and to reach the consciousness only a small part of the infinite stream of stimuli from environment. The task of our perceptual system, therefore, is not to represent the world around us in all its details, but to extract the information necessary for us to survive, to carry out a task to be accomplished or solve the problems. In the course of this work we have tried to respond and shed light on one of the most recurrent questions in research on attention, that is, what and how do you determine the greater importance of information with respect to another, and the relative precedence in making processes more complex. It is emerged how should be selected first as the most important inputs and ignored the other, and then focus our attention on that particular aspect of the environment and subjecting it to more and more efficient processing. These operations are mediated by a series of processes that interact with each other and which contribute to prevail information rather than another. In sports, the ability to focus and concentrate in moments / key areas of competition, an act or a gesture, may prove crucial to achieving the result. This causes an athlete to achieve performance excellence, and then performing, must possess not only a valuable technical knowledge and excellent physical condition, but must also perfects his attentional capacity, mental fundamental prerequisite to be able to adapt as effectively as possible to the changing situations of the game. From the research above, and from the reflections and contextualization related to it, has emerged as the focus can be defined in different ways according to the different functions carried out by it, and that in itself has several components by which interaction is greater relevance of one or more information to the detriment of others. The shift in focus on a particular rather than another implies, as explained in detail, a check is voluntary (endogenous) and involuntary (exogenous). On the basis of these considerations and others associated with them, we have tried in the first instance to bring out how this cognitive resource is essential in the life of every day and not only that, in order to perform a series of tasks and solve a wide spectrum issues that otherwise would not be able to deal with. All this should make us reflect first and foremost the importance that this cognitive resource plays especially in our sport, in order to focus our attention more and more of their trainers and coaches on the mental aspects necessary to complete the growth of an elite player but also of the normal level. Secondly, but no less important, you must become aware of the costs and consequences of unwanted attention that it may cause, for example, when we restrict the attentional focus of our players with an excess of signs strategic tactics.

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