

THE INFLUENCE OF COLOUR ON THE EFFICIENCY OF BASKETBALL THROWS

*Moroşan Larionescu Virgil¹
Mihoc Pantelimon¹*

¹Ştefan cel Mare University of Suceava, Romania

Motto: "Everything that lives aspires to colour", J.W. Goethe

Keywords: *colour, perception, basketball throw , efficiency, synaesthesia.*

Summary: *The colour red, due to its association with perils and mistakes, should activate a motivation for hesitation, a motivation which determines people to be more vigilant and more open to taking risks. Thus, red, by comparison to blue, should improve the performance that is based on details and the orientation towards tasks that require concentration and special attention (e.g. basketball throws).*

Introduction

The interest for the cognitive psychology of sports is reflected by the progress seen in the field of research of sports psychology, the research being conducted on subjects such as identifying the most efficient ways of training in order to better the formation of habits and the development of the personality, the equipment and installations aiding in the process of preparing, the team spirit-building techniques, the means for knowing the psychological characteristics of great athletes.

The necessity to know the physical and psychological elements which influence basketball players, the development tendencies and the progress factors during preparing, is an essential requirement for the coach to follow.

The sensorial processes are so important for our survival and functioning that the first scientific studies were on the subject of sensations. Today many psychologists discern sensations and perceptions, the starting point for both being a stimulus, a form of energy (such as light or sound waves) which can have an effect on sense organs (the eyes or the ears). Sensations depend on specialized cells called sensorial receptors which detect the stimuli and turns them into nervous impulses through the process of sensorial transduction. Although specific sensorial receptors usually serve specific senses, in certain cases the phenomenon known as synaesthesia appears.

This phenomenon is a characteristic of situations in which the stimulation of one sense conveys experiences which are specific of another sense.

Chromatic perception depends on the physiological and educational profile of each individual, of the psychological and emotional stress factors which could occur when a colour image is watched. Thus, some authors think that the excitation or inhibition make the cells around have an opposite reaction. The concentration of the excitation will induce around the initial core an inhibition area (simultaneous negative induction), while the concentration of the inhibition will induce an excitation area (simultaneous positive induction).

For example, if the analysed individual suffers from hyperactivity or hyper excitability, there won't be the same effects as there would be in the case of an emotionally healthy individual.

On the eye's retina there are two types of cells: cone cells and rod cells. Rod cells activate during night-time, in the dark, while cone cells react when light reaches the retina and signals the brain with a certain colour. For distinguishing colours, the cone cells contain: cone cells which are more sensitive to light that has a great wavelength, these have a maximum reaction to the colour red (marked conventionally as L), cone cells which are more sensitive to light that has a medium wavelength, these react best to the colour green (M) and cone cells sensitive to light that has a minimum wavelength, these cells react best to the colour blue (H) (Fig. 2 and 3)

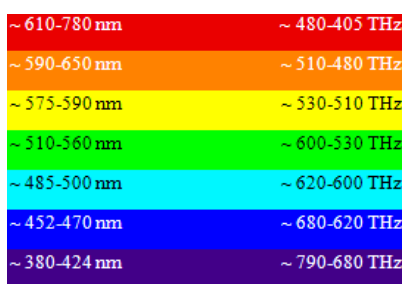


Fig. 1 The time period between colour wavelengths and colour spectrums

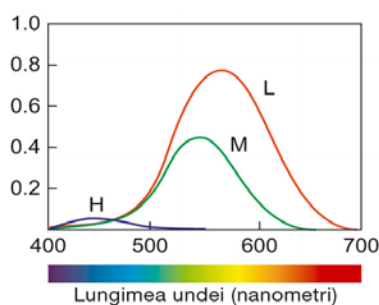


Fig.2 A normal eye's sensibilitycurb

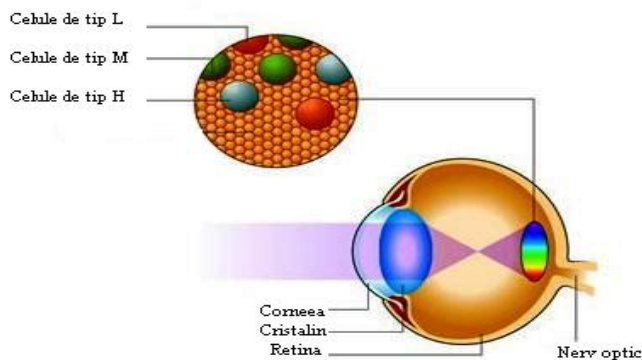


Fig. 3 Types of cells present in the retina and in the formation of the spectrum

Thus, all colours are obtained through the different stimulation of each type of cone cell. For example, the colour yellow involves the stimulation of both L and M cells equally, but the H cells only play a small part, while blue stimulates the H cells more intensely, but have a lesser effect on L and M cells. Knowing these things we can notice the fact that in the sport-related activity the particularities of coloured vision have a special significance. Thereby, on sports fields the intensity of achromatic colours, black and white, is taken into account and, as a consequence, the thresholds for throws and vaults, the colours of the racing track, the bars of fences, the margins of the playing field are all painted white. It should also be taken into account that the colours are more distinguishable when projected on a background which is of a complementary colour (the green lawn, black or red tarmac).

Some solutions regarding the use of colours have been introduced in the sports activity: in table tennis, dark colours for the players' shirts is recommended so that the white ball is easily distinguished and seen, in football the goal-keeper's equipment is different from the other players'.

And so, having such an important effect on motor activity, we must discover what influence the colour has in the multitude of sports so that we can realise how we must redecorate the technical installations, the players' training grounds, and the area in which the competitions take place, the sports players' equipment and so on, if necessary.

Method material

We have started from the assumption that by using modern means of projecting the colours red and blue on the basketball panel we will be able to show their influence on the players' psyche regarding the efficiency of stationary basketball throws.

We intend to prove the different associations of the colour red in comparison with blue, both of which can induce distinct incentives. The colour red, due to its association with perils and mistakes, should activate a motivation for hesitation, a motivation which determines people to be more vigilant and more open to taking risks. Thus, red, by comparison to blue, should improve the performance that is based on details and the orientation towards tasks that require concentration and special attention (e.g. basketball throws). In contrast, because blue is usually associated with relaxation, peace and quiet it is possible that it would activate a motivation to try a different approach because the aforementioned associations signal an environment that is without perils which encourages the players to use innovations when completing the task. Blue stimulates creativity and negatively influences the performance in tasks which require concentration. Thus, blue, in comparison with red, should improve the performance in creative tasks.

For the accomplishment of the experiment ten students from "Stefan cel Mare" University in Suceava were recruited, with ages between 19 and 23, all of them basketball players who have a throwing percentage of $50\% \pm 5\%$. We would like to mention that none of the participants suffer from colour-blindness or any other congenital diseases which interfere with their perception of spectres or colour waves.

The registering of the data took place in the University's gym and was done repeatedly so that the collecting of the data could be done in conditions which would make the results incontestable.

A DMX dimmer operator with joystick, two image projection rotating heads and red and blue colour filters were placed behind the free throw line. (see fig. 4 and 5)



Fig 4. Dimmer DMX

Fig. 5. Rotating head for image projection

The following methods were used for data registering and processing: the observation method, the experimental method, the registering method, the investigation method, the statistical and mathematical method, the testing method, the graphic and table method, the video method.

The development of the experiment

It must be mentioned from the very beginning that the subjects didn't know they were part of an experiment group so that they wouldn't be influenced by certain information and so that everything progressed naturally. Thereby, the task that was to be accomplished took the form of a free-throw contest starting from the free-throw line. The task consisted of 6 sets, each set requiring 10 throws, the colour being projected onto the panel as follows: blue, red, half red-half blue then half blue-half red. At the last two sets of throws the colours alternated for each throw.



Fig. 6 (a și b) Aspects from experiment

Interpreting the results

As a result of registering the individual performances of each participant, we have observed that the average of the successes varies, as it can be seen in fig. 7 and 8. Thus, the success rate of the basketball throws went up 0,6 points when the colour red was projected on the

panel, which could mean that the players were positively influenced by it, but a relevant difference, statistically speaking, is not noticeable: $t=0,57$, $p>0,6$.

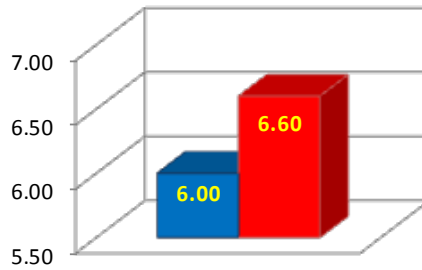


Fig. 7 The efficiency of basketball throws by colour

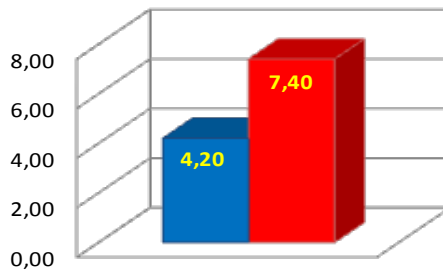


Fig. 8 Efficiency of basketball throws when the colours alternated

As we can see in fig. 8, the instant the colour was changed to red/blue after each throw, the difference was of 3,2 point, which translates into 74 successful throws out of a total of 100 when the colour red was displayed and 42 out of 100 when the colour blue was displayed.

Table nr. 1 Values of the shots thrown when the colours were alternating

Nr crt	Nume prenume	ROȘU	ALBASTRU
1	Z.M.	8	4
2	J.P.	6	4
3	M.C.	6	2
4	D.F.	8	4
5	T.A.	10	6
6	B.C.	6	1
7	B.C.	10	6
8	C.M.	8	2
9	S.B.	2	4
10	M.C.	10	10
	Abaterea standard	2,50	2,58
	Eroarea medie	0,79	0,82
	Media aritmetică	7,4	4,3

Calculating the correlation quotient, following the Brava-Pearsons method, we have reached a $t=3,44$ with a significance threshold of $p<0,05$, which is very close to 0,01 which supports the relevance of the completed study.

Conclusions

Obtaining these results we can affirm that red, in comparison to blue, improves the accomplishment of tasks which require concentration and special attention. Knowing that this colour is characterised as "the colour of will", improves the muscle tone, activates breathing and raises blood pressure, those who prepare teams should take into account the factors which exist in the gym and during competition due to the implication of colour. Then we realise that it is not for nothing that installations and the materials in a gym have certain colours, such as the basketball hoop which is red (or orange, depending on the case). Thereby, if during a game, on the walls of the gym, close to the panel, banners which are predominantly red were to be placed, it would affect the efficiency of the throws. Still, red shouldn't be considered only as a distracting factor. It could be used in training, either in the way the experiment was conducted, in order to form the throwing stereotype, or in innovative ways which could lead to improving the teams' performance.

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Titlu: Influența culorii asupra eficienței aruncărilor la coș

Cuvinte cheie: culoare, percepție, aruncări la coș, eficiență, sinestezie.

Rezumat: Roșu, datorită asocierii sale cu pericole și greșeli, ar trebui să activeze o motivație de evitare, motivație ce îi face pe oameni mai vigilenți și mai deschiși spre asumarea riscurilor. Astfel, roșu, în comparație cu albastru, ar trebui să îmbunătățească performanța pe detalii și orientarea spre sarcini care necesită concentrare și atenție deosebită (de exemplu, aruncarea la coș).

Titre: L'influence de la couleur sur l'efficacité de jeter.

Mots-clés: la perception des couleurs, en jetant les déchets, l'efficacité, la synesthésie.

Résumé: Rouge, en raison de son association avec les dangers et les erreurs, devrait déclencher une motivation d'évitement, la motivation qui rend les gens plus vigilants et plus ouvert à la prise de risques. Ainsi, le rouge, par rapport au bleu, devrait améliorer les performances sur les détails et des conseils pour des tâches nécessitant de la concentration et l'attention (par exemple, en jetant le panier).