

# Colors that can Enhance the Track Athletes' Motivation

by

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## Abstract

Questionnaire research was conducted on the track colors in a stadium with the aid of a semantic differential method for both experienced athletes and inexperienced ordinary persons. From principal component analysis, three principal components, consisting of "Solid impression," "Enhancing excitement" and "Aesthetic pleasure," were extracted. It was also revealed that the colder colors such as light-blue and green would enhance the athletes' motivation while such colors were different from the ones chosen by the inexperienced persons, who selected the warmer colors like reddish brown and yellow. It would be beneficial for athletes if there were a common color to improve and enhance their mental status, which would improve the possibility of yielding an epoch making record during an event.

**Keywords:** Track color, Athlete motivation, SD method, Kansei engineering

## 1. Introduction

Track and field events are held at stadiums or arenas, where games are processed in accordance with rules and regulations. Following the rule, competitors are allowed to use supporting tools, such as spikes on the shoes and tightening tape on the knees in order to support their physical condition. However, other possible factors to be modified are only the athlete's own physical and mental states. Usually, the athlete's physical state is not changed after he/she has entered the arena as it is to be adjusted to best match the game through substantial efforts and exercises beforehand. His/her mental status would depend on the condition of the day and the ability of concentration. The athlete could achieve best performance if it is possible for him/her to stabilize the mental status on the very moment of the game.

In this study, the color effect of the track in the stadium on the athlete's mental status is focused. Examination will be accomplished on the impression that is perceived by athletes in case when the color of the track is changed to a different one. Investigation with an aid of Kansei engineering is processed whether there is a positively affecting factor to their mental condition such as the peace of mind, collectiveness, motivation, excitement, etc. A questionnaire research will be conducted in two groups, the one of which consists of experienced persons and the other inexperienced. With this comparison, difference

between the experienced and the inexperienced groups will be studied on each viewpoint. Moreover, colors that can improve or enhance the athlete's mental status towards the competition will be discussed.

## 2. Research procedure

### 2.1 Research sample

Picture samples used in this study are the ones from the track field located at Shonan campus stadium of Tokai University. The original picture of the track is shown in Fig. 1. Based on this picture, only the color of the track is modified; the other elements such as the background and white lines are the same as in the original picture. As seen in Fig. 2, seven color samples are produced with an image handling software and the total 8 pictures including the original one are evaluated by the experienced and the inexperienced testees.

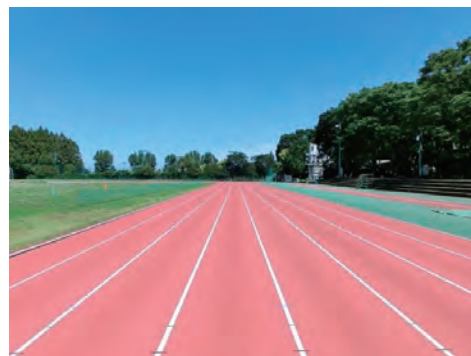


Fig. 1 The original picture of the track

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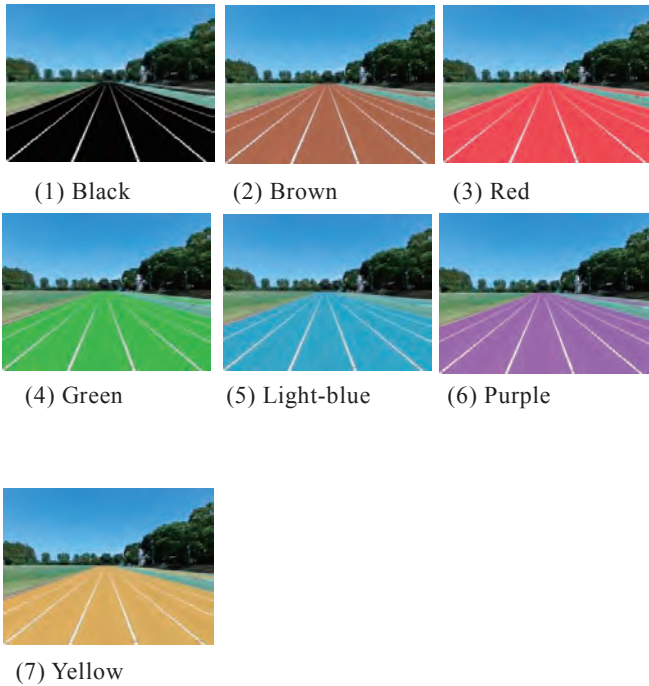


Fig. 2 Modified track colors

## 2.2 Investigation method

The questionnaire survey is processed by a semantic differential method,<sup>1-3)</sup> in which each questionnaire items (a pair of adjective, e.g. hard – soft, excited – not excited) are evaluated in a 5-grade evaluation method on the each modified color picture. The adjective pairs chosen in this survey are taken from the criteria described the literature.<sup>4)</sup> Principal component analysis is performed and principal components are determined. The experienced testees are selected from the Track And Field Club Tokai University (53 persons; averaged age 20.3) and the inexperienced from the general public (51 persons; averaged age 21.5). After the survey results are obtained, the principal components of the two groups are extracted and compared with each other by calculated eigenvalues and eigenvectors.

## 3. Results and discussion

### 3.1 Principal component Analysis

The research results were processed to find out a set of correlation matrices, eigenvalues and eigenvectors through principal component analysis. The obtained principal components for the groups of the experienced and the inexperienced testees are shown in Figs. 3 and 4, respectively.

It can be seen that the first principal component gives the positive scores on the items such as “(it) looks solid,” “(it is) significant,” “(it is) impressive,” and “(it) looks warm” for both experienced and inexperienced groups, which fundamentally give the direct impression of solid, hardness and so on. Therefore, this component was named as “Solid impression.”

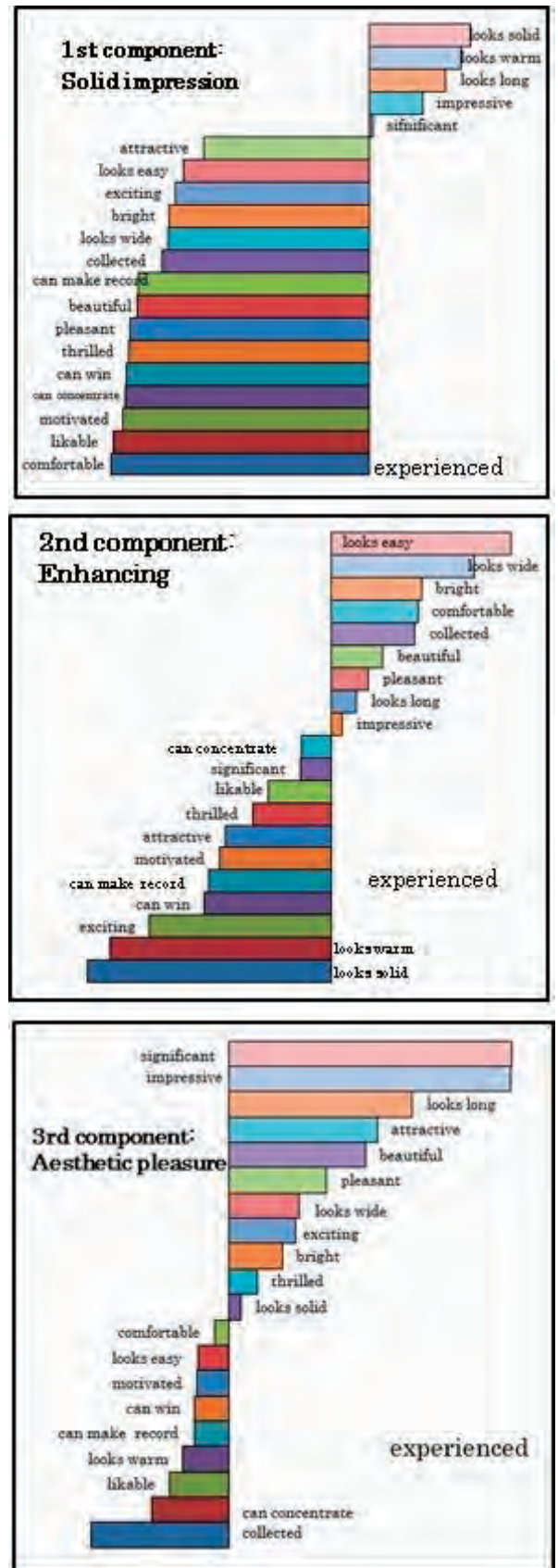


Fig. 3 Extracted three principal components and the corresponding constituent items on the experienced testees

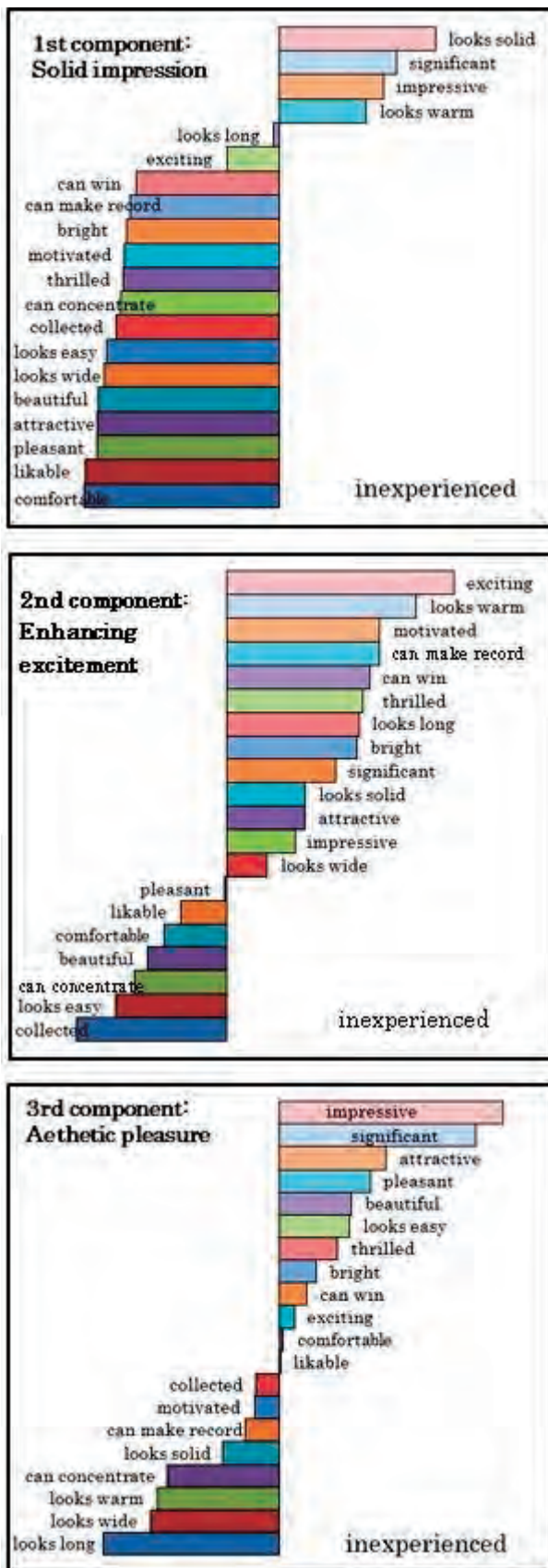


Fig. 4: Extracted three principal components and the corresponding constituent items on the inexperienced testees

For the second principal component, “(it looks) easy,” “(it is) comfortable,” “(it looks) collected,” “(it is) beautiful,” and “(it is) pleasant” give a higher scores, whereas “(it looks) solid,” “(it looks) warm,” “(it is) exciting,” “(I) can win,” “(I) can make record,” “(it is) motivated” and so on give lower points among the experienced testees. On the other hand, “(it is) exciting,” “(it looks) warm,” and “(it is) motivated,” “(I) can win,” “(I) can make record,” give the higher points, whereas “(it looks) easy,” “(it is) comfortable,” “(it looks) collected,” “(it is) beautiful,” and “(it is) pleasant” give the lower points among the inexperienced testees. This is a decisive contrast between the experienced and the inexperienced testees that the adjective pairs which give the higher and lower points seems to exist mostly in the opposite sides with each other; for example, the experienced group gives the adjective pairs of “(it looks) collected” and “(it looks) easy” higher scores, whereas the inexperienced group gives the same adjective pairs lower points, in which sense the obtained results are basically opposite. Accordingly, the second principal component of each group was named “Enhancing excitement.” Here, the positive and negative scores can be obtained for the experienced and the inexperienced groups, respectively, which gives an opposite feature on the same scale of the component.

For the third principal component, it is found that both groups give higher scores on the items of “(it is) impressive” and “(it is) significant,” “(it is) attractive,” “(it is) beautiful,” “(it is) pleasant,” “(it is) significant,” and so on. Therefore, this component was named as “aesthetic pleasure.”

The contribution rates of each component obtained in the experienced group are 51.1, 18.7 and 16.9% for the first, second and third principal components, respectively. For the inexperienced group, the contribution rates are 50.8, 25.9 and 12.7%, respectively. The accumulative contribution fractions of these three principal components are 86.7 and 89.4% from the analyses of the experienced and the inexperienced groups, respectively.

### 3.2 Relationship between the three principal components and its implication

Figs. 5, 6 and 7 show the correlations between “Solid impression” and “Enhancing excitement”, between “Solid impression” and “Aesthetic pleasure,” and between “Enhancing excitement” and “Aesthetic pleasure,” respectively. Here, the calculated scores on the extracted principal components are plotted. The color of the marker on each drawing is identical to the color of the sample picture. The markers of the same color are connected with an arrow, where the initial marker shows the principal component score derived from the experienced group and the terminal marker shows the one from the inexperienced group.

It is seen from Fig. 5 that the differences between the initial and the terminal markers are significant for the



track colors of light-blue, green and red, though there is no significant difference seen among these three colors in the viewpoint of “Solid impression.” In particular, the score of red for “Enhancing excitement” shows the highest value for the inexperienced group, whereas it is lowest for the experienced group. The scores of light-blue and green show rather high values for the experienced group, whereas it is substantially low for the inexperienced group. From these findings, it is noticed that the experienced people would be more motivated towards the game when they were surrounded in a cold color like light-blue and green compared with a situation surrounded in a warm color like red. Moreover, it is also said that the inexperienced people have tendency to be fond of warm colors like red rather than cold colors like light-blue and green.

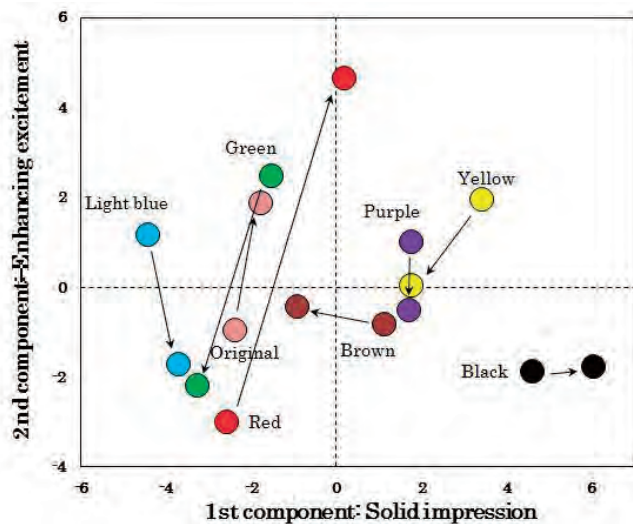


Fig. 5 Relationship between “Solid impression” and “Enhancing excitement”

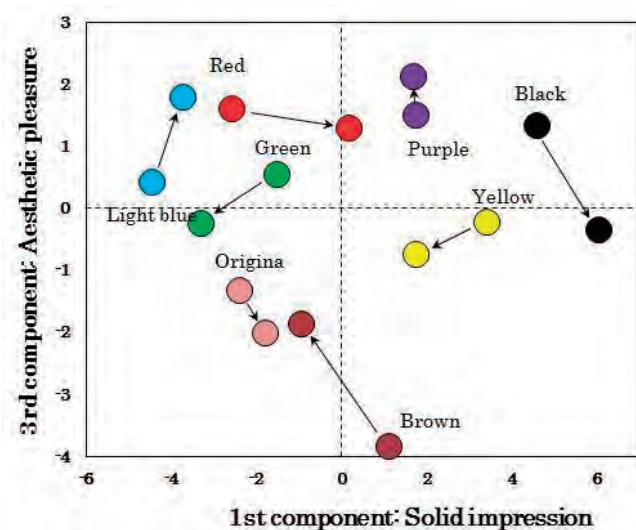


Fig. 6 Relationship between “Solid impression” and “Aesthetic pleasure”

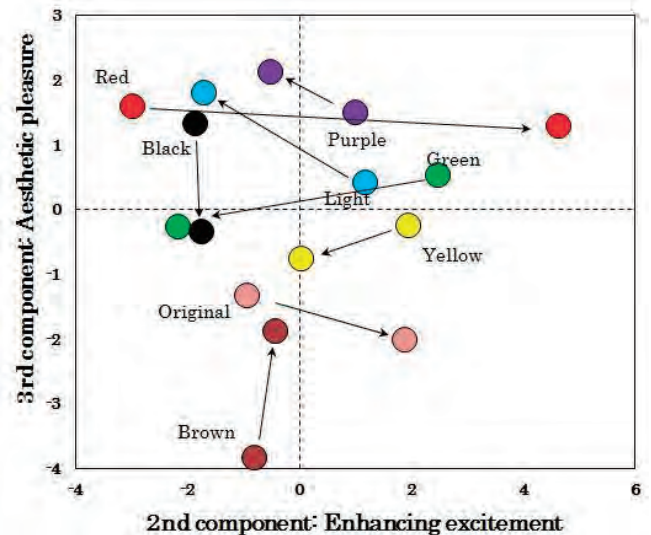


Fig. 7 Relationship between “Enhancing excitement” and “Aesthetic pleasure”

In Fig. 6, both groups show the higher scores of vivid colors for “Aesthetic pleasure” though the scatter here is substantially large. It is also found that the experienced group receives a good impression from the track of black color. In Fig. 7, it is said that vivid colors, especially red, give higher “Aesthetic pleasure” with significant impression to the inexperienced group.

From the comparison described above, it is concluded that the motivation of the experienced athletes can be more enhanced by colder colors than by warmer ones. On the other hand, the inexperienced, ordinary public is more motivated with the tracks of warmer colors.

Before conducting this research, the authors thought that warm colors which could stimulate and excite one’s mind would give more motivation for both experienced and inexperienced groups. However, an unexpected attitude was found for the experienced group. The reason why the experienced group has tendency to like cold colors is that they would become calm and collected with these colors and they do not need to be excited.

As a matter of fact, the experienced group is familiar with the reddish brown color, which is a very usual color of the track. Accordingly, there is a good reason for that a similar color of red should be avoided by the experienced group. On the other hand, the inexperienced group has much less experiences in the games on the track than the experienced group. Therefore, it may be possible for the inexperienced group to imagine and grow concern with the usual track color, which in turn make them motivated and excited.

In the field of sport psychology, a large amount of literatures and books have been published. However, self improvement and enhancement are the major concerns on the mental status of the athletes.<sup>5,6)</sup> It is not rare to develop an aethetical approach in sport.<sup>7)</sup> Here in this paper, one of the non-physical factors of the surrounding environment and facility for the athletes is

focused, which led to the following unique conclusions.

#### 4. Closing Remarks

It may be concluded that experienced athletes would be more concentrated and their motivation would become higher in case when they are surrounded with the colder colors, compared with the warmer colors. On the other hand, the inexperienced (usual, ordinary) people, who are doing exercises occasionally from time to time for health, etc., are fond of warmer and vivid colors like red and yellow.

It would be beneficial for any athletes if there is a color to improve and enhance their mental status, which would bring a possibility to yield an epoch making record in the game. The knowledge found in this study may be useful in a better planning of a stadium construction.

#### 5. Acknowledgment

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