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“Red wins”, “black wins” and “blue loses” effects are in the eye of beholder, but they are culturally universal: A cross-cultural analysis of the influence of outfit colours on sports performance.

Abstract: Although many studies have demonstrated an influence of uniform colors on sports performance, there are still more questions than answers regarding this issue. In our study, participants from Poland ($N = 147$) and China ($N = 143$) watched a two-minute video of a semi-professional boxing match. The participants viewed six different versions of the same fight – the original was modified to change the colors of the boxers’ trunks (red vs. blue, blue vs. red, blue vs. black, black vs. blue, red vs. black, and black vs. red). We experimentally confirmed that “black wins” and “red wins” effects exist, but in a way that caused an erroneous perception of the number of blows landed by boxers wearing red and black trunks fighting against boxers in blue trunks. We also showed that both effects are similarly strong even in Chinese culture, where the color red has different connotations from those in Western cultures. Additionally, our results suggest that context might play a very important role in the assessments of the boxers – color only influenced the perception of the weaker boxer. Finally, our findings suggest that the topic of the influence of colors on sports competitions has not been thoroughly investigated and further studies are necessary.

Key words: colors, boxing, perception, competition, cross-culture differences

Introduction

Psychology has long been interested in the influence of color on human functioning; however, until recently only few research achievements have been realized on this topic. Studies regarding the color red are a good example. For many years it has been suggested that red symbolizes fire, energy, passion, and love, while at the same time it is a metaphor for war, rage, and anger (Mahnke, 1996). In this context, one would assume that the color red raises an individual’s level of excitement (Mahnke, 1996). However, a majority of experimental studies have not confirmed such a hypothesis (e.g., Ainsworth, Simpson, & Cassell, 1993; Hackney, 2006; Hatta, Yoshida, Kawakami, & Okamoto, 2002). For this reason, recent research showing that the color red influences human motivational processes (Elliot, Maier, Moller, Friedman, & Meinhardt, 2007; Lichtenfeld,

Maier, Elliot, & Pekrun, 2009; Mehta & Zhu, 2009) or perceived physical attractiveness (Elliot et al., 2010; Elliot & Niesta, 2008; Roberts, Owen, & Havlicek, 2010) is of particular interest.

One of the general research trends in modern color psychology is sport psychology (see Sorokowski & Szmajke, 2011). Many teams create their image with a reference to color. For example, Belgium’s national football team wears red uniforms and their team nickname is the “Red Devils.” Similarly, the team with the most dangerous look of our times – New Zealand’s national rugby team (which performs a “ritual dance” before each match in order to scare their opponents) – is known as the “All Blacks.” Thus, it is not surprising that scientists are interested in the influence of colors on sports performance.

Among the first experimental studies regarding the influence of color on human performance was one

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conducted by Frank and Gilovich (1988). They showed that U.S. National Hockey League (NHL) and National Football League (NFL) players performing in black uniforms were more frequently punished for aggressive behavior than players wearing different colors. In that study, the participants also rated the black and other colored uniforms of the NFL and NHL teams on five dimensions. All the black uniforms were more often assessed as being "sinister" compared with the other colored uniforms, and black NFL uniforms (in the NHL, on a trend level) were also more frequently associated with power and (marginally) activity. These results are consistent with the findings of Adams and Osgood's (1973) study, which showed that the color black is associated with strength. In the context of sports, the color black was found to be more "sinister," as in aggressive, but also more "powerful" and "active." Such a combination of associations might lead to overestimating the chances of winning for a person wearing the color black, as well as to a distorted perception in favor of this person (especially in sports involving physical fighting). This hypothesis seems to be confirmed by Frank and Gilovich (1988), who showed that observers of the same behavior rated this behavior as being more aggressive if a competitor was wearing a black uniform. At the same time, when a competitor (particularly if it was a group) was wearing the color black, he (they) became viewed as being more aggressive than others wearing a different color (Frank & Gilovich, 1988).

Hill and Barton (2005) began a new trend in studies regarding the influence of uniform color – this time red – on sports performance. The influence of a competitor's red uniform on the results of sports competitions was analyzed during the Olympic Games in Athens. During the boxing, Taekwon-Do, Greco-Roman wrestling, and freestyle wrestling tournaments, the competitor's uniform color (red or blue) was chosen at random. Hence, the number of victories for the competitors wearing blue and for those wearing red should have been similar in the course of the whole tournament. However, significantly more winners of the above-mentioned disciplines were among the competitors wearing red (Hill & Barton, 2005 – competitors wearing red won 5% more frequently than expected by chance; $p < .03$). The "red wins" effect was even stronger when the competitors were initially on the same level (62%: 38%, $p < .005$ for "reds").

Hill and Barton (2005) claimed that the "red wins" effect might have a biological/evolutionary basis. As other studies have shown (e.g., Milinski & Bakker, 1990; Setchell & Wickings, 2005), a red skin tone or red ornamentations correspond to the level of testosterone and/or male dominance in many animals. Therefore, red ornaments (even artificial ones, like sports gear) should increase an organism's excitement level, raising its "will to fight," its striving for dominance, etc. Thus, these characteristics can influence the result of a sports competition.

Such an explanation (Hill & Barton, 2005) of the obtained results is somewhat problematic. For example, the results of self-recognition in animals confirm that mammals, other than chimpanzees, do not exhibit any self-consciousness (e.g., recognizing themselves in a mirror)

(Anderson & Gallup, 1997; Povinelli, 1989). Therefore, if animals are not aware of their own color, it is doubtful that this color would excite them. Additionally, as Hackney (2006) showed in his study, when testosterone was measured in people wearing a red or black t-shirt, simply changing the color of the shirt did not influence the participants' testosterone level. This result, together with the previously obtained outcomes (e.g., Ainsworth et al., 1993; Hatta et al., 2002), is inconsistent with the common knowledge stating that the color red should increase the excitement level of an organism. This suggests that the explanation of this effect proposed by Hill and Barton (2005) might be erroneous.

It is possible that the cause of the "red wins" phenomenon is related to the "observer" (i.e., the judge or the opponent of the "red" competitor; see Sorokowski & Szmajke, 2007) rather than to the person wearing the color red. Seeing a "red fighter" might trigger the stereotypical associations with fire, rage, and anger (Manhke, 1996). This hypothesis was confirmed by Hagemann, Strauss, and Leming (2008), who showed that judges assessing the same Taekwon-Do matches in which only the colors of the uniform were interchanged gave, on average, 13% more points to the "red" competitors than to the "blue" ones. We hypothesize that this pattern of results also might be observed if the color black was compared to other colors, for example, white or blue.

Due to the lack of experimental evidence, analyses involving the color blue reveal even less consistent results. While verifying Hill and Burton's (2005) study, Rowe, Harris and Roberts (2005) found that competitors wearing blue uniforms were worse performers than competitors wearing other colored uniforms, but they were better than the competitors wearing white uniforms (i.e., judokas in blue uniforms won more often than those wearing white uniforms). Similar results were found by Matsumoto et al. (2007). Generally, researchers (see Matsumoto et al. 2007; Rowe et al., 2005) have suggested that victories by competitors wearing certain colors might result from perceptual distortions of movements of objects having some specific color. However, the existence of a "blue wins over white" effect has not been confirmed beyond all doubt. Analyses by Dijkstra and Preenen (2008) suggest that the results obtained from these studies were an artifact because, first, in the elimination and early rounds of competition, the assignment of uniform color was not absolutely random and, second, the results were influenced by different variables, such as a competitor's length of rest.

Another issue investigated was the universality of findings by Frank and Gilovich (1998) and Hill and Burton (2005). It does not seem very probable that simply wearing the color red or black (like in the case of Santa Claus or a chimney sweep, respectively) influences people's aggressiveness and dominance (or, alternatively, assessments of their aggressiveness and dominance). Hence, it would be interesting to know whether this effect could be observed in other individual and team competitions, like boxing, chess, or golf. So far, only the influence of colors on team performances has been analyzed and no convincing results were found. Attrill and collaborators (2008) suggested that

the “red wins” effect could be observed in football matches (demonstrated in data from the English Premier League from 1947 and from analyses of performances by England’s national team in white or red uniforms); however, Polish (Szmajke & Sorokowski, 2006) and German (Kocher & Sutter, 2008) data did not confirm this. It also must be noted that the influence of black uniforms on the aggressiveness of competitors (Frank & Gilovich, 1998) was not observed in analyses of the Turkish football league (Tiryaki, 2005).

Additionally, analyses presented by Caldwell and Burger (2011) suggest that some of Frank and Gilovich’s (1998) results were an artifact. Caldwell and Burger (2011) observed that uniform colors may suffer from confusion because of the location of the event and the type of sports competition. Similar results were obtained by Piatti, Savage, and Torgler (2010), who analyzed the results of the Australian Rugby League over a period of 30 years and found that the team wearing red uniforms won more often than teams wearing other colors. However, when they explored the difference in uniform colors between the home and away teams, the positive relationship became insignificant. Typically, in professional football and other team sports, players wear their team color (which frequently is black or red) for home games, and when the referee decides that the two teams are not easily distinguishable, the visiting team has to change into uniforms with a different color. This could also explain Attrill et al.’s (2008) results in the English Premier League, as Liverpool, Manchester United, and Arsenal are historically some of the most successful teams and, traditionally, they all wear red uniforms. These results (Caldwell & Burger, 2011; Piatti et al., 2010) may provide some indication that the “red wins” team effect was observed in places where highly successful teams wearing red uniforms drove the overall results.

In conclusion, as Piatti et al. (2010) summed up, “this literature is still in its infancy” and it seems that there are still more questions than answers regarding the issue of the relationship between colors and sports performance:

1. Dozens of studies exist demonstrating that the color of a uniform can influence performance in sports (e.g., Attrill et al., 2008; Dijkstra & Preenen, 2008; Hill & Burton, 2005; Kocher & Sutter, 2008; Matsumoto et al., 2007; Mills & French, 1996; Rowe et al., 2005; Tiryaki, 2005), but a great majority of these studies are simply correlations or observations. Even the relatively well researched “red wins” effect was observed in only one experimental study (Hagemann et al., 2008). Until now, the existence of a “black wins” effect has not been confirmed in any experimental study. Therefore, further experimental studies are necessary in order to confirm the described effects.
2. No studies analyzed blue, red, and black simultaneously. It is unclear whether black is as strongly associated with dominance, aggression, etc., as red is, and whether a person wearing red would win over a person wearing black.
- 3.
4. The cross-cultural universality of the described findings has not been investigated. Hence, it is still unknown whether the “red wins” and “black wins” effects are related to or are rooted in the culture of the stereotypical Western perception of these colors (Adams & Osgood, 1973; Mahnke, 1996).

Material and Methods

Participants

The participants of this study were 290 students from Poland and Mainland China. Our research was first conducted in Wroclaw and Opole, Poland, where the raters were 147 students (from the University of Wroclaw and the University of Opole) of both genders (72 men and 75 women), ages 19 to 25 (mean age = 22.1), and then in Shenzhen, China, where the raters were 143 students (from Peking University Shenzhen Graduate School) of both genders (57 men and 84 women; 2 participants did not report gender) ages 20 to 28 (mean age = 23.56; 8 participants did not report age). All of the raters volunteered to participate in the study.

Stimuli

The participants watched a two-minute video of a semi-professional boxing match. In the assessment of the five authors of this study, the performance level of both boxers was very similar. The fight had been selected from a few hundred fights that the authors watched. For the purpose of this study, we chose a fight that finished almost in a tie, one in which there were many blows and punches but only a few blows prevented the fight from ending in a tie. Both boxers punched their opponent a few dozen times, sometimes punching in a longer series. The video was captured from the perspective of referees (or spectators sitting in the front rows). Six groups of participants viewed six different versions of this fight – the original was modified by a computer program to change the colors of the boxers’ trunks. The following versions were obtained: red vs. blue, blue vs. red, blue vs. black, black vs. blue, red vs. black, and black vs. red (color film available upon request). In the pilot study, because the participants had problems distinguishing the boxers when they both wore the same boxing trunk color, we did not use these versions in the stimuli.

Procedure

The participants from Poland and China watched one of the six videos (random assignment) in group sessions. In Poland, there were 24 or 25 people in each group, and in China, there were 23 or 24 people in each group. The video was played from a multimedia projector and was presented to the participants on a screen size of about 2 meters by 1.5 meters. The participants were seated at a distance of three to six meters from the screen.

The participants rated the boxing match using a paper-and-pencil questionnaire. They were given the following instructions: “The video you will see presents a boxing match. Imagine that you are the referee for this fight. Your task is to estimate the number of successful and

effective blows made by each boxer (here we provided an additional explanation and demonstrated on the video what a successful blow meant, in that not all the blows – like hitting a glove or hitting the air – were effective). Please tick or put a line in the boxes on your questionnaire when you see a successful blow by a boxer. Counting them "by memory" is impossible, because you will see many hits" (here we explained that during the experiment they should watch the video carefully and not look at the questionnaire when they mark the blows because there were too many hits to rate them "effectively" in this way. We also showed them about 10 seconds of the film as an example). The instructions were presented in the participants' native language.

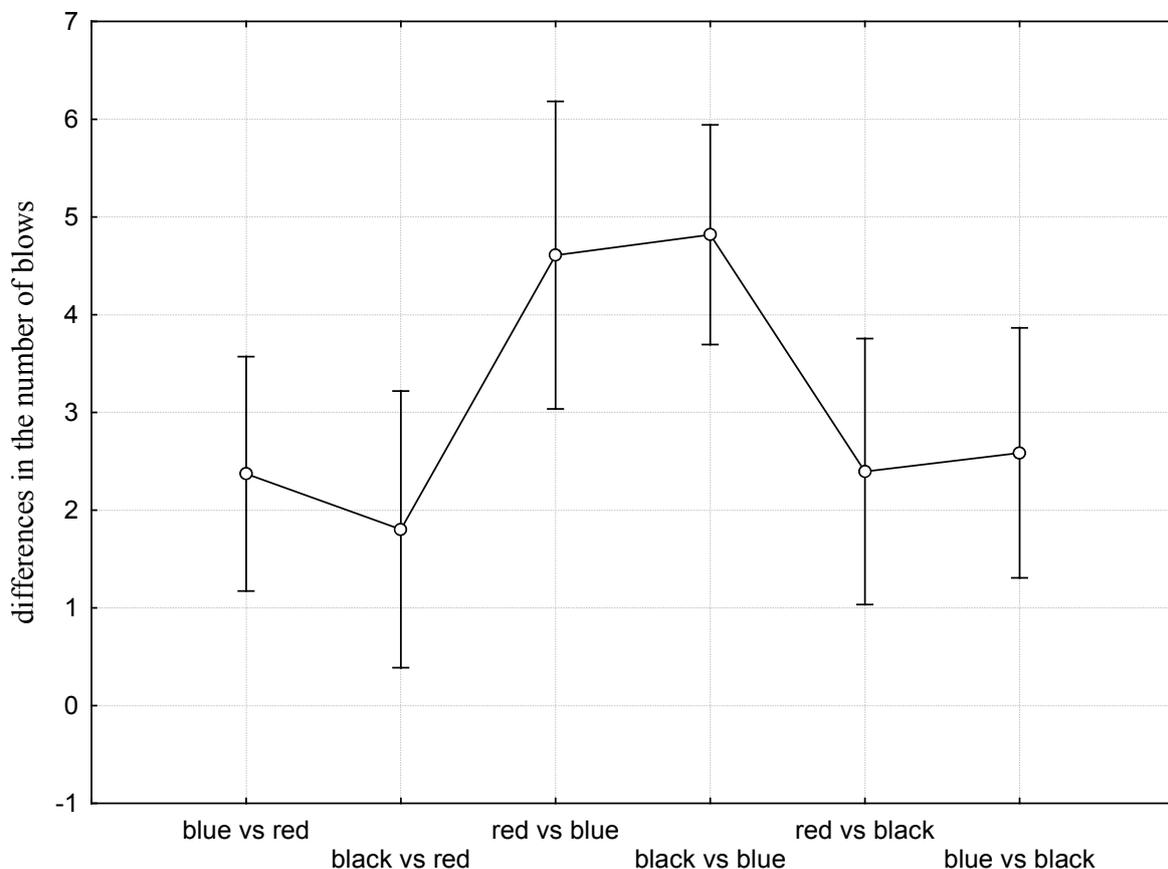
Results

Because of the problems mentioned in distinguishing the boxers when they wore boxing trunks that were the same color, it was impossible to design a 3 (first boxer in black, blue, red trunks) x 3 (second boxer in black, blue, red trunks) study. Therefore, the design of the study was 2 (participants' origin – China vs. Poland) x 2 (participants' gender) x 6 (experimental group – red vs. blue, blue vs. red, blue vs. black, black vs. blue, red vs. black, black vs. red). The dependent variable in this analysis was the difference in the perceived number of blows between the two boxers.

The mixed factorial ANOVA analysis demonstrated two significant main effects: "participants' origin" and "experimental group." The first of these effects demonstrated that the participants across cultures differed in their assessment of the fight: Chinese participants ($M = 2.08$, $SD = 4.04$) did not differentiate the numbers of blows by the two boxers as much as the Polish participants did ($M = 3.97$, $SD = 5.2$); ($F(1, 266) = 13.47$, $p = .0003$, $\eta_p^2 = .05$).

The main effect "experimental group" confirmed that the color of the boxing trunks influenced the perceived number of blows ($F(5, 266) = 4.09$, $p = .001$, $\eta_p^2 = .05$). We found that the participants assessed the boxers wearing black ($M = 4.82$, $SD = 3.69$) and red ($M = 4.61$, $SD = 5.3$) trunks as being higher in supremacy when they fought against a boxer wearing blue trunks (significantly higher than in all the other groups; i.e., blue-red, black-red, red-black, blue-black, LSD post hoc tests, $p < .03$, at least). This indicates that no significant differences in the number of blows by both boxers were observed when the boxers' trunk colors were changed from black to red, and vice versa ($M = 1.8$, $SD = 5.29$ vs. $M = 2.4$, $SD = 4.42$, $p = .52$), whereas the differences were significant when the colors were changed from black to blue, and vice versa ($M = 4.82$, $SD = 3.69$ vs. $M = 2.59$, $SD = 4.87$, $p = .02$), and from red to blue, and vice versa ($M = 4.61$, $SD = 5.3$ vs. $M = 2.37$, $SD = 3.9$, $p = .01$) (see Figure 1).

Figure 1. Color of outfit and the perceived number of blows.



Note. The figure presents the advantage in number of blows landed by blue boxer (fighting against red boxer), black (against red), red (against blue), black (against blue), red (against black) and blue (against black).

The hypothesis about the cross-cultural differences in the influence of boxing trunk colors on the perception of the result of a fight was not confirmed. The interaction effect “(experimental group) x (participants’ origin)” was not significant ($F(5, 266) = .72, p = .61, \eta_p^2 = .01$). Additionally, an analysis 2 (participants’ origin) x 2 (participants’ gender) x 3 (boxing trunk color) was conducted separately for the winning and losing boxers. The dependent variable was the difference in the number of blows between the two boxers.

Interestingly, in the case of the winning boxer, the color of his boxing trunks did not influence his perceived supremacy ($F(2, 278) = 1.05, p = .35, \eta_p^2 = .01$). Additionally, no interaction effect “(experimental group) x (participants’ origin)” ($F(2, 278) = 1.18, p = .31, \eta_p^2 = .01$), again, demonstrated cross-cultural similarities in the influence of boxing trunk colors on the perception of the result of a fight.

Similar analysis conducted for the losing boxer ($F(2, 278) = 9.7, p = .0001, \eta_p^2 = .1$) showed that the blue-trunked boxer’s loss ($M = -4.71, SD = 4.56$) was more clearly perceived than both the black-trunked boxer’s loss ($M = -2.05, SD = 4.72$) and the red-trunked boxer’s loss ($M = -2.51, SD = 4.66$). No cross-cultural differences were found – the interaction effect “(experimental group) x (participants’ origin)” ($F(2, 278) = 1.33, p = .27, \eta_p^2 = .01$) and all other effects were not significant (all $ps > 0.1$, at least).

Discussion

The present study is one of the first experimental attempts to show the influence of boxing trunk color on the perceived result of a fight. Additionally, this is the first study of this kind conducted, at least partially, outside Western culture.

First, our results fully confirm the outcome of Hagemann et al.’s (2008) study. It seems, therefore, that the “red wins” and “black wins” effects are not necessarily a consequence of the mechanisms related to the two boxers fighting (although at this stage of research, such a hypothesis cannot be refuted). The red- and black-trunked boxers appeared stronger, more aggressive, and more dominant to the observer (referee) than their opponents. This might be the reason – especially in a close fight – the boxers wearing red or black trunks were perceived as the winner and/or received more points. Such an explanation is very probable in the context of the study presented by Hill and Burton (2005), in which the number of red-trunked boxers who won fights was particularly high in the case of fights close to finishing in a tie. In such fights, the final result depends on the points given by the judges, and – importantly – in some disciplines, in the case of a tie, the judges choose the winner, picking the one they perceive as performing better. This line of thinking is consistent with the results obtained in Sorokowski and Szmajke’s (2007) study. They demonstrated that a boxer in red trunks was assessed as being a more aggressive and better fighter than a boxer in blue trunks (but only on the trend level). At the same time, the color of the boxing trunks did not influence

the assessment of technical abilities and physical qualities of the boxers (like strength and resistance). Our study additionally demonstrated that the perception of the color black was similar to that of the color red. It is also important to state that in our study the “red wins” and “black wins” effects were not strong enough to change the result of the fight.

In the present study, we also showed that the “red win and black win” mechanism extends beyond Western culture. On the one hand, in three previous cross-cultural works on emotions and colors, it was shown that people rather consistently associate light colors with good qualities and dark colors with bad qualities (Adams & Osgood, 1973), and that the color red is seen as strong and angry (Adams & Osgood, 1973; Hupka et al., 1997). On the other hand, these studies were conducted mainly in Western societies, where red usually refers to passion, danger, blood, and anger, but also to love (Mahnke, 1996). In contrast, in China, the color red has largely positive connotations that are associated with courage, loyalty, honor, success, fortune, fertility, happiness, passion, and summer (Cullen, 2000). In China, red even represents increases in market shares, whereas green represents losses (which is exactly opposite to Western culture) (Jiang et al. 2013). Similarly, in Chinese cultural traditions, red is associated with weddings (brides traditionally wear red dresses), and red paper is frequently used to wrap gifts of money or other things. Mainland Chinese people describe business prosperity as “red and fire” and rich and noble people as “coming from the red door” (Jiang et al., 2013; Xu, 2007; Zhao, 2010). Because of such cultural associations with the color red, Hulbert and Ling (2007) used a Chinese sample in their study investigating the universality of preferences for certain colors (however, the Chinese in the sample represented those of Chinese origin residing in the United States).

Our results suggest that even though colors might be perceived in different ways in different cultures in everyday conditions, in a boxing match and in other sports competitions, emotional connotations might be similar. The way the color red is connected with human and animal physiology seems crucial. Because this topic has been analyzed in many previous studies (e.g., Attrill et al., 2008; Hill & Burton, 2005; Sorokowski & Szmajke, 2007) we only note that in animals, among many species, red coloring or red skin are signals of the male’s quality in terms of sex and testosterone level (Bakker & Milinski, 1993; Pryke, Andersson, Lawes, & Piper, 2002; Setchell & Wickings, 2005; Waite et al., 2003). Despite many suggested explanations, such a phenomenon seems to be connected, above all, to male competition and showing superiority to other males (Gerald, 2001; Pryke et al., 2002; Setchell & Wickings, 2000). The results of the ethologists’ research presented above allow us to state that a male’s red coloring is a factor in facilitating his victory over other competing males.

Biological bases of stereotypes regarding the color red have been discussed in many studies (e.g., Attrill et al., 2008; Hill & Burton, 2005; Sorokowski & Szmajke, 2007), but not much is known about the color black. It is

also possible that some biological mechanisms exist that explain the stereotype of “powerful and aggressive black.” For example, some studies have shown that the color black in animals might convey some information. The darkness of an African lion’s mane indicates nutrition and testosterone level, and it influences both female choice and male-male competition. For example, dark-maned males enjoy longer reproductive life spans and higher offspring survival (West & Packer, 2002). Additionally, as indicated by Borodin (1990), melanism – black pigmentation – is the second most popular mutation (after albinism). However, in contrast to albinism (present only in some organisms), melanism frequently spreads among many members of a given population, sometimes becoming characteristic for a species (e.g., in the case of the black rat). Frequency of melanism in natural populations is caused by a particular characteristic of black-pigmented organisms – they are especially resistant to stress (Borodin, 1990). In practice, the belief about higher levels of “toughness and resistance” in black organisms is popular among breeders of many animals, for example, horses (Gless, 1988, p. 61). It is thus possible that an association with strength, toughness, resistance, etc., is automatic and subconscious and/or is related to the observation of melanism in animals. In this second case, such an association could become a cognitive heuristic in the perception, assessment, and prediction of events. Consistent with this heuristic, people expect that an individual who is “darker”/“wearing a dark outfit,” particularly in a stressful situation (e.g., during a fight), should be more “tough and resistant.” This individual would be perceived as a prospective winner, as it is easier to notice elements related to his victory (e.g., number of blows landed) in his actions.

Therefore, although the perception of colors seems different in various cultures (e.g., Jiang et al., 2013), in a fight, or while watching a fight, an evolutionary schema might be activated and as with many other animals, including fish (Bakker & Milinski, 1993), birds (Pryke & Griffith, 2006), and primates (Setchell & Wickings, 2005), dark and red colors are associated with aggression and dominance. In this context, we might presume (although further evidence is necessary) that even if “black wins” and “red wins” effects are only in the eyes of the beholders, their bases might be biological.

We observed some surprising cross-cultural differences in the assessments of more-or-less even fights. The Polish participants saw an average of 27.6 blows in a fight, while the Chinese participants saw an average of 21.7 blows. It is possible that the participants from the different countries did not have the same level of knowledge concerning boxing matches. The Polish participants might have perceived some blows hitting the gloves, etc., as successful and effective. Some other cultural explanations for the observed differences also might exist. For example, the Chinese participants might have assessed the struggling, brave boxer as being a better boxer, even though he lost the fight; alternatively, the Polish participants might have perceived the losing boxer as being worse than he was in reality.

Our study also demonstrated that the influence of color might be significant only in a certain context. Although the results are only preliminary, they suggest that colors modify the perception of losing competitors to a higher extent than the winning ones. It is possible that the winning competitors’ abilities, and not the color of their uniform, were a factor in winning. However, in the case of losing competitors, a blue uniform decreased their positive assessments. The fight presented in our study was relatively even. It would be interesting to investigate whether similar results could be obtained in the case of dramatic supremacy of one of the competitors. As the color black is, at least in Polish culture, associated with death, depression, and sadness, would a person wearing black be assessed as being even weaker than he was in reality?

On the other hand, reasoning regarding a higher influence of color on the perception of losing competitors than on the winning ones might not be justified. Figure 1 suggests a different interpretation, related more to the perception of the winning boxer. A winning boxer might benefit from wearing black or red trunks (perceived as being a better performer) only when a losing boxer wears a non-aggressive color, such as blue. However, when a losing opponent wore black or red trunks, this was not observed – the winning boxer was not perceived as being a better performer, no matter what color his trunks were. This is beneficial for a weaker boxer, because then the difference between him and his opponent is not so apparent, independently from the color of the winning boxer’s trunks.

The results of our study can also help to understand why the “red wins” and “black wins” effects are observed only in some disciplines – mainly in combat sports, like boxing or wrestling – and only sporadically (or maybe never) in team sports (basketball, volleyball, football, etc.). In combat sports, the referees’ decisions on whom they should assign points, influencing the result of a competition, are not very frequent and are not visible at all to spectators (like in boxing) or are visible only sometimes (like in wrestling and Taekwon-Do). This situation is completely opposite to that of team sports, where the decisions of a referee are very frequent and can be seen all the time. If the boxing referee is subconsciously influenced by the color of the boxer’s trunks, the outcome of his actions can be observed only when the final verdict is announced. In football, basketball, and volleyball, all the decisions of a referee are visible to the spectators (usually fans of both teams). The perception of fans, of course, is not objective, as they tend to favor their own team. Following the Hastorf and Cantril (1954) experiment, we now know that the fans of a certain team see more effective throws/moves by their team (and more fouls and mistakes by their opponents) than the fans of the opposite team. In team sports, a referee whose decisions were influenced by the color of a team’s uniform would receive very strong, criticizing feedback from the spectators (who easily notice all the decisions made against their team). Therefore, in such a case, using schemas related to uniform colors is less likely than in the case of a boxing referee, who does not get any feedback from the spectators during the competition, but only after it is finished.

Our study has certain limitations. In further studies, it would be useful to introduce a control group observing competitors wearing the same color (however, in such a case, it would be difficult for judges to distinguish them). Another solution could be creating a maximally even fight (but that also would be difficult).

In our study, the participants watched a fight in which both competitors performed many blows during two minutes, and it was a relatively difficult task for them. This might have made the results more significant. It is hard to determine whether the same results would be observed if there were only a few important blows in the fight. The outcome of the fight was determined not only by the number of blows but also by “clean strikes.” Although the participants were informed about what they should count, they probably noticed more blows than the professional referees did. Hence, the probability of a significant distortion of the perception of the number of blows decreases during a real boxing match. For this reason, we suggest that further studies should involve real referees, and not students. Another limitation is the fact that the participants completed the task in group sessions, not individually. However, the problems related with watching the video as a group (e.g., seeing the fight from different angles) were averaged across the experimental group, so the group method should not have influenced the results significantly.

The results of the experimental studies on the influence of colors on the competitors’ performances should be taken into account when regulations for disciplines are created. The competitions should be as objective and as fair as possible. In some disciplines, this problem has already occurred. For example, in 1997, the International Judo Federation decided that during the fight, one of the competitors had to wear a blue judoga (although the Japan federation opposed this regulation) (Matsumoto et al., 1997). Some people from the discipline suggested that such changes should be preceded with appropriate research regarding their possible influence on competitors’ performances (Matsumoto et al., 1997).

In summary, our study is the first one to experimentally show the existence of the “black wins” effect. It also confirmed the “red wins” effect in boxing matches. In addition, we demonstrated that both of these effects are similarly strong in both Poland and China, and thus it is potentially a cultural universal. Finally, our results suggest that context might play a very important role in the assessments of the boxers – color influenced the perception of the weaker boxer. We suggest that because the topic of the influence of colors on sports competitions has not been thoroughly investigated, further studies are necessary. For example, we know exactly how colors influence intersexual competition in Gouldian finch birds (*Erythrura gouldiae*) (e.g., Pryke & Griffith, 2006) and in many other species of lizards, fish, etc. (hundreds of studies exist in this area), but we did not explore fully how these mechanisms work in humans.

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