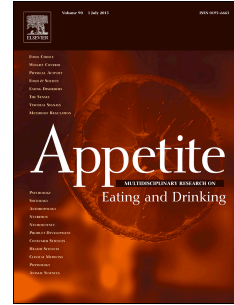# Journal Pre-proof

Can the color red trick you into drinking less? A replication study

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Can the Color Red Trick You into Drinking Less? A Replication Study

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Abstract

This replication of the study of Genschow et al. (2012) examines the effect of the color red on beverage consumption. In total, 148 men were asked to consume drinks in either red- or blue-labeled cups. Cup labels were assigned at random. Unlike in the previous study, the findings in our replication study did not provide empirical support for the hypothesis that people will drink less from red-labeled cups than blue-labeled cups. The difference between groups in drink consumption was non-significant. Thus, the red color did not have an inhibitory effect on drink intake.

Keywords: red color, intake, priming, avoidance behavior, general avoidance motivation

1 Introduction

Color is one of the most important factors people take into account when forming expectations about how food or drink will taste, and these expectations subsequently influence taste experience (Piqueras-Fiszman & Spence, 2015). According to some previous

research, viewing objects that are red can reduce food and drink consumption (Bruno et al., 2013; Genschow et al., 2012;). If the color red can reduce food and drink consumption, this could contribute to overall health in the general population, for example, to help reduce the prevalence of obesity. However, the results of studies examining the effect of color on consumption have been inconsistent.

Genschow et al. (2012) conducted a study with 41 participants and found that people drank less from red-labeled cups than blue-labeled cups. Then, with 120 participants, they examined the effect of the color red on pretzel consumption. Participants who ate from a red plate consumed fewer pretzels than those with blue or white plates. The authors explained this effect by the fact that when the color red occurs in nature in connection with food, it serves as a signal to "stop". The inhibitory effect of the color red was also supported by Bruno et al. (2013). They found participants consumed smaller amounts of popcorn (N = 90), chocolate chips (N = 75), and cream (N = 75) when using a red plate, as opposed to a blue or white plate.

However, some recent research has not supported the inhibitory effect of the color red on food and drink consumption. Carstairs et al. (2019) investigated the effect of plate color on snack consumption in 36 kindergarten children and found the amount of food they consumed was not affected by whether the plate was red, white, or green. Akyol et al. (2018) even found a positive effect of red on food consumption in 54 women who ate breakfast, lunch, and dinner from a white, red, or black plate. The results showed that participants ate more food from the red and black plates than from the white plates (see the summary of all available experiments on the effect of red on consumption in Table 1).

Table 1. Summary of experiments focused on the effect of red color on consumption

Study	Consumed food/drink	Colors	Sample	Findings
Akyol, et. al. (2018)	Pasta	red vs. black vs. white	54 Turkish female university students	The energy intake by eating from red plates was higer in comparison to white plates and similar to black plates.
Angka et al. (2020)	Cucumber	red vs. white	216 children form Denmark and Indonesia aged 8-11	Red plate color did not influence cucumber consumption.
Bruno et. al. (2013)	Popcorn	red vs. blue vs. white	90 (popcorn), 75 (chocolate) and 75 (cream) Italian university students	Red plate color reduced popcorn, chocolate and cream consumption.
Carstairs, et. al. (2020)	Cheese, Breadsticks, Peaches, Pears	red vs. green vs. white	36 English speaking children aged 3-5 years	Red plate color had no effect on food consumption.
Genshow et al. (2012)	Ice tea, pretzels	red vs. blue	41 (Ice tea) and 107 (pretzels) German speaking male university students	Red label reduced drink consumption, red plate color reduced pretzel consumption.
Reutner, et. al. (2015)	Grapes and chocolate	red vs. white	82 European university students of psychology	Red plate color reduced chocolate consumption but not grapes consumption.

There are several possible explanations for these inconsistencies in the results of previous experiments examining the effect of red on how much food or drink is consumed. First, there is a possibility of false-negative results in experiments that did not find an effect. These experiments had relatively small sample sizes, and therefore, a low observed power. Thus, there was a good chance they would not find an effect even if one existed. Second, there is also a possibility of false positives in the studies that found an effect. The effect of the color red on food and drink consumption is related to the concept of priming, which has become a recent target of criticism, as attempts to replicate the effect of priming have failed repeatedly (Forwood et al., 2015; Pashler et al., 2012). Schimmack et al. (2017) highlighted a possible publication bias regarding priming effects, arguing that the number of published replication studies that support the original findings has been conspicuously high, considering that most of these studies were conducted with small samples and featured statistical analysis demonstrating low observed power. Furthermore, studies reporting a significant effect of red on consumption were not pre-registered and had small samples and low observed power, as was found in other studies on priming, and the results could not be replicated. Third, it is possible that the effects of a red container on consumption found in previous studies only exist in certain conditions or contexts, such as a contrast in colors between the food and container (Bruno et al., 2013; Van Ittersum & Wansink, 2012;), whether the food is perceived as healthy or unhealthy (Reutner et al., 2015), and cultural differences in color perception (Shankar et al., 2010).

It is also important to consider the theories on which the original study was based to see why the color red may reduce food and drink consumption relative to other colors. Genschow et al. argue that the color red is easy to detect due to its high contrast against most other colors occurring in natural environments. Based on this presumption, the authors conclude that the color red is naturally predisposed as a warning signal. For example, they include animals with an effective chemical protective mechanism of red coloration (e.g., the fire-bellied toad, the lady beetle, the burnet moth). They also mention examples from man-made environments in which the color red signals danger, prohibition, or the need for vigilance (e.g., red traffic lights, stop signs, red alert). The conclusion is that these biological predispositions and culturally learned associations might represent the mechanism responsible for the fact that red seems to induce a general avoidance motivation.

In our opinion, this theory is missing one important aspect which is that the color red can have the opposite effect as well. It can similarly lead to an inclination to an object. In the natural

environment, for example, there are red berries whose red color signals ripeness and readiness to be eaten. Or in the context of sex and romance, red serves as a signal of sexual receptivity, for example, red coloration on the chest or genitals of some primates (Deschner et al., 2004; Dixson, 1983). A similar example can be found in human culture, where red has been associated with sex and romance across the ages in mythology, traditions, and fashion (Aslam, 2006; Elliot & Maier, 2012; Knight et al. 1995). Our point is that the color red in nature as well as in man-made environments is more likely a signal of alert and excitement or importance, with no clear evidence that the alert should always be in the context of something negative that should elicit avoidance behavior. The color red can lead to inclination to the object as well, in both nature and the human environment. Therefore, the theoretical mechanism presented in the original study could be questionable, offering another possible explanation for why the research on the color red shows that much inconsistency.

In order to lean toward any of the above explanations, it is necessary to perform pre-registered close replication studies of previous experiments, using sample sizes that are adequate to test differences in consumption and equivalence with sufficient observed power, thus providing sufficiently strong evidence either for or against the effect. Such replications will also allow researchers to conduct meta-analyses of the main effect and look for potential moderators which could explain the differences between studies that did and did not support the effect of red color on consumption.

In this brief study, we took the first step by performing a pre-registered close replication of the first experiment that found support for the effect of red on consumption (Genschow et al., 2012). In this experiment, the authors investigated the effect of color on three different flavors of soft drinks. For two flavors, the p-values indicating the significant effects were very close to $p = .05$; for the third flavor, the effect was non-significant ($p = .12$). A summary analysis, including all three flavors also reported a high p-value ($p = .04$). Thus, the combination of low observed power and a high p-value raises concerns regarding the replicability of the experiment's result (e.g., Lindsay, 2015) and makes the study a suitable candidate for close replication.

In our replication study, as in the original study, we tested the hypothesis that people will drink less from red-labeled cups than from blue-labeled cups.

2 Methods

Our study was a pre-registered close replication of the first experiment by Genschow et al. (2012). We used the same procedure as in the original study with only minor changes, as explicitly described below. Pre-registration information is available at the following website: https://aspredicted.org/bg2fh.pdf.

2.1 Sample

The sample consisted of 148 men. We estimated this sample size using G*Power (Faul et al., 2009) to achieve 80% power for 75% of the original effect size (i.e., $f = .285$) at a 1% significance level. This sample was also more than 2.5 times larger than the original sample ($N = 41$), which allowed for the testing of nonequivalence with 80% power (Simonsohn, 2015). Therefore, the sample size is large enough to provide strong support either for or against the effect size reported in the original study. Initially, 156 men were selected to participate in the study; however, eight were excluded before the end of data collection because they did not meet the pre-registered criterion as they had drunk more than three alcoholic drinks within 24 hours before the experiment. In the rest of the sample, the respondents had drunk in average .23 dcl of wine ($SD = .79$), 1.02 dcl of beer ($SD = 2.8$), .03 cl of liquors ($SD = .12$) and .07 dcl of other alcoholic drinks ($SD = .59$) within 24 hours before the experiment started.

In line with Genschow et al. (2012), we included only men in the sample because their pretest revealed that women, on average, drank only half as much as men. In our study, we used a convenience sample of young workers and students aged 18 to 32 years ($M = 21.92$; $SD = 2.45$). We contacted all participants via Facebook or in person at the university.

2.2 Procedure

For our experiment, we chose group administration with a maximum of four participants per group. To avoid interference, participants always sat at a distance of 4 m apart, with their backs toward each other. For the first administration, we used a random number generator to assign participants to two experimental conditions, one with red-labeled cups and the other with blue-labeled cups. Subsequently, throughout the data collection, the blue and red labels regularly alternated.

The procedure was similar to that reported by Genschow et al. (2012), and we chose stimulus material from that study (i.e., shades of red and blue used[1], size and shape of the label[2], the wording of the questionnaire, and the specific types of beverage they used). As in the original study, participants received iced tea served in three cups with either red or blue labels. The authors of the original study used three different flavors of tea; however, we used one flavor of iced tea (peach flavored black iced tea) that was diluted by varying amounts. We did not feel this change from the original study would affect the inhibitory effect of red, as the experiment is not focused on a specific type of beverage.

Each experiment took place in the same room at the university. Participants were given instructions, after which they provided signed informed consent. They were then asked to drink water until they were not thirsty. Three cups with 220 ml of iced tea were placed in front of each participant. They were labeled A (tea diluted 1:2), B (1:1), or C (undiluted). The letter A, B, or C was printed on either a red or blue label, depending on the experimental condition to which the participants were assigned. Within the group administration, all participants in each group had cups with the same color labels. We weighed all the cups before and after the experiment and recorded the amount of drink consumed in grams (i.e., dependent variable).

Participants were instructed to taste all three drinks and remember how they tasted. They could drink as much as they wanted, in any order. They were allowed to go back to previously tasted cups. Subsequently, they had to complete a short questionnaire, in which they evaluated the taste of each tea on a nine-point scale. It also contained questions about alcohol consumption in the past 24 hours, the current hunger level on a five-point scale, and age. The final question asked them to write a guess as to what they thought the research was about. The only extension in comparison to the original study controlling for the effect of hunger and an additional question on whether the participants presently felt affected by any alcohol consumed, because people can feel different effects from the same amount of alcohol. As in the original study, we excluded participants who reported drinking more than three alcoholic beverages in the past 24 hours. We ran supplementary analyses to control hunger, as it could affect the amount of drink consumed (McKiernan et al., 2009).

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[1] red: hue = 0, saturation = 240, lightness = 120; blue: hue = 160, saturation = 240, lightness = 120
[2] shape: circle; diameter = 5.5 cm

We did not reveal the real aim of the research to the participants because it would devalue the results. The authors of the original study (Genshaw et al., 2012) told participants that the research was interested in their opinion on the taste of soft drinks. Our study differed in the explanation of the experiment: we said that we were investigating the effect of previous alcohol consumption on taste. We consider this a to be a plausible explanation for the study procedure because alcohol played an essential role in our experiment, and we asked participants about their recent alcohol consumption. After the experiment, we debriefed the participants.

2.3 Ethical considerations

This research was approved by the committee of the Department of Psychology at the Faculty of Social Studies, Masaryk University, Brno, Czech Republic. The study was conducted in accordance with the American Psychological Association's (2017) ethical principles and the Ethics Code of conduct. Written informed consent was obtained prior to data collection. Data were processed anonymously, and personally-identifying information was not collected from participants. The data matrix and materials have been made publicly available via the Open Science Framework and can be accessed at https://osf.io/fec8s/?view_only=5e07ec517d994d66b5fb7aec031456bd.

2.4 Data analysis

First, we conducted descriptive analyses to examine our data and possible violation of assumptions in performed statistical analyses. To test our hypothesis, we performed one-way ANOVA as the original study did. Cup color was used as an independent variable and mean composite of drink intake as a dependent variable. We also conducted a multilevel linear model as a supplementary analysis which enabled us to control for the variable of hunger and consider the influence of individual beverage type. Apart from the main hypothesis testing, we performed equivalence tests for the hypothesis that the difference in the amount of drink consumed from red - or blue-labeled cups was less than small. For all analyses, the significance level was settled to 0.05. For performing statistical analysis, we used IBM SPSS Statistics 25 and Jamovi 1.6.15 (The jamovi project, 2021).

3 Results

Our research aimed to determine whether people drink less from the red-labeled cups than from blue-labeled ones. In total, 72 (48.6%) and 76 (51.4%) had blue- and red-labeled cups, respectively. Descriptive statistics for the dependent variable (i.e., mean tea intake) are shown in Table 2 and Figure 1.

The control variable (i.e., hunger) was similar for both groups (blue label: *M*: 3.11, *SD*: 1.33, red label: *M*: 3.08, *SD*: 1.32; $U = 2699.5$, $p = 0.885$); therefore, hunger should not have affected the study results.

Table 2. Mean tea intake in grams

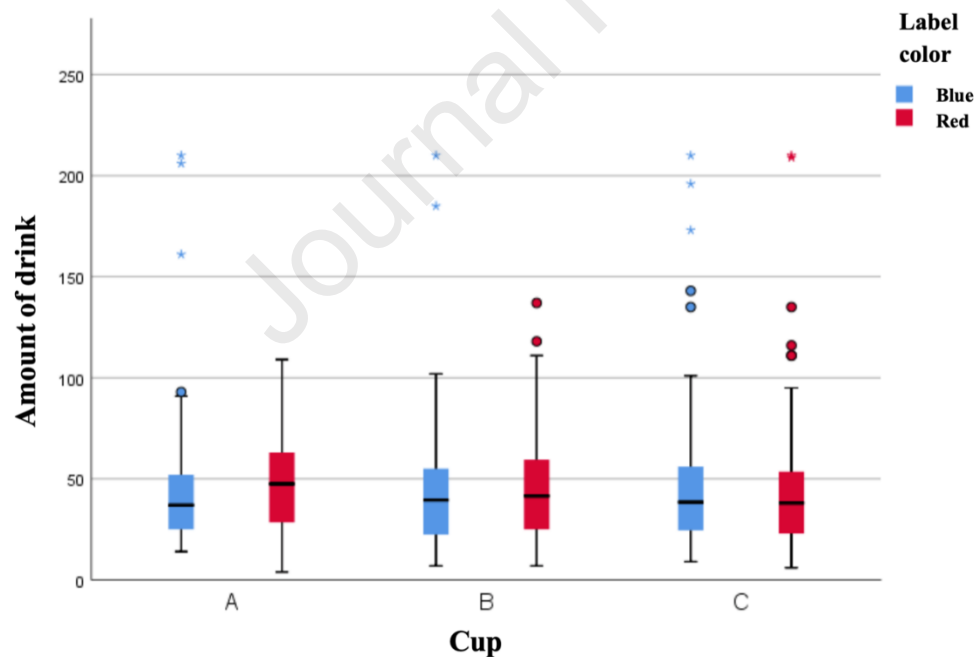|	Cup A		Cup B		Cup C		Total	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Blue label	44.97	36.03	45.29	34.72	48.51	40.26	138.78	98.61
Red label	47.07	22.84	46.32	27.44	45.57	37.63	138.95	79.70

Figure 1. Mean intake for all drinks served in either blue- or red-labeled cups.

3.1 Hypothesis testing

3.1.1 ANOVA

As was done in the original study, we used a one-way ANOVA tested the hypothesis that people will drink less from red-labeled cups than from blue-labeled cups. The independent variable was cup color (blue or red), and the dependent variable was the mean composite of drink intake for all three cups. The distribution was right-skewed due to the outliers; however, the outliers had meaningful values. Therefore, we did not exclude them from the analysis. Since the assumption of normality was violated, we performed a logarithmic transformation of the dependent variable.

As seen in Table 2, participants with blue-labeled cups ($M = 138.78$ mg), on average, drank a similar amount as participants with red-label cups ($M = 138.95$). The difference between the two groups was practically (*Hedges' g* $= .002$, 95% CI [-. 32, .32]) and statistically non-significant ($F_{(1,146)} < 0.01$, $p = 0.99$). This finding did not support the hypothesis. The original study used multiple one-way ANOVAs: separately for Cups A, B, and C and for all of them together. However, this procedure is not suitable because of the increased probability of a type 1 error.

Our results were not consistent with the original study. In the original study, the data supported the hypothesis for the total amount of drink consumed ($F_{(1,39)} = 4.52$, $p = 0.04$, $\eta^2 = 0.10$), Cup A ($F_{(1,39)} = 4.20$, $p = 0.05$, $\eta^2 = 0.10$), and Cup B ($F_{(1,39)} = 4.08$, $p = 0.05$, $\eta^2 = 0.10$). For Cup C, the data did not support the hypothesis ($F_{(1, 39)} = 2.57$, $p = 0.12$, $\eta^2 = 0.06$).

3.3 Non-preregistered supplementary analyses

Genschow et al. (2012) also performed separate analyses for individual cups. In our study, there were no significant differences found in the amount of drink consumed for Cups A (F(1, 146) = .18, p = .672, g = -.07), B (F(1, 146) = .04, p = .842, g = -.03), or C (F(1, 146) = .21, p = .646, g = .08). The differences were very small, and for Cups A and B, the participants with red-labeled cups even drank a little more than the participants with blue-labeled cups (see Table 2).

3.3.1 Multilevel linear model

In addition to the one-way ANOVA, we also used multilevel linear modeling, which allowed us to control for the variable of hunger, while at the same time considering the influence of

individual beverage type. We tested the hypothesis that people will drink less from red-labeled cups than from blue-labeled cups. We also controlled for the effect of hunger.

We verified the assumption of a normal distribution using a histogram. The distribution was right-skewed due to the influence of outliers, which, however, had meaningful values. Because the assumption of normality was violated, we performed a logarithmic transformation of the dependent variable.

Table 3. Multilevel linear model

	Estimate	SE	df	t	p	95% CI	
						Lower	Upper
Intercept	3.74	0.14	156.65	27.44	0.001	3.47	4.01
Cup A*	0.07	0.04	296	1.77	0.078	-0.01	0.15
Cup B*	0.03	0.04	296	0.74	0.46	-0.05	0.11
Label color	0.02	0.1	148	0.17	0.868	-0.18	0.21
Hunger	-0.05	0.04	148	-1.36	0.176	-0.12	0.02

*Reference group: Cup C

First, we analyzed the model without predictors; -2LL for this model was 634.79 for 3 degrees of freedom. Our multilevel linear model (with predictors already included) did not show a significant difference between groups with red- or blue-labeled cups ($t_{(148)} = 0.17$, $p = 0.868$). The confidence interval included zero; thus, it is not clear whether the relationship between this predictor and the dependent variable was positive, negative, or null. None of the other predictors was significant (see Table 3). It seems that the amount of drink consumed does not depend on the type of drink; the confidence intervals include zero, so the predictor does not say anything about the dependent variable.

The control variable, hunger, also did not affect the amount of drink consumed (see Table 3). All predictors in this model were fixed; -2LL had a value of 629.78 for 7 degrees of freedom. Compared to the model without predictors, it decreased non-significantly ($x^2_{(4)} = 5.01$; $p = 0.714$). For the interaction between hunger and cup color, the -2LL model decreased to 627.5, compared to the non-interaction model, and the degrees of freedom increased to 8. However, the difference from the baseline model was not significant ($x^2_{(1)} = 2.28$; $p = 0.869$).

This interaction was not part of our hypothesis; however, we wanted to use it to test whether the effect of color on drink consumption differed according to hunger level. Nevertheless, the interaction of hunger and color was also non-significant (b = -0.11; $t_{(148)}$ = -1.52; p = 0.132; 95% CI = [-0.26−0.03]).

The results of the analysis were affected by several influential cases that affected the model. However, data for these people was meaningful and legitimately included in the analysis. The intraclass correlation was 0.37, meaning that the differences between people can explain 37% of the dispersion of the amount of drink consumed.

3.3.2 Equivalence testing

A non-significant result in "null hypothesis significant testing" means that we did not find support for the hypothesis. However, this cannot be interpreted as evidence of an absence of difference between groups. Therefore, we also performed equivalence tests for the hypothesis that the difference in the amount of drink consumed from red - or blue-labeled cups was less than small. Simonsohn (2015) recommends using "small-telescopes" for equivalence testing in replication studies. In the small-telescopes approach, two one-sided t-tests are used to test if the effect is significantly smaller than d33%, where d33% is the effect size that could be found in the original study with 33% power. According to our analysis (assuming balance groups, using G*Power, Faul et al., 2009), the smallest effect of interest should be d33% = |.49| when replicating the original study (Genschow et al., 2012). Two one-sided t-tests supported the hypothesis (upper: t(137) = -2.98, p = .002; lower: t(137) = 2.96, p = .002) that the effect of color label was smaller than d = |.49|. Therefore, our findings provide support against the hypothesis that people will drink less from red-labeled cups than blue-labeled cups. However, effects slightly weaker than d < |.49| could be still considered as relevant and practically significant (see Lakens, Scheel and Isager, 2018). Nevertheless, the effect that we found in our replication is even smaller than d < |.32| (upper: t(137) = -1.95, p = .027; lower: t(137) = 1.93, p = .028) which is the d33% for the second study of Genshow et al. (2012).

4 Discussion

In this study, we replicated the first experiment by Genschow et al. (2012), which focused on the inhibitory effect of red color on drink consumption. We tested the hypothesis that people will drink less from red-labeled cups than from blue-labeled cups. Unlike the original study, we did not find support for the hypothesis that color affects consumption amount; however, we find support against it. The difference between the amount of drink consumed from the red- and blue-labeled cups was close to zero. According to our results, the label color did not affect the amount of drink consumed. A possible explanation for the difference between the original study and our replication is that the effect of red on consumption may exist only under certain conditions or in specific contexts. Cultural differences in color perception between participants in both experiments may also play a role; however, Genschow et al. (2012) did not assume that the effect of color on consumption could be culturally conditioned. Furthermore, we found nothing in previous literature on color perception that would explain relevant cultural differences between students from Switzerland and the Czech Republic, which are two culturally and geographically close Central European countries.

The results could have been affected by minor differences in the procedures of the original experiment and our replication. In our study, the drink consumed was more brownish, while in the original study, it was more yellowish. According to Van Ittersum and Wansink (2012), the contrast between package color and the color of the food or drink can affect color priming. However, other studies, such as Bruno et al. (2013), did not confirm the effect of color contrast on consumption. Moreover, the theory explaining the effect of red on beverage consumption (see Genshow et al., 2012) does not suggest that this inhibitory effect should only appear when there a specific color contrast between the label and beverage.

Another possible explanation for the difference in the results of the original study and our replication is that our results represent a false negative. That is, the inhibitory effect of red on consumption exists, but unlike in the original study, we could not find it. However, the sample in our study was more than three times larger than that of the original study. Furthermore, we also performed equivalence tests, which indicated there is a very small probability of a practically significant effect of color on drink consumption in the general population.

The result of the original experiment may have been much stronger than the real effect, or even a false positive. We consider this a more plausible explanation. The original experiment had a very small sample size, and the difference in the amount of drink consumed between the

groups with red- or blue-labeled cups was barely statistically significant. Studies with small samples may suffer from nonequivalent groups. Only 41 people participated in the experiment by Genschow et al. (2012), and it could easily be the case that some participants in either condition were more thirsty or hungry than others. Our study, similar to Carstairs et al. (2019) and Akyol et al. (2018), showed that the inhibitory effect of red on consumption might not be generally valid.

Strengths and limitations

We replicated an experiment conducted by Genschow et al. (2012) by matching the design of the original study. We used the same instructions, stimulus material, and data collection methods. None of the minor deviations from the original procedure (i.e., the use of diluted iced tea instead of the three types of iced tea or a slightly different shade of beverage) should be a reason for the general inhibitory effect on consumption. In our experiment, we used differently diluted iced teas which could affect the perceived taste and unhealthiness of the drink. Reutner et al. (2015) suggest that the unhealthiness of the consumed drink could influence the effect size of the red color on the amount of consumed drink. Our results do not show that the degree of dilution influences effect size. Nevertheless, participants drank a little less of the undiluted drink when compared to the diluted drinks, however, this difference was anecdotal (Hedges g = 0,07). In our study, we had a sample that was three times larger than the original; therefore, we had significantly higher observed power. Furthermore, we pre-registered the hypothesis, procedure, sample size, and statistical analysis. Thus, we believe that our study provides strong empirical evidence against the hypothesized inhibitory effect of red on consumption.

The limitations of this study are similar to those of the original study. One is the absence of a control group with cups that do not have a colored label, for example, transparent labels. Although Genschow et al. (2012) considered the group with blue-labeled cups to be a control group, some studies suggest that the color blue can also affect consumption (Grah et al., 2015). Therefore, our study provides evidence against the differential effects of red and blue on consumption, not against the effect of red.

Many factors affect how much a person drinks at a time. This is also evidenced by the high standard deviation in the amount of beverage consumed. Other factors may include people's subjective experience with a particular color, diet (Koch et al., 2018; Leech, 2019), or

smoking habits (Lee, 2017). As with Genshow et al. (2012), we did not control for the influence of these variables; thus, we cannot exclude their effect on the amount of drink consumed in our study. However, given the sizes of the compared groups, we assume that we managed to randomize the influence of these factors.

Implications

The results of research on the effect of red on consumption are inconsistent. To our knowledge, none of these studies has been successfully replicated so far. Our replication suggests that several positive, not pre-registered studies could present a random effect and that the popularity of the effect of the color red on consumption could be due to publication bias. Nevertheless, further pre-registered replications of other experiments need to be conducted and present positive result to show whether an inhibitory effect of the color red on consumption exists or if it is context-dependent. If some replications are successful, further research should focus on the context in which the effect is manifested.

In Genshow et al. (2012), there is also an opportunity for further replication. According to Piqueras-Fiszman et al. (2012), plate color affects how people perceive food. Similarly, instead of a colored label, a red cup could be used. For some participants, the label may not have been expressive enough, and in the case of a red container, the effect could be more pronounced.

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Can the Color Red Trick You into Drinking Less? A Replication Study

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Ethical considerations

This research was approved by the committee of the Department of Psychology at the Faculty of Social Studies, Masaryk University, Brno, Czech Republic. The study was conducted in accordance with the American Psychological Association's (2017) ethical principles and the Ethics Code of conduct. Written informed consent was obtained prior to data collection. Data were processed anonymously, and personally-identifying information was not collected from participants.