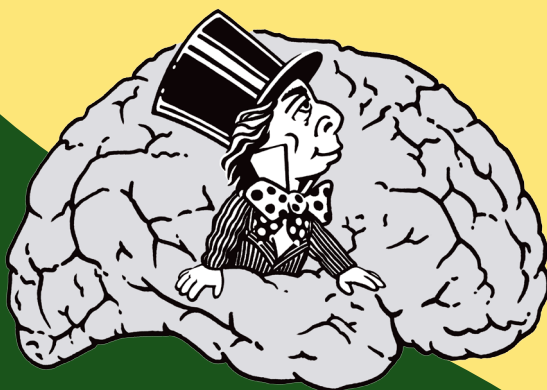


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IN SEARCH OF THE STROOP INCONGRUITY EFFECT

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Abstract. Recently, a new effect related to the Stroop task (Stroop, 1935) was reported (Hatukai & Algom, 2017). Participants were presented with Stroop stimuli that could be congruent or incongruent. They were asked to judge a third dimension of the stimuli unrelated to the Stroop conflict; the judgments were faster if the stimuli were incongruent. The authors named this phenomenon the Stroop incongruity effect and suggested an explanation based on the idea that Stroop-incongruent stimuli elicit negative affect that people try to avoid, resulting in faster responses. Our study is part of a larger project aimed at finding alternative explanations for the Stroop incongruity effect. We first attempted to replicate the effect. In Experiment 1 (27 participants), the classical Stroop effect was obtained; however, the Stroop incongruity effect was not replicated. We suggested that this failure could be due to the unequal salience of the Stroop dimensions of our stimuli. In Experiment 2 (32 participants), we made both Stroop dimensions of the stimuli equally salient but still found no Stroop incongruity effect. We can conclude that even if this effect exists, it is rather unstable and depends on some subtle and yet unknown characteristics of the stimuli or procedure.

Keywords: Stroop effect, Stroop incongruity effect, negative affect, replication study, interference

The study was implemented in the framework of the Basic Research Program at the National Research University Higher School of Economics (HSE University) in 2023.

Introduction

Recently, a new effect related to the Stroop task (Stroop, 1935) has been reported (Hatukai, Algom, 2017). Participants were presented with Stroop stimuli that could be congruent and incongruent. Unlike the traditional paradigm, participants were asked to judge a third dimension of the stimuli unrelated to the Stroop conflict. It is noteworthy that the judgments were faster if the stimuli were incongruent. The authors named this phenomenon the Stroop incongruity effect and suggested an explanation based on the idea that Stroop-incongruent stimuli elicited negative affect that participants tried to avoid giving faster responses.

Our study is a part of a larger project aimed at finding alternative explanations for the Stroop incongruity effect since the evidence presented in the original

study seems insufficient for the negative affect explanation. We first attempted to replicate the effect, and the results are reported below.

We chose Experiment 2 of the original study for the replication because its procedure and results were the most straightforward. The stimuli were arrows with two Stroop dimensions – vertical position and direction – and a non-Stroop dimension – color. In the Stroop task, participants were asked to make vertical position judgments; in the non-Stroop task, they were asked to make color judgments. The authors reported the Stroop effect of 52 ms and the Stroop incongruity effect of 22 ms; both were statistically significant.

Experiment 1

Method

Participants. Twenty-seven participants took part in the experiment, including 15 in the “position” condition (8 females and 7 males, aged 18 to 26 years, $M=20.47$, $SD=2.03$) and 12 in the “direction” condition (8 females, 3 males and 1 not specified, aged 18 to 23 years, $M=20.08$, $SD=1.78$).

Stimuli. The stimulus set consisted of arrows that differed in vertical position (top, bottom), direction (up, down), and color (purple, blue). The arrows appeared on a white background inside a 12.5 cm square with a black outline 0.7 mm wide, which was located in the center of the computer monitor. The arrows were created in Freeform software. The arrow size was 2.31×1.26 cm, with the triangle part 1.31×1.26 cm and the rectangle part 1×0.3 cm. The arrow had a black outline 0.35 mm wide. Horizontally, the distance to the center of the arrow from the nearest edge of the square was 4.95 cm. Vertically, the distance to the center of the arrow from the nearest edge of the square was 5.025 cm. The arrow colors corresponded to the RGB system: 26ADF8 for blue and DE1BEC for purple.

Procedure. Participants were seated at a viewing distance of 30 cm in front of a 15.6-inch color monitor set to a resolution of 1366×768 pixels. The Stroop tasks were administered in two versions. Participants from the “position” group were asked to make position judgments pressing the predefined keys. Participants from the “direction” group made direction judgments. All participants also performed non-Stroop tasks, making color judgments. The order of blocks with the Stroop and non-Stroop tasks was counter balanced. The same stimuli were used for both tasks. All variations of stimuli were presented in random order. Each block started with 8 training trials, then 48 main trials followed. Each stimulus was presented twice within the main trials. Participants were tested individually. The reaction time in milliseconds and accuracy of responses were registered.

Results

The statistically significant Stroop effect of 41 ms was obtained for the position judgments ($t(14)=3.14$, $p=.007$, $d=0.80$) but not for the direction judgments ($t(11)=0.036$, $p=.972$, $d=0.01$). This means that the position dimension was very low in salience and unable to interfere with the direction judgments. Importantly,

no Stroop incongruity effect was found ($t(14) = 0.30$, $p = .76$, $d = 0.08$ in the “position” group and $t(11) = 0.274$, $p = 0.789$, $d = 0.08$ in the “direction” group).

Discussion

The absence of the Stroop incongruity effect can be explained by the unequal salience of the Stroop dimensions of stimuli. For this reason, stimuli were not processed as congruent or incongruent during the performance of the non-Stroop task. It can be suggested that both Stroop dimensions of stimuli, position and direction, must be equally salient to obtain the Stroop incongruity effect. Placing the arrows higher and lower from the center could increase the salience of the position dimension (Clark, Brownell, 1975). These suggestions were tested in Experiment 2.

Experiment 2

Method

Participants. Thirty-two participants took part in Experiment 2, including 16 in the “position” condition (8 females and 8 males, aged 18 to 22 years, $M = 19.69$, $SD = 1.30$) and 16 in the “direction” condition (12 females and 4 males, aged 18 to 22 years, $M = 19.81$, $SD = 1.56$).

Stimuli were the same as in Experiment 1 but with stronger eccentricity of the arrow. They were positioned half of their height (0.63 cm) farther from the center to the borders of the square.

Procedure was the same as in Experiment 2.

Results

Stroop effects of approximately the same size were obtained for both types of judgments, positional ($t(15) = 2.47$, $p = .026$, $d = 0.62$) and directional ($t(15) = 3.3$, $p = .005$, $d = 0.8$). This means that both Stroop dimensions were equally salient. However, the Stroop incongruity effect was still not found ($t(16) = 0.01$, $p = .99$, $d = 0.03$ in the “position” group and $t(16) = 0.30$, $p = .80$, $d = 0.07$ in the “direction” group).

General Discussion and Conclusions

We failed to replicate the Stroop incongruity effect although manipulated the salience of the Stroop dimensions of stimuli to make the conflict between them stronger. However, the authors of the original study reported the effect in a series of experiments, and it was larger when the stimuli were presented in blocks consisting of only congruent or incongruent stimuli. This type of stimuli presentation can be tested in further studies in an attempt to replicate the Stroop incongruity effect. However, it is clear that even if this effect exists, it is rather unstable and depends on some subtle and yet unknown characteristics of stimuli or procedure.

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В ПОИСКАХ ЭФФЕКТА НЕКОНГРУЭНТНОСТИ СО СТИМУЛАМИ СТРУПА

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Аннотация. Недавно был опубликован новый эффект (Hatukai, Algom, 2017), связанный с задачей Струпа (Stroop, 1935). Испытуемым предъявляли конгруэнтные и неконгруэнтные стимулы Струпа, но просили реагировать на третий параметр стимулов, не связанный с конфликтом Струпа. Ответы испытуемых были быстрее при предъявлении неконгруэнтных стимулов. Это явление было названо эффектом неконгруэнтности со стимулами Струпа (Stroop incongruity effect). Авторы предложили объяснять его, исходя из идеи, что неконгруэнтные стимулы вызывают отрицательный аффект, и люди пытаются избежать его, быстрее выполняя задание. Наше исследование является частью более масштабного проекта, направленного на поиск альтернативных объяснений этого эффекта. В качестве первого шага мы попытались его воспроизвести. В Эксперименте 1 (27 испытуемых) мы получили классический эффект Струпа, однако не удалось воспроизвести эффект неконгруэнтности. Мы предположили, что это связано с неодинаковой заметностью (salience) измерений стимулов, связанных с конфликтом. В Эксперименте 2 (32 испытуемых) мы добились одинаковой заметности этих измерений, однако эффект неконгруэнтности всё равно не был получен. Можно сделать вывод, что даже если этот эффект существует, он неустойчив и зависит от тонких, пока не известных характеристик стимулов или процедуры.

Ключевые слова: Эффект Струпа, эффект неконгруэнтности со стимулами Струпа, отрицательный аффект, репликационное исследование, интерференция

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