

Ivanina E.O.¹, Gracheva A.S.¹, Markov Y.A.², Gorbunova E.S.³ Search for familiar and dangerous: not seeing a gopnik in the crowd

Иванина Е.О.¹, Грачева А.С.¹, Марков Ю.А.², Горбунова Е.С.³ Зрительный поиск знакомых и опасных стимулов: «гопник» в толпе

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Background: Subcultures often develop distinct fashion style, which eventually becomes their “trademark” and represents the culture. In post-soviet countries, “gopniks” are one of the most prominent subcultures that is also present in popular media. Nevertheless, it is unknown to which extent the established image of “gopniks” in common knowledge can influence low-level perceptual processes such as search asymmetry.

Objective: Our aim was to examine the influence of specific features of “gopnik” image on visual search.

Design: We conducted two experiments to investigate familiarity and threatening of the “gopnik” features. In experiment 1, participants had to find a man-like stimuli in two conditions: a man-like silhouette with vertical stripes on his trousers among similar figures, but with horizontal stripes and vice versa. In experiment 2, participants had to search for the same stripes pattern only (but without man-like silhouette). Conditions were the same as in the first experiment. The experiment 3 was conducted in order to replicate results from previous two experiments with better control.

Results: Overall, our results demonstrated visual search asymmetry for man-like (with horizontal stripes on trousers) and gopnik-like (with vertical stripes on trousers) objects, which could not be explained by the basic feature differences of these stimuli.

Conclusion: We suggest that nowadays in Russia “gopniks” are perceived as a familiar group rather than dangerous subculture with real power. Their image was successfully transmitted to the general cultural background for post-soviet communities.

Keywords: visual search, visual search asymmetry, familiarity, gopniks

Introduction

Visual search is a crucial part of visual behavior, and many tasks in our lives depend highly on the efficiency of its performance. Thus, visual search has always been a subject of great interest, and the considerable amount of knowledge on this theme has been accumulated throughout the years [Treisman & Souther, 1985; Wolfe, Cave, & Franzel, 1989; Wolfe, 1994; Wolfe & Horowitz, 2017; Wolfe, 2010].

Search asymmetry, being one of the phenomena in visual search, was firstly well described by Treisman and Souther in 1985 [Treisman & Souther, 1985]. In the experiment, the presence or absence of one feature in targets and distractors affected the performance of the subjects, such as a circle with a vertical line among circles without any lines was found faster – it “*popped out*” – by the participants, than a circle without a vertical line among circles with one [Treisman, 1985; Wolfe, 1994]. Treisman argued that search asymmetry is one of the properties of a basic, preattentive feature. Since that finding, research was directed towards discovering other attributes of objects which influence visual search asymmetry, some of them being basic features, such as color, shape, motion, orientation. [Foster & Ward, 1991; Kristjánsson & Tse, 2001; Royden, Wolfe, & Klempen, 2001; Treisman & Gormican, 1988].

One of the most discussed features of stimuli which could be basic and lead to visual search asymmetry is *novelty*. For instance, Wang and colleagues demonstrated the “pop-out effect” for novel stimuli, when the reversed letter “N” – an unfamiliar object – among familiar objects – normal letters “N” – was found faster than vice versa [Wang, Cavanagh, & Green, 1994]. Novelty is mainly reported to have “preattentive” qualities, so new objects could be found more efficiently [Bruce, Tsotsos, Leibold, & Maximilians, 2011]. However, further studies disagree with some results found by Wang and colleagues and show the effects of familiarity on visual search more precisely. Shen and Reingold showed that the presence of letters familiar to Chinese speakers as distractors sped up the process of searching for both familiar and unfamiliar targets [Shen & Reingold, 2001]. Malinowski and Hübner [2001] argued for the significance of familiar distractors in their paper – a more efficient search was shown for the condition when distractors were familiar. When the participants were familiar with both types of targets – “N” and mirrored “N” (Slavic group of participants) – the difference between conditions was absent [Malinowski & Hübner, 2001]. The notion that mainly the familiarity of distractors is crucial in visual search activity is also supported by many other studies [Becker, Smith, & Schenk, 2017; Gilford & Juola, 1976; Meinecke & Meisel, 2014; Mruczek & Sheinberg, 2005], some even argue that familiar distractors shorten the time spent on observing a

group of objects [Greene & Rayner, 2001]. Besides letters or symbols, the search for objects such as normal images of elephants or camels also seems to be affected by the familiarity of distractors and novelty of targets. Wolfe [2001] reported that the unfamiliar, “dead” (upside-down) elephant which is an unusual object to subjects, was found faster than a normal one (highly familiar). Thus, the search is most effective when the distractors are familiar and when there are differences between the target and the distractor at the level of basic features [Wolfe, 2001].

The effect of the emotional stimuli on the visual search has also been researched, so that, for example, an angry face is found faster among other faces than happy or neutral faces [Hansen & Hansen, 1988]. Hansen and Hansen argue that faces are biologically and evolutionary more efficient to process, therefore, their processing is special and “a facial threat commands attention”. However, Coelho and colleagues disagree with this hypothesis and suggested another explanation [Coelho, Cloete, & Wallis, 2011]. They claim that angry faces contain some special features, so that they could be more easily found among other faces. This means that these differences in visual search could be explained through standard search asymmetry effect similarly to bump - un-bump objects [Wolfe, 2001]. Coelho and colleagues through several experiments show that the face-in-the-crowd effect could be explained via low-level image features: such as specific line orientations, which have no explanation (so far) to be connected with faces. There are other threatening stimuli, such as snakes, spiders, for which effects similar to angry faces have been observed [Flykt, 2005; Ohman, Flykt, & Esteves, 2001]. But still, there are debates between these two explanations for the threatening effect, which can also be observed in other paradigms (for example continuous flash suppression) and for other threatening stimuli (for example weapons or knives) [Bar & Neta, 2006; Fox, Russo, & Dutton, 2002; Gray, Adams, Hedger, Newton, & Garner, 2013; Hedger, Adams, & Garner, 2015; Horstmann, 2007; LoBue, 2010; Öhman, 2005; Öhman, Soares, Juth, Lindström, & Esteves, 2012; Schubö, Gendolla, Meinecke, & Abele, 2006; Stein & Sterzer, 2012; Sulikowski & Burke, 2014].

The subculture of gopniks is a widely known cultural and social group in Russia [Gavriliuk, 2011]. It mainly flourished as it is in the 1990s [Tikhomirov, 2011] and it has well-defined characteristics and a special place in Russia’s socio-cultural development. In the 1990s and early 2000s, this subculture made a place in the pool of basic knowledge of Russian people. “Gopniks” can be defined as a marginal subculture consisting of predominantly young white men, who tend to have aggressive attitudes and often participate in criminal activities. Moreover, gopniks have a prominent style of clothing - they often wear an Adidas tracksuit with a cap and pointed shoes [Yakovleva, 2013]. Gopniks can be compared with other low-class semi-criminal subcultures as chavs in England or racionales in France; all of them have a distinct fashion style and are perceived by the majority of people as threatening and violent.

While gopniks still possess the qualities, which make them a familiar target, they also have been seen by society as threatening individuals, so it must be noted, that the search for the objects with some of the “gopnik” attributes can also be affected by this “face-in-the-crowd effect” as well as by familiarity. Here we will investigate how the visual search act for these familiar and dangerous stimuli, and how gopniks, could be perceived by Russian people today. We also conducted an additional experiment, where we control for differences in the visual search for basic features of man-like and gopnik-like objects.

Experiment 1

To define gopnik we used the most famous gopnik attribute – Adidas-like pants with two white vertical stripes. Other man-like objects in the visual search had similar pants but with horizontal stripes (perceptually equal by area and size). We expect to find visual search asymmetry for dangerous and familiar gopnik-like objects.

Method

Participants

Twenty-four volunteers, students of National Research University Higher School of Economics participated in the study (19 female). All of them were native Russian speakers with normal or corrected to normal vision and with no reported neurological problems. The age varied between 18 and 24 y.o. ($M = 19,37$, $SD = 1,40$). All participants were naive to the experimental hypothesis. In this and the following experiment, sample sizes were determined based on similar studies addressing the issue of visual search (from 8 to 20; for example [Gilford & Juola, 1976; Mruczek & Sheinberg, 2005; Treisman & Souther, 1985; Wolfe et al., 1989]).

Stimuli and apparatus

In this experiment, we used contour images of people with either vertical (gopnik-like, Fig. 1B) or horizontal white stripes (Fig. 1A) of the same length and area on their pants. Each image size was $0,59^\circ \times 2,1^\circ$. Four set sizes were used: 3, 6, 9 and 12. The stimuli were presented on a gray background and located in random order in an irregular $11,3^\circ \times 15,7^\circ$ grid not intersecting with each oth-

er.

Stimuli were displayed with PsychoPy v. 1.85.2 [Pierce, 2007], OS Windows 7, 21.5-Inch Diagonal LCD Monitor, resolution 1920x1080 (16:9), response time 6 ms.

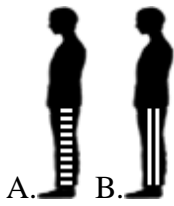


Fig. 1. An example of stimuli for the first experiment.

Procedure

Participants sat in a light room 60 cm from a monitor. The experiment consisted of 560 trials divided into two sessions. In each session, there were 50 trials where the target was present and 20 trials without a target for every set-size (for 3, 6, 9 and 12 stimuli). The order of presentation was randomized. The participant's task was to find the target stimulus or to report its absence. Twelve participants were asked to find a man-like object with vertical stripes among man-like objects with horizontal stripes on their pants in the first session, and vice versa in the second. For the other twelve people the order was reversed. Participant's answers were registered with “left” and “right” keyboard buttons assigned for the answers “no” (target is absent) and “yes” (target is present) respectively. Features of target stimuli were precued during the instruction at the beginning of each trial using written words on the screen (e.g., “find vertical stripes amongst horizontal”). Each trial had a limit of 5 seconds, after which the screen cleared. The participant pressed the “space” keyboard button at the end of both trial and main sessions to proceed to the next. The participants were able to take small breaks between the sessions. The participants were instructed to perform as fast and accurately as they could. A training session of 12 trials preceded each part of the experiment.

Results

The mean reaction time for the two types of patterns within 4 set sizes was compared. Data analysis was performed using IBM SPSS Statistics 23.0 and R [R core team, 2017]. The descriptive statistics are presented in Table 1. Repeated measures ANOVA was used. Correct answers with target absent were not analyzed; errors of the participants were not analyzed either.

Table 1

Descriptive statistics for reaction time (sec) for correct answers with target present for Experiment 1

| Pattern | Set size | | | |
|------------------|----------|------|-------|-------|
| | 3 | 6 | 9 | 12 |
| Vertical, Mean | .741 | .885 | 1.030 | 1.178 |
| Vertical, SD | .088 | .158 | .180 | .222 |
| Horizontal, Mean | .701 | .783 | .854 | .927 |
| Horizontal, SD | .113 | .126 | .157 | .167 |

Notes. Vertical (Mean, SD) – participants were trying to find a vertical stimulus among horizontal stimuli, Horizontal (Mean, SD) – vice versa.

The repeated measures ANOVA revealed a main effect of pattern on the reaction time for visual search ($F(1,23) = 43.97, p < .001, \eta^2 = .657$). We also found significant effect of set size ($F(3,69) = 128.11, p < .001, \eta^2 = .848$) and most importantly significant effect of pattern and set size interaction ($F(3,69) = 19.24, p < .001, \eta^2 = .455$). Significant differences between vertical and horizontal condition were found for all set sizes (Vertical vs Horizontal for set size equal to 3: $p_{Holm} = .038$; 6: $p_{Holm} = .001$; 9: $p_{Holm} < .001$; 12: $p_{Holm} < .001$). The results are presented in Figure 2.

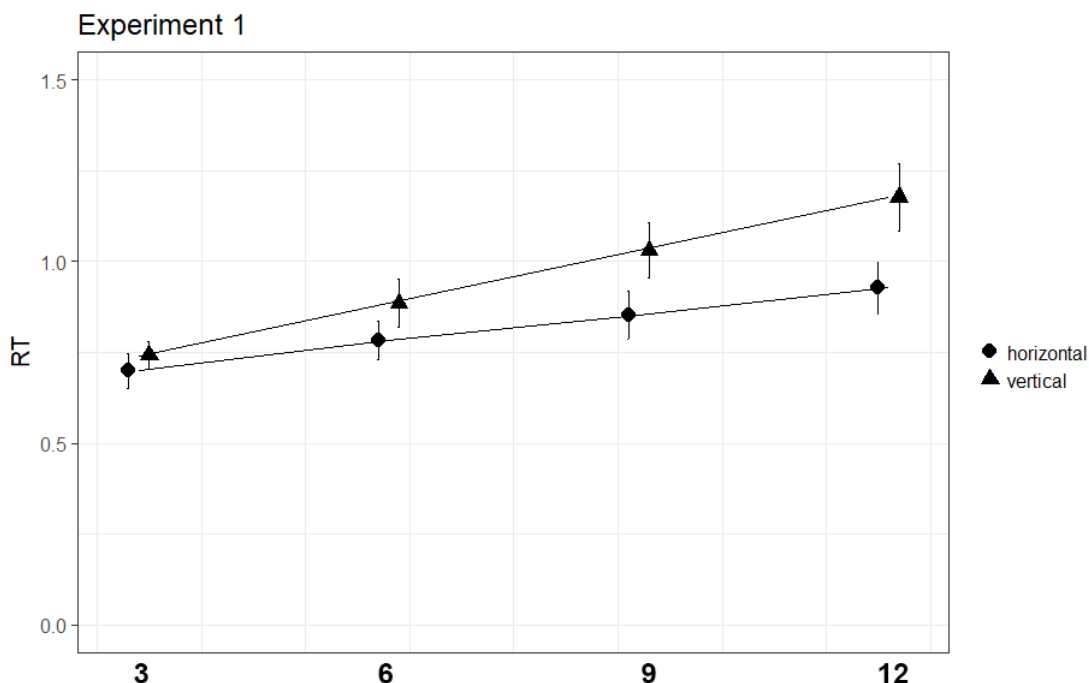


Fig. 2. Mean reaction time in Experiment 1 for 4 set size (3, 6, 9, 12 stimuli present) for 2 kinds of patterns

Experiment 2

To check whether the results of Experiment 1 could not be explained only by the low-level characteristics of stimuli, we conducted Experiment 2, where we tested stimuli similar to Experiment 1, but without the contour of people. These stimuli were the same on a feature level, but have no connection to gopniks.

Method

The method of the second experiment was similar to the first experiment, but the stimuli were images of either vertical or horizontal white stripes resembling the stripes in the first experiment. The stimuli size was $.14^\circ \times .86^\circ$.

Participants

Another twenty-four volunteers, students of National Research University Higher School of Economics participated in the study (21 female). All of them were native Russian speakers with normal or corrected to normal vision and with no reported neurological problems. The age varied between 18 and 23 y.o. ($M = 19.45$, $SD = 1.06$). All participants were naive to the experimental hypothesis.

Procedure

The second experiment was constructed the same way as the first one with the only difference that instead of contour images of people, simple images of stripes were used. Analogically twelve participants were to find vertical stripes among horizontal stripes in the first session, and vice versa in the second session. For the other twelve people, the order was reversed.

Results

The mean reaction time for two types of patterns within 4 set sizes was compared. Data analysis was performed using IBM SPSS Statistics 23.0 and R [R core team, 2017]. Repeated measures ANOVA was used. Correct answers with target absent were not analyzed; errors of the participants

were not analyzed as well. The descriptive statistics are present in Table 2.

The repeated measures ANOVA revealed no effect of the pattern (horizontal or vertical) on reaction time ($F(1,23) = .911, p = .350, \eta^2 = .038$), the effect of set size on reaction time ($F(1,23) = 99.904, p < .001, \eta^2 = .813$) and no effect of interaction between pattern and set size ($F(3,69) = .305, p = .882, \eta^2 = .013$). The results are presented in Figure 3.

Table 2

Descriptive statistics for reaction time (sec) for correct answers with target present for Experiment 2

| Pattern | Set size | | | |
|------------------|----------|------|------|------|
| | 3 | 6 | 9 | 12 |
| Vertical, Mean | .679 | .733 | .797 | .897 |
| Vertical, SD | .163 | .184 | .188 | .216 |
| Horizontal, Mean | .644 | .723 | .777 | .886 |
| Horizontal, SD | .153 | .180 | .228 | .225 |

Notes. Vertical (Mean, SD) – participants were trying to find a vertical stimulus among horizontal stimuli, Horizontal (Mean, SD) – vice versa.

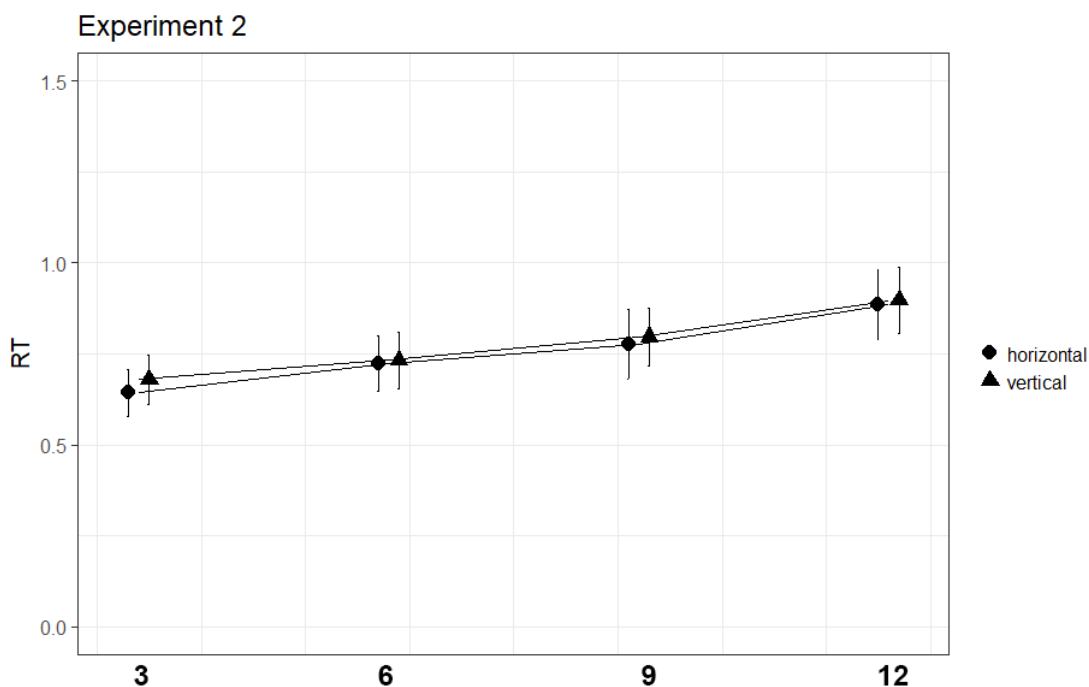


Fig. 3. Mean reaction time in Experiment 2 for 4 set size (3, 6, 9, 12 stimuli present) for 2 kinds of patterns.

Experiment 3

We decided to replicate results from previous two experiments with better control. Stimuli from Experiment 2 had a significant difference from stimuli from Experiment 1, they were presented without black background (Figure 4) and this could lead to differences in results. Also, we had two different groups of participants in the previous experiments. In Experiment 3 we used silhouettes and black rectangles with stripes as stimuli.

Method

The method of the third experiment was similar to the first and second experiment. We conducted an online experiment using pavlovia.org and PsychoPy3 [Peirce et al., 2019]. Previous studies demonstrated that visual search results from online experiments are reliable and highly similar to in-lab experiments [Bridges, Pitiot, MacAskill, & Peirce, 2020; Crump, McDonnell, & Gureckis, 2013; de Leeuw & Motz, 2016].



Fig. 4. Types of stimuli used in three Experiments.

Participants

Twenty-seven volunteers, students of National Research University Higher School of Economics participated in the study (19 female). All of them were native Russian speakers with normal or corrected to normal vision and with no reported neurological problems. The age varied between 19 and 24 y.o. ($M = 20.33$, $SD = .94$). All participants were naive to the experimental hypothesis.

Procedure

The third experiment was constructed the same way as the first two with the only difference that instead of two blocks observers now participated in four blocks. In two blocks silhouettes as stimuli were used, in another two blocks, rectangles were presented. The order of blocks was random.

Results

The mean reaction time for two types of patterns and two types of stimuli within 4 set sizes was compared. Thus, we had 2 (types of patterns (horizontal and vertical)) \times 2 (types of stimuli (silhouettes and rectangles)) \times 4 design (4 set sizes). Data analysis was performed using IBM SPSS Statistics 23.0 and R [R core team, 2017]. We used RM ANOVA for 2 \times 2 \times 4 design and two RM ANOVA (2 (types of patterns (horizontal and vertical)) \times 4 design (4 set sizes)) for each type of stimuli. The Bayes factor (BF_{10}) was calculated for t-test using JASP 0.12.0.0 [Wagenmakers et al., 2017; JASP Team, 2020] and interpreted using the standard Jeffrey's scale [1961]. We also analyzed the percent of correct answers. Correct answers with target absent were not analyzed. The descriptive statistics are present in Table 3 and Figure 5.

Table 3

Descriptive statistics for reaction time (sec) for correct answers with target present for Experiment 3

| Pattern | Set size (Silhouettes) | | | | Set size (Rectangles) | | | |
|------------------|------------------------|------|------|------|-----------------------|------|------|------|
| | 3 | 6 | 9 | 12 | 3 | 6 | 9 | 12 |
| Vertical, Mean | 0.71 | 0.83 | 0.98 | 1.07 | 0.68 | 0.77 | 0.88 | 0.99 |
| Vertical, SD | 0.11 | 0.14 | 0.2 | 0.23 | 0.1 | 0.15 | 0.16 | 0.21 |
| Horizontal, Mean | 0.69 | 0.76 | 0.87 | 0.96 | 0.65 | 0.76 | 0.82 | 0.92 |
| Horizontal, SD | 0.14 | 0.14 | 0.2 | 0.18 | 0.11 | 0.14 | 0.15 | 0.18 |

Notes. Vertical (Mean, SD) – participants were trying to find a vertical stimulus among horizontal stimuli, Horizontal (Mean, SD) – vice versa.

RT. The repeated measures ANOVA revealed a main effect of pattern on the reaction time for visual search ($F(1,26) = 6.995, p = .014, \eta^2 = .212$). We also found significant effect of set size ($F(3,78) = 180.674, p < .001, \eta^2 = .874$), significant effect of type of stimuli (rectangles were found faster than silhouettes – $F(1,26) = 6.973, p = .014, \eta^2 = .211$), and significant effect of pattern and set size interaction ($F(3,78) = 5.081, p = .003, \eta^2 = .163$).

RT. Silhouettes. The repeated measures ANOVA revealed a main effect of pattern on the reaction time for visual search ($F(1,26) = 8.161, p = .008, \eta^2 = .062$). We also found significant effect of set size ($F(3,78) = 111.735, p < .001, \eta^2 = .535$), and most importantly interaction between pattern type and set size ($F(1,26) = 6.142, p < .001, \eta^2 = .015$). Pairwise comparison between two types of pattern within each set size stimuli revealed significant differences (not significant only for set size equal to 3) for silhouettes (Vertical vs Horizontal for set size equal to 3: $p_{Holm} = .352 (BF_{10} = .306)$; 6: $p_{Holm} = .033 (BF_{10} = 4.015)$; 9: $p_{Holm} = .008 (BF_{10} = 15.868)$; 12: $p_{Holm} = .033 (BF_{10} = 4.195)$). These results perfectly replicate results from Experiment 1.

RT. Rectangles. The repeated measures ANOVA revealed an only main effect of set size ($F(3,78) = 162.836, p < .001, \eta^2 = .562$). Pairwise comparison between two types of pattern within each set size stimuli revealed no significant differences (Vertical vs Horizontal for set size equal to 3: $p_{Holm} = .366 (BF_{10} = .489)$; 6: $p_{Holm} = .573 (BF_{10} = .237)$; 9: $p_{Holm} = .308 (BF_{10} = .889)$; 12: $p_{Holm} = .366 (BF_{10} = .627)$).

Percent correct. The repeated measures ANOVA revealed an only main effect of set size ($F(3,78) = 19.592, p < .001, \eta^2 = .156$).

Percent correct. Silhouettes. The repeated measures ANOVA revealed an only main effect of set size ($F(3,78) = 14.552, p < .001, \eta^2 = .199$).

Percent correct. Rectangles. The repeated measures ANOVA revealed an only main effect of set size ($F(3,78) = 12.718, p < .001, \eta^2 = .175$).

Discussion

Results of Experiment 3 perfectly replicated results from the previous two experiments. The online version of the experiment revealed similar results. Thus, the differences in contrast between stimuli in Experiment 1 and 2 didn't influence results.

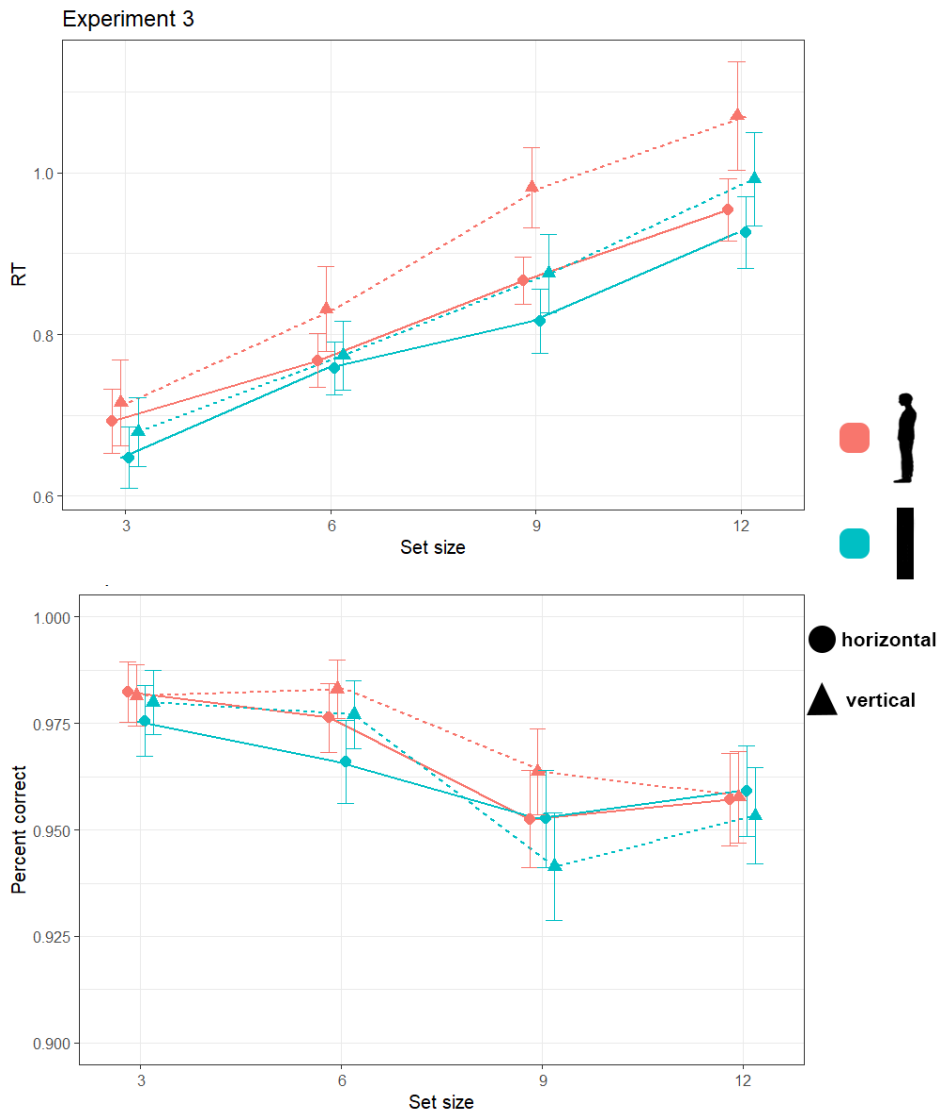


Fig. 5. Mean reaction time and percent correct in Experiment 3 for 4 set size (3, 6, 9, 12 stimuli present) for 2 kinds of patterns for two types of stimuli

General Discussion

In our work, the influence of cultural and specific features of “gopniks” subculture on visual search was tested. In Experiment 1 we observe visual search asymmetry for man-like and gopnik-like objects. Man-like objects (with horizontal stripes on the pants) were found faster among gopnik-like (with vertical stripes on the pants) objects than gopnik-like objects among man-like objects. Thus, we could observe standard visual search asymmetry for familiar distractors [Wolfe, 2001]. This experiment shows additional evidence that the familiarity of non-letter objects (having a cultural background [Malinowski & Hübner, 2001; Shen & Reingold, 2001]) influences visual search. In

Experiment 2 we did not observe any differences in the visual search for vertical and horizontal stimuli, which suggests that visual search asymmetry was not caused by differences in basic features for man-like and gopnik-like objects. The Experiment 3 confirmed results from previous experiments, however, revealed that the effect is actually very small, but still present.

An alternative explanation of our results may be related with low level perceptual factors. Despite the stimuli in our experiment were perceptually equal by area and size, there are well-known differences in vertical and horizontal lines perception. One example may be horizontal vertical illusion, when a vertical line is perceived as longer than a horizontal line of equivalent length. Those differences may have had the impact on our results. One concern is that SDs were larger with vertical stripes regardless of condition. This may suggest a difference in the internal noise at some stage. Nevertheless, as the main experimental effect is not present for simple objects (rectangles), but present for man-like objects, so the cultural explanation seems to be preferable in this case.

However, we did not observe any threatening effect of stimuli [Hansen & Hansen, 1988; LoBue, 2010; Ohman et al., 2001; Öhman et al., 2012; Sulikowski & Burke, 2014] – gopnik-like stimuli did not pop-out during visual search. There are two different explanations for these results:

1) In contrast to snakes and spiders, which evolutionally represent a danger to us [Ohman et al., 2001; Öhman et al., 2012], gopniks is a subculture, which was created not so long ago. This group had a big cultural influence – movies, books, music, etc. [Tikhomirov, 2011] – a lot of people are familiar with this subculture. However, it is possible that gopniks nowadays are perceived as not a threatening group, but as one of the modern subcultures. For example, one of the new subcultures in Russia is A.U.E. (А.У.Е. – Арестантский Уклад Един – Convict's/Prisoner's Practice/way of life, law/Codex [Lyadova, 2018]). This youth community promotes among minor thieves' concepts of the Russian criminal environment and prison concepts. This subculture appeared in 1990, but in 2016, the subculture received a new round of popularity among young people, when a gang of teenagers AUE attacked a police station in the Transbaikal region. This group had strong associations with criminal and prison (and perhaps is more dangerous than gopniks) but perceived by some people just as one of the new popular subcultures (similarly to popular subcultures of goth and emo in 1990s – 2000s in Russia [Novak & Ignatov, 2014]), and not as a criminal gang. This could be the same for gopniks. It is already a well-established group of people, having its attributes and cultural background. So, perhaps nowadays they are perceived dangerous only in a personal meeting in a dark alley.

2) Another explanation is that participants did not explicitly understand that they were searching for gopniks in the task. Thus, it is possible that they did not understand the threat of these objects.

However, we observed a familiarity effect on these stimuli. This means that at least implicitly these objects were associated with a well-known subculture in Russia.

Conclusion

Our study, in addition to earlier findings, shows that asymmetry in visual search can also be induced by deeply culturally marked stimuli such as the figure of a gopnik which portrays a prominent and notorious Russian subculture.

In further experiments, we could investigate how participants who consider gopniks a threatening group perform a visual search for this kind of stimuli. Such an experiment could shed light on the nature of the effect of threatening stimuli in visual search [Coelho et al., 2011; Hansen & Hansen, 1988; Horstmann, 2007; Öhman et al., 2001; Öhman et al., 2012; Stein & Sterzer, 2012].

Limitations

One of the limitations of our study is that probably some of the participants did not recognize the stimuli as gopniks. However, we could not inform in advance participants about objects, because it could cause some participants effects. Another limitation is that our findings could only be generalized to people familiar with this subculture.

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