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Priming Effect as a Result of the Nonconscious Activity of Consciousness

The article focuses on the priming effect and reports on experimental studies comparing the degree of influence of previously consciously perceived and previously nonconsciously perceived information on conscious perception. The influence of different types of priming on the perception of an ambiguous figure (Rubin's figure) is investigated. The study indicates that conscious visual perception in the experimental situations that were created was a result of a nonconscious decision to consciously perceive. A comparative analysis of the results of the experiments shows that previously consciously perceived prime stimuli exert a stronger influence on the effects of the conscious perception of an ambiguous figure.

Although priming is defined as "a change in the ability to identify or produce an item as a result of a specific prior encounter with the item" (Schacter and Buckner, 1998, p. 185), this effect in the broader sense denotes the influence of a stimulus (as a rule, a verbal stimulus) on subsequent conscious reactions by the test subject (associative reactions, the choice of one of the images of an ambiguous figure, sensorimotor reactions, the choice of a method to solve a cognitive problem, etc.).

A prime stimulus that influences the results of subsequent cognitive activity may be consciously perceived, or it can occur at the subliminal level. A distinction is drawn between positive and negative priming on a different basis.

English translation © 2010 M.E. Sharpe, Inc., from the Russian text, A.Iu. Agafonov, "Praiming-effekt kak rezul′tat neosoznavaemoi deiatel′nosti soznaniia."

Translated by Steven Shabad.

In the case of positive priming, there is an improvement in the efficiency of performing cognitive tasks—for example, a decrease in the time or an increase in the productivity of the solution. Negative priming entails a reduction in the efficiency of cognitive activity. In particular, some writers see negative priming in a delayed reaction to a target stimulus that acted as an ignored stimulus (distractor) in the preceding trial (Tipper and Driver, 1988). Sometimes the phenomenon is viewed as akin to repetition blindness (see Falikman, 2001).

A large number of works have studied priming (see, e.g., Chua, Goh, Kek, 1996; Falikman, 2001; Merikle and Joordens, 1997; Merikle and Reingold, 1990; and others). As M.G. Filippova points out: "The priming methodology in research is combined with a number of specially devised experimental procedures: 'a lexical-decision task,' 'a word-completion task,' 'an identification task,' and so on. . . . The priming effect is manifested regardless of whether the test subject consciously perceives the prime stimulus, which sets the context for performing cognitive tasks, making the priming methodology an irreplaceable instrument for assessing the influence of subliminal information on conscious activity" (2006, pp. 165–81). Indeed, a number of studies have established that nonconscious stimulation is not only processed at a semantic level but also determines the subsequent conscious reactions of test subjects (Palmer and Jonides, 1988).

Studies done by Anthony J. Marcel (1983, pp. 238–300) are revealing in this regard. In one experiment he presented a masked word or a blank field for ten milliseconds. Then the test subject had to perform one of two tasks. In the detection task he only had to indicate whether a word had been presented to him or not. In the so-called lexical-decision task the test subject was shown a string of letters and asked to determine whether it was a word or a meaningless set of letters. In a certain portion of the probes the preceding word was semantically related to the word of the letter string. The results showed that in the detection task the test subjects gave positive responses with equal probability, both when a word was presented and when a blank field was presented—that is, they were not conscious even that a stimulus had been presented. Nevertheless, in the lexical-decision task there was a pronounced effect from semantic precedence: identification of a letter string as a word occurred far more rapidly if the word was related in meaning to the preceding word presented at the subthreshold level (see Dormashev and Romanov, 1999, p. 92). Thus, a word presented for ten milliseconds is semantically processed without reaching the conscious level! This finding is corroborated by the results of experiments in which the preceding word was ambiguous. For example, presentation of the word *palm* at the subthreshold level sped up the lexical decision (identification) both for the letter string *mapl* and for the letter string *wrist* (ibid., p. 93). In our study the ambiguous images presented at the

subthreshold level had a positive influence on the time needed to identify the verbal stimuli that were semantically related to both images of the reversible figure. Meanwhile, the time needed to identify words that were semantically unrelated to the figure's images (the control condition) proved to be much greater (Agafonov and Kudelkina, in press).

Emotionally meaningful words presented at the nonconscious level may influence the test subject's impression of subsequent, consciously perceived images. In one experiment the test subject was presented an image of a man with a neutral facial expression for enough time for conscious perception. Between presentations specific words were shown at the subthreshold level: "happy" and "angry." When these words were presented the test subject usually perceived only a certain fluctuation in the image of the man. It turned out that the subthreshold presentation of the words directly influenced the evaluation of the "neutral" face—test subjects perceived it as pleasant when the word "happy" was presented and described it as unpleasant when the word "angry" was presented (see Kostandov, 1977, pp. 103, 104).

A similar influence of subliminal verbal stimuli on an evaluation of a neutral image was observed in other studies as well. For example, in one experiment, with the aid of special glasses, subliminal words were presented to one eye of test subjects, and facial images to the other. The results showed a clear influence from the subliminal stimuli on the interpretation of the facial expression (ibid).

Filippova proposed an atypical experimental procedure to investigate the priming effect. The purpose of her experiment was to detect the influence of the subliminal meaning of ambiguous (reversible) figures on the results of cognitive tasks. Stimuli were presented to the test subjects on a monitor screen divided into two parts so that two types of tasks could be performed. First the test subject had to identify the image in the left part of the screen (the Type-1 task) and then had to perform cognitive tasks in the right part of the screen (Type-2 task). The assumption was that the image in the left part of the screen would set the context for resolving the cognitive tasks. The images offered to test subjects for identification included ambiguous ones. As a rule, the test subjects would not notice the ambiguity and would identify the image according to one of its meanings. The results of the experiment showed that the previously not perceived meanings of the stimulus figures had a negative priming effect on the performance of the cognitive tasks associated with them. The author of the study explains the results this way:

> After comparing the speed with which cognitive tasks were performed as a function of the nature of their connection with an ambiguous prime image, we ascertained that test subjects took longer to perform tasks associated with its subliminal meanings than other types of tasks. For example, if an

> ambiguous "saxophone player/woman" image was presented and the test subject saw a saxophone player, then the test subjects took significantly longer to perform tasks that were to be answered with the stimuli "woman" or "dress" (associated with the subliminal meaning of the prime) than tasks that were to be answered with the stimuli "saxophone" or "concert" (associated with the perceived meaning of the prime) and longer than tasks that were to be answered with the stimuli "dog" or "island" (not related to the prime). (Filippova, 2006, pp. 176–77)

Based on the data obtained, Filippova concludes: "the presence of subliminal meanings of ambiguous stimuli does not simply 'not assist' but more likely impedes performance of cognitive tasks" (ibid.).

The influence of subliminal information on the effects of conscious perception was also demonstrated by Morris Eagle. In his experiment, test subjects were presented pictures depicting the same adolescent in three different situations: in the first instance, the boy is bringing a gentleman a cake; in the second picture, he is stabbing a person with a knife; and in the third, the adolescent is quietly standing by himself. Graphically the first two pictures are similar, although they are substantively different in their semantic situations. Test subjects were exposed at the subthreshold level to one of these situational images. Naturally, given the short exposure time, test subjects did not consciously grasp the meaning of the stimulus image. Then the test subjects were presented, for a fairly long time, the neutral image so that they could describe the adolescent's personality. If the neutral situation came right after the fight, test subjects evaluated the quietly standing adolescent in a negative way; if it was preceded by the cake scene, they more often gave the same adolescent a positive assessment (see Dormashev and Romanov, 1999, pp. 91, 92).

Boris M. Velichkovskii describes an experiment that he conducted with Vladimir I. Pokhil′ko and Aleksandr G. Shmelev. The experiment used visual masking of words by moving a word horizontally with an angular velocity of eighty degrees per second. Under these stimulation conditions the test subject sees only a "blurred" stimulus that he is not able to comprehend. Yet the words presented in this manner influenced the performance of subsequent tasks. For example, test subjects were able to confidently associate the nonconsciously perceived word *veter* [wind] with the word *buran* [blizzard] rather than *vecher* [evening] (Velichkovskii, 1982, p. 182).

In an experiment to test the degree of influence of subliminal stimuli on a subject's set, B.I. Khachapuridze used the subthreshold presentation of specific phrases ("I'm going to look in the mirror," "I'm going to cut the paper," "I'm going to look at the album"). For ten minutes a certain phrase was presented about 700–800 times. Then the experimenter would tell the test subject: "I will now raise the curtain, and you will perform some action on one of the

objects that most attracts you." The results showed that test subjects, with greater than random frequency, performed the action that was prescribed by the meaning of the subliminal phrase. The net effect of suggestion (relative to control values) was 30–40 percent (see Kostandov, 1977, p. 102).

David A. Swinney conducted a series of experiments in which he used ambiguous words as the perceptual prime. In one experiment he presented test subjects sentences such as the following: "The man was not surprised when he found several spiders, roaches, and other bugs in the corner of his room." The word "bugs" is a homonym and denotes either insects or eavesdropping devices. Swinney was interested in how the semantic ambiguity of the word, given that it had already been perceived in the related context, would influence the fulfillment of the "lexical decision" task (Swinney, 1979, pp. 645–59). After hearing the sentence, test subjects were presented pairs of words. The first word in each pair was "bugs." The second element in the pairs consisted of the words "ant," "spy," or a neutral word, for example, "sew." It was determined that the words "ant" and "spy" were recognized more quickly than neutral words—that is, those that were not associated with either meaning of the homonym. True, this effect held if the interstimulus interval between the prime and the word to be evaluated was not more than 400 milliseconds. It is interesting to note that under these parameters in the experimental procedure there were no differences in the recognition time for the words "ant" and "spy." In discussing this result, Anderson (2002, p. 384) concludes that "presentation of the word 'bugs' immediately activated both meanings of the word 'bugs.'" If the interval between the prime word and the word to be evaluated exceeded 700 milliseconds, the word "ant" was better recognized. Therefore we can say that, regardless of the prior context, in the initial stages of cognitive processing all meanings of a word with lexical ambiguity are activated, and only then is a nonconscious choice made of the meaning that relates to the previously consciously perceived context. Anderson offers a similar interpretation of the results of the above experiment: "two meanings of an ambiguous word are momentarily active, but context operates very rapidly to select the appropriate meaning" (ibid.). Steven Pinker provides this interpretation of the experiment: "the brain knee-jerkingly activates both dictionary entries for 'bug,' even though one of them could sensibly be ruled out beforehand. The irrelevant meaning is not around long. . . . Presumably that is why people deny that they even entertain the inappropriate meaning" (2004, pp. 201, 202).

One pressing task with regard to studying the determinants of the activity of consciousness is to describe the logic of the decision-making process for conscious perception (Allakhverdov, 2000). An important aspect of this task is to identify the dependency of the effects of conscious perception on various influences. An analysis of empirical data has shown that the results of

the cognitive activity of consciousness can be determined both by previously consciously perceived influences and by subliminal influences. However, no recent experimental studies have compared the degree of influence of previously consciously perceived and previously nonconsciously perceived information on conscious perception. A study that has been done eliminates this gap.

Purpose of the study: to determine the difference in the degree of influence of consciously perceived and previously not consciously perceived prime stimuli on the perception of an ambiguous figure.

Scope of the study: the influence of the semantics of prior stimulation on the performance of a perceptual task (conscious perception of a certain image in an ambiguous figure).

Hypothesis of study: conscious perception of one of the images in an ambiguous figure (the "face-vase") will depend more on the semantics of the consciously perceived prime stimulus than on the influence of a previously nonconsciously perceived stimulus.

Procedure

Test subjects: The study had 180 participants (113 in Experiment 1, 67 in Experiment 2) of both genders, ages nineteen to twenty, with normal or corrected-to-normal eyesight.

Materials and equipment: The experiment, which was intended to detect the influence of the nature of anticipatory stimulation on the effects of conscious perception when test subjects performed a perceptual task, included the use of a personal computer. The procedure was carried out with a special computer program that provided a random listing of the stimuli to be presented, with due regard for the specific nature of the experimental tasks, a variation in the font size from 5 points to 60 points, a variation in the presentation time of the stimuli from 25 milliseconds, and the use of visual masking after presentation of each stimulus.

The stimulus material consisted of three sets of words displayed on the computer monitor screen. Each set contained three Russian words (font size 12). A reversible (ambiguous) figure, 150 x 150 mm, was also used, displayed on the computer monitor screen.

Outline of the study: The structure of the study consisted of two experiments. Experiment 1 tested the dependency of the perception of an ambiguous figure on the semantics of subliminal verbal stimuli. Experiment 2 used the same stimulus words for prime stimuli as in Experiment 1, but they were presented for enough time for them to be perceived. Thus, the dependent variable in both experiments was the choice of one of the images of the ambiguous

figure. The independent variable—the nature of the prime stimulus—had five conditions:

1. Subliminal words semantically related to the vase image.
2. Subliminal words semantically related to the image of faces.
3. Intelligible words semantically related to the vase image.
4. Intelligible words semantically related to the image of faces.
5. Subliminal neutral words with no semantic connection to either of the images of the ambiguous figure.

Experiment 1. The influence of subliminal primes on the perception of an ambiguous figure

The experiment had 113 participants, who were divided into three groups. The first and second experimental groups numbered 45 people each, while the control group had 23 participants.

The procedure consisted of two stages.

The crux of the first stage was that the test subject was shown a sequence of words on the monitor screen from the list that the experimenter had made up beforehand for each group of test subjects.

In the second stage the test subject was shown a reversible figure on the monitor screen. The subject's task was to state as quickly as possible what he saw on the screen.

In the first stage the test subjects of the first experimental group were shown a three-word sequence on the monitor. All of the words were semantically related to the concept of "vase." The semantic proximity of the test words and the key concept was determined in advance by calculating the frequency of associations with the word "vase." The three most frequent associations were incorporated into the list presented to the first group of subjects. The words were presented in the following sequence: *ROZY* [ROSES], *BUKET* [BOUQUET], *TSVETY* [FLOWERS].

The subjects of the second experimental group were shown three words that were related in meaning to the word "face." These words were similarly chosen on the basis of a calculation in advance of the frequency of association with the word "face." The three most frequent associations were incorporated into the list presented to the second group of subjects. The words formed the following sequence of presentation: *GLAZA* [EYES], *PORTRET* [PORTRAIT], *VZGLIAD* [LOOK].

The subjects of the control group, before performing their visual task, were presented a sequence of three words that were semantically neutral with regard to the images of the reversible figure: *STUL* [CHAIR], *VETER* [WIND], *RADIO* [RADIO].

The presentation of each of the three sets of words began with the test subject's using the computer mouse to click on the START button, which was located in the upper right-hand corner of the program's interactive window. The symbol "!" appeared in the center of the screen, defining the spot for the subject to watch. Then the subject would click on the NEXT button, located in the lower left-hand corner of the interactive window, to initiate the display of the relevant verbal stimuli.

The display time of each stimulus, defined in advance by the experimenter in program settings, was 25 milliseconds. The interval between stimuli was 400 milliseconds. The words were presented against a uniform gray background. After each element of the stimulus string, a visual mask in the form of a uniform red background was presented on the monitor for 100 milliseconds. The time between the presentation of the mask after the last word of the stimulus sequence and the display of the reversible figure was 500 milliseconds.

In the second part of the procedure for the experiment, the test subject was presented the reversible "vase-faces" figure on the monitor for 3 seconds and asked afterward to say aloud as quickly as possible what he saw. The subject's response was entered in the record of the experiment.

Processing of results: The primary data obtained in the experiment were processed with a Microsoft Excel packet. The statistical processing compared:

1. The percentages of test subjects in the first experimental and control groups who in their reaction to the reversible "vase-face" figure chose the "vase" image.
2. The percentages of test subjects in the second experimental and control groups who chose the "faces" image.
3. The influences of the prime stimuli in the first and second experimental groups.

The *f*-statistic ϕ^* was used to compare the above values.

When the results obtained in the first experimental group, where the influence of subliminal primes on the choice of the "vase" image was investigated, were compared with the results obtained in the control group, where neutral words were used, the statistical significance of the differences in the percentages of test subjects who chose the "vase" image in reacting to the ambiguous figure was tested. When the results obtained in the second experimental group, where the influence of subliminal primes on the choice of the "faces" image was investigated, were compared with the control group, the statistical significance of the differences in the percentages of test subjects who chose the "faces" image was tested. When the first and second experimental

Table 1

Relative Proportions of Perceptions of "Vase" and "Faces" Images with Subliminal Prime Stimuli

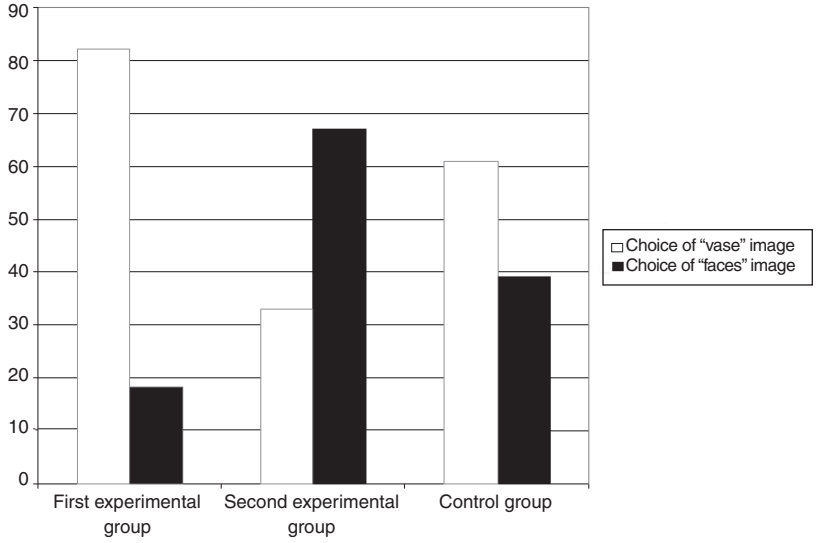
	First experimental group		Second experimental group		Control group	
Visual decision	No. of decisions	% of total	No. of decisions	% of total	No. of decisions	% of total
"VASE"	37	82	15	33	14	61
"FACES"	8	18	30	67	9	39
Total number of decisions	45	100	45	100	23	100

groups were compared, the significance of the differences in the influence of the prime stimuli on the decision making by the consciousness regarding the conscious perception of the "vase" and "faces" images, respectively, was tested. In all of the comparisons, the significance of the differences was tested at a significance level of $p \leq 0.05$.

The results of the experiment are presented in Table 1. In 82 percent of cases the test subjects in the first experimental group, who were shown words semantically related to the word "vase," stated when reacting to the reversible figure that they saw the "vase" image, while only 18 percent saw the "faces" image. Meanwhile, the test subjects in the second group, who were shown words related in meaning to the word "face," stated in only 33 percent of cases that they saw the "vase" image. In 67 percent of cases the subjects in that group perceived the two profiles. The subjects in the control group, where the influence of subliminal prime stimuli was neutral with respect to both images of the reversible figure, saw the "vase" image in 61 percent of cases and the "faces" image in 39 percent of cases.

The results demonstrated a strong correlation between the performance of the perceptual task and the semantic relatedness of the stimulus words. Figure 1 shows a clear increase in the percentage of test subjects who chose the appropriate image on the reversible "vase-faces" figure in the experimental groups, where the influence of primes was investigated, over the percentage of subjects in the control group who chose that image given a neutral prior stimulation. For example, in the first experimental group, where the influence of primes related to the "vase" choice was present, the proportion of subjects who consciously perceived the vase image increased by 21 percent over the corresponding proportion in the control group. In the second experimental

Figure 1. **Relative Percentages of Perceptions of "Vase" and "Faces" Images with Prior Subliminal Primes**



group, where prime stimuli semantically related to the word "face" were operative, the proportion of subjects who chose the "faces" image increased by 28 percent over the corresponding proportion in the control group. These percentages represent the net effects of the influence of subliminal primes on the choice of the "vase" and "faces" images, respectively.

A significance test of the differences in the percentages of test subjects who chose a certain image on the reversible figure when a prime is not operative and when it is done with Fisher's ϕ^* statistic of angular transformation, in which a paired comparison of the first and second experimental groups with the control group was made, led to the following results.

The empirical value of ϕ^* for the comparison of the first experimental group and the control group is 1.87 at a significance level of $p \leq 0.05$. The empirical value of ϕ^* for the comparison of the second experimental group and the control group is 2.18 at a significance level of $p \leq 0.01$.

The values obtained in both comparisons for the statistic ϕ^*_{emp} are greater than the critical value $\phi^*_{cr} = 1.64$ at the adopted significance level of $p \leq 0.05$ and fall within the significance zone. Therefore, we can say that the influence of prime stimuli on the performance of the visual perceptual task is statistically significant—that is, the semantic relatedness of subliminal stimulus words does influence the subsequent perceptual choice by test subjects of the appropriate image of the reversible figure.

Experiment 2. The influence of consciously perceived primes on perception of an ambiguous figure

In order to test the baseline hypothesis that there is a difference in the degree of influence between previously nonconsciously and consciously perceived prior stimulation on the effects of perception of an ambiguous figure, we must establish a correlation between such effects and the influence of the same prime stimuli that were used in Experiment 1 but were presented for enough time to be unmistakably recognized.

Sixty-seven people took part in the experiment. (There were two experimental groups of 25 people each, with 17 participants in the control group.)

The procedure of the experiment was no different from the one described above, except that the words were presented for enough time for them to be recognized before the ambiguous figure was displayed. The display time for each verbal stimulus was 1 second. Visual masking was not used. The time between the presentation of the last word and the display of the reversible figure was, as in Experiment 1, 500 milliseconds. The reversible figure was presented for 3 seconds.

The processing of the results was similar to Experiment 1. Besides the calculation for each of the three groups of the percentages of test subjects who chose the "vase" image and the "faces" image, respectively, in reacting to the ambiguous figure, the significance of the differences between the strength of the priming effects detected in Experiment 1 and Experiment 2 was also determined.

Results: The results of the experiment are presented in Table 2. In 92 percent of cases the test subjects of the first experimental group, who were presented words on the conscious level that had a semantic connection to the word "vase," stated when subsequently reacting to a reversible figure that they saw the "vase" image. In 8 percent of cases these subjects perceived the "faces" image. The test subjects in the second experimental group, who were presented words with a semantic connection to the word "face," stated in 16 percent of cases that they saw the "vase" image and in 84 percent of cases perceived "faces." The test subjects in the control group showed the following results: 65 percent of test subjects chose the "vase" image and 35 percent of the total number of subjects chose the "face" image.

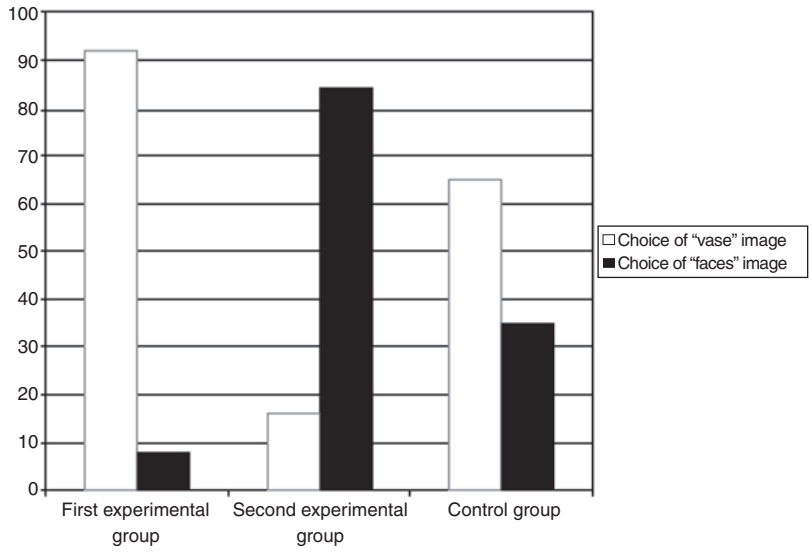
The results revealed a clear correlation between the performance of the perceptual task and the influence of previously consciously perceived prime stimuli. Figure 2 shows the results of the performance of the perceptual task by the test subjects in the three groups. In the first experimental group the number of choices of the "vase" image increased over the control conditions by 27 percent. In the second experimental group the increase in the number

Table 2

Relative Proportions of Perceptions of the "Vase" and "Faces" Images with Consciously Perceived Prime Stimuli

	First experimental group		Second experimental group		Control group	
Visual decision	No. of decisions	% of total	No. of decisions	% of total	No. of decisions	% of total
"VASE"	23	92	4	16	11	65
"FACES"	2	8	21	84	6	35
Total number of decisions	25	100	25	100	17	100

Figure 2. **Relative Percentages of Perceptions of "Vase" and "Faces" Images with Previously Consciously Perceived Primes**



of choices of the "faces" image was 49 percent. These proportions represent the net effects of the influence of previously consciously perceived primes on the choice of the "vase" and "faces" images, respectively.

A significance test of differences in the results, done with the ϕ^* statistic, yielded these results:

- the empirical value of ϕ^* for the comparison of the first experimental group and the control group is 3.8 at a significance level of $p < 0.01$;

- the empirical value of ϕ^* for the comparison of the second experimental group and the control group is 2.2 at a significance level of $p < 0.05$.

The values obtained in both comparisons for the statistic ϕ^*_{emp} are greater than the critical value $\phi^*_{cr} = 1.64$ at the adopted significance level of $p \leq 0.05$ and fall within the significance zone. Therefore, we can say that the influence of prime stimuli on the performance of the visual perceptual task is statistically significant. This means that the semantics of previously consciously perceived stimuli has a significant influence on the interpretation of an ambiguous figure.

The values obtained for the statistic in comparing the first and second experimental groups, respectively, with the control group show that there is a different degree of influence from the perceived primes on the choice of the "faces" and "vase" images. The value of the ϕ^* statistic for the influence of primes on the choice of the "faces" image is 2.2, while the value of the statistic for the influence on the "vase" choice is 3.8. This points to a stronger influence from the primes in the case of the test subjects' choice of the "vase" image. What is interesting is that the opposite situation occurred in Experiment 1: the influence of primes that were semantically related to the "faces" image proved to be statistically more significant than the influence on the choice of the "vase" image. It is quite probable that the "conscious/nonconscious" nature of the perception of the prime stimuli is one of the factors determining the perceptual choice between the black figure on the white background and the white figure on the black background. Testing this hypothesis was not part of the purpose of the study, although the above factor deserves attention.

A significance test of the differences in net effects for each case was also done with Fisher's ϕ^* statistic. The resulting data are presented in Table 3.

The value obtained for the statistic φ^*_{emp} when comparing net priming effects is 3.1, which is greater than the critical value $\varphi^*_{cr} = 1.64$ at a significance level of $p \leq 0.01$. Therefore the differences between the net effects from the influences of previously consciously perceived primes on the appropriate decision by the consciousness are statistically significant. The influence of primes semantically related to the "faces" image was stronger than the influence of previously consciously perceived primes with a semantic connection to the "vase" image.

To test the hypothesis of the study, the net priming effects found in Experiment 1 and Experiment 2 were compared. First the increase in the number of choices of the "vase" image in the first experimental group of Experiment 1 over the number of similar choices in the control group was added to the increase in the number of choices of the "faces" image in the second experimental group of Experiment 1. This resulted in the priming effect related to the influence of subliminal stimulation, regardless of its connection to either image of the reversible figure. The value of the net priming effect from the

Table 3

Calculation of the ϕ^* Statistic for a Comparison of the First and Second Experimental Groups in Terms of the Magnitude of the Net Effect of the Influence of Previously Consciously Perceived Words on the Choice of the "Vase" and "Faces" Images

Net priming effects	Magnitude of net priming effect, in %	Value of ϕ
Orientation toward "vase" image	27	3.11 ($p < 0.01$)
Orientation toward "faces" image	49	3.11 ($p < 0.01$)

influence of subliminal stimuli was 49 percent. Then the mean value was computed; it came to 24.5 percent.

The net priming effect from the influence of previously consciously perceived stimuli was computed in a similar manner. It came to 76 percent. The mean was 38 percent.

A significance test was done on the differences between the mean values of the net priming effects found in Experiment 1 and Experiment 2 (see Table 4).

The significance test of the differences showed that the influence of primes in Experiment 2 was statistically more significant than in Experiment 1. This is evidence of a higher degree of influence on the perception of the reversible figure from previously consciously perceived prime stimuli than subthreshold stimuli.

Discussion of results: The results of the study indicate that conscious visual perception in the experimental situations that were created was a result of a nonconscious decision to consciously perceive.

At each point in time the decision-making mechanism makes a cognitive choice out of many subliminal options for interpretation. The cognitive choice is not the option itself for interpreting the external influence but the stage of cognitive activity at which this interpretation is determined. The results of the experiment showed that, given a potential variability in the interpretation, an unequivocal understanding of an ambiguous figure is determined by the semantics of the mnemic context that is most active at the moment. Conscious perception always occurs in a mnemic context, although the subject is not conscious of this. In Experiment 1 this context was formed by subliminal stimulation, and in Experiment 2, by a sequence of previously consciously perceived words. The mind is not conscious either of the operation of the mechanisms of consciousness that provide the final effects of conscious perception or of the mnemic context in which the interpretation occurs (Agafonov, 2003a, 2003b, 2007; Allakhverdov, 2000, 2003). This principle

Table 4

Calculation of the ϕ^* Statistic for a Comparison of the Net Priming Effects Obtained in Experiment 1 and Experiment 2

Net priming effects	Mean net priming effect, in %	Value of ϕ
Influence of previously nonconsciously perceived prime stimuli (Experiment 1)	24.5	2.12 ($p < 0.05$)
Influence of previously consciously perceived prime stimuli (Experiment 2)	38.0	2.12 ($p < 0.05$)

is also valid, of course, in cases in which the mnemic context is formed at the subliminal level. In Experiment 1 the test subjects did not have time to consciously perceive the meaning of the stimulus words presented before the visual task was to be performed. Nevertheless, the semantics of the preceding context determined the subsequent effect of conscious perception of a certain image in the ambiguous figure. It was thereby demonstrated once again that understanding occurs even in cases in which the subject is not conscious of it. The content of the nonconscious understanding, in turn, can determine the effects of conscious perception in the subsequent moments of time.

A comparative analysis of the results of the experiments showed that previously consciously perceived prime stimuli exert a stronger influence on the effects of conscious perception of an ambiguous figure. The data obtained in the first experimental groups attest to the fact that under the influence of previous perceived prime stimuli the number of choices of the "vase" image increased by 10 percent, while a comparison of results for the second experimental groups shows an increase in the number of choices of the "faces" image by 17 percent. On average, the influence of previously consciously perceived words was 13.5 percent more significant than the influence of previously nonconsciously perceived words. The difference in the degree of influence of consciously perceived and previously nonconsciously perceived words proved to be statistically significant ($p < 0.05$).

Thus, the study showed that the effects of conscious perception depend more on previously consciously perceived information than on previously nonconsciously perceived information.

References

Agafonov, A.I. 2003a. "Ideals of Rational Knowledge, Modern Russian Psychology, and the Phenomenon of Consciousness." *Journal of Russian and East European Psychology,* vol. 41, no. 6, pp. 7–36.

———. 2003b. *Osnovy smyslovoi teorii soznaniia.* St. Petersburg.
———. 2007. *Kognitivnaia psikhomekhanika soznaniia, ili kak soznanie neosoznanno prinimaet reshenie ob osoznanii.* Samara.
Agafonov, A.Iu., and N.S. Kudel′kina. In press. *Effekty opoznaniia v usloviiakh mnogoznachnoi praim-stimuliatsii.*
Allakhverdov, V.M. 2000. *Soznanie kak paradoks. (Eksperimental′naia psikhologika. T. 1).* St. Petersburg.
———. 2003. *Metodologicheskoe puteshestvie po okeanu bessoznatel′nogo k tainstvennomu ostrovu soznaniia.* St. Petersburg.
Anderson, J.R. 2002. *Kognitivnaia psikhologiia.* St. Petersburg.
Chua, F.K.; J. Goh; and G. Kek. 1996. "Priming Within the 'Attention Blink' in an RSVP Task." *Perception 1996: 19 ECVP Abstracts.* Available at http://perceptionweb.com.
Dormashev, Iu.B., and V.Ia. Romanov. 1999. *Psikhologiia vnimaniia.* Moscow.
Falikman, M.V. 2001. "Dinamika vnimaniia v usloviiakh bystrogo posledovatel′nogo pred″iavleniia zritel′nykh stimulov." Dissertatsiia kandidata psikh. nauk. Moscow.
Filippova, M.G. 2006. "Issledovanie neosoznavaemogo vospriiatiia (na materiale mnogoznachnykh izobrazhenii)." In *Eksperimental′naia psikhologiia poznaniia: kognitivnaia logika soznatel′nogo i bessoznatel′nogo,* ed. M. Allakhverdov, pp. 165–81. St. Petersburg.
Kostandov, E.A. 1977. *Vospriiatie i emotsiii.* Moscow.
Marcel, A.J. 1983. "Conscious and Unconscious Perception: An Approach to Relation Between Phenomenal Experience and Perceptual Processes." *Cognitive Psychology,* vol. 15, no. 2, pp. 238–300.
Merikle, P.M., and S. Joordens. 1997. "Measuring Unconscious Influences." In *Scientific Approaches to Consciousness,* ed. J.D. Cohen and J.W. Schooler, pp. 109–24. Mahwah, NJ: Erlbaum.
Merikle, P.M., and E.M. Reingold. 1990. "Recognition and Lexical Decision Without Detection: Unconscious Perception?" *Journal of Experimental Psychology: Human Perception and Performance,* vol. 16, no. 3, pp. 574–83.
Palmer, J., and J. Jonides. 1988. "Automatic Memory Search and the Effects of Information Load and Irrelevant Information." *Journal of Experimental Psychology: Learning, Memory, and Cognition,* vol. 14, no. 1, pp. 136–44.
Pinker, S. 2004. *Iazyk kak instinkt* [The Language Instinct]. Moscow.
Schacter, D.L., and R.L. Buckner. 1998. "Priming and the Brain. Review." *Neuron,* vol. 20, pp. 185–95.
Swinney, D.A. 1979. "Lexical Access During Sentence Comprehension: Reconsideration of Context Effects." *Journal of Verbal Learning and Verbal Behavior,* vol. 18, no. 6, pp. 645–59.
Tipper, S.P., and J. Driver. 1988. "Negative Priming Between Pictures and Word in a Selective Attention Task: Evidence for Semantic Processing of Ignored Stimuli." *Memory and Cognition,* vol. 16. no. 1, pp. 64–70.
Velichkovskii, B.M. 1982. *Sovremennaia kognitivnaia psikhologiia*. Moscow.

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