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Does Unconscious Information Affect Cognitive Activity?: A Study Using Experimental Priming

Margarita G. Filippova

St. Petersburg State University (Russia)

In a series of three experiments the influence that information unrecognised by the subjects has on the effectiveness of occurring cognitive activity is studied. With this aim 3 types of stimulus were compared which for one reason or another were not afforded sufficient attention, namely: unconscious meanings of polysemantic information, stimuli presented at the subliminal level, and intentionally ignored distractors. All the listed types of stimuli are united in that the subjects were not able to give an account of them, i.e., these stimuli were not processed attentively. It is assumed that each of the types of stimuli studied is in actuality perceived, which can be judged by the impact they have on occurring cognitive activity. The purpose of the present research is the comparison of this impact: apart from the determination of the impact of unperceived stimuli on the information directly associated with them (priming-effect registration), also identified is the presence/absence of an overall interference effect rendered by the unperceived stimuli on the performance of occurring cognitive activity. To this end, each experiment had a control condition the aim of which was the creation of the possibility for the subjects to perceive stimuli unnoticed under experimental conditions. An experimental priming paradigm was used in combination with image-classification and lexical-decision tasks.

The results of the experiments conducted demonstrate that all types of stimuli 'slipping the attention' are assimilated, but their effect on occurring cognitive activity is varied. Thus, subliminally presented information aids, and distractors, on the contrary, hinder the solution of tasks associated with them, whereas unperceived meanings of polysemantic information hinder not only the solution of the tasks directly associated with them, but also the performance of any other cognitive activity for which they serve as a context. The effect of subliminal stimuli on occurring cognitive activity in the present research is explained by the spreading activation in the memory, the effect of distractors – by the inhibition of irrelevant representations in the information-processing system. For an explanation of the consequence of unperceived meanings of polysemanticity, not only an inhibition model was used, but also an unconscious negative choice model which assumed the necessity of making a special decision on non-perception.

Keywords: unconscious perception, priming-effect, lexical decision task, polysemantic images, subliminal stimuli, distractor, negative choice.

En una serie de tres experimentos se estudió la influencia que tiene la información no reconocida por los participantes en la efectividad de la actividad cognitiva concurrente. Con este objetivo, se compararon 3 tipos de estímulos que por una razón u otra, no obtenían suficiente atención, como: significados no conscientes de información poli-semántica, estímulos presentados a nivel subliminal, y distractores ignorados intencionalmente. Todos los tipos de estímulos mencionados tienen en común que los sujetos no eran capaces de percatarse de ellos, i.e., estos estímulos no se procesaban atentamente. Se asume que cada uno de los tipos de estímulos estudiados es percibido, lo que puede juzgarse por el impacto que tienen en la actividad cognitiva concurrente. El propósito de esta investigación es la comparación de este impacto: además de la determinación del impacto de estímulos no percibidos en la información directamente asociada a ellos (registro del efecto de facilitación), también se identifica la presencia/ausencia de un efecto global de interferencia de los estímulos no percibidos en el en el desempeño de la actividad cognitiva concurrente. Hasta este punto, cada experimento tuvo una condición de control cuyo objetivo era crear la posibilidad de que los sujetos percibieran los estímulos no percatados bajo las condiciones experimentales. Se utilizó un paradigma experimental de priming en combinación con tareas de clasificación de imágenes y de decisión léxica. Los resultados de los experimentos realizados demuestran que todos los tipos de estímulos que "escapaban a la atención" eran asimilados, pero su efecto en la actividad cognitiva concurrente variaba. Por tanto, la información presentada de forma subliminal facilita, y los distractores, al contrario, retrasan la solución de tareas asociadas a ellos, mientras que los significados no percibidos de la información poli semántica retrasan no sólo la solución de tareas directamente asociadas a ellos, pero también el desempeño de cualquier otra actividad cognitiva para la que sirvan como contexto. El efecto de estímulos subliminales en la actividad cognitiva concurrente de esta investigación se explica por la propagación de la activación en memoria, el efecto de los distractores –por la inhibición de representaciones irrelevantes en el sistema de procesamiento de información. Para dar una explicación de la consecuencia de significados de poli semántica no percibidos, no sólo se ha utilizado un modelo de inhibición sino también un modelo de decisión negativa inconsciente que asume la necesidad de tomar una decisión especial en no-percepción.

Palabras clave: percepción no consciente, efecto de priming, tarea de decisión léxica, imágenes poli-semánticas, estímulos subliminales, distractor, decisión negativa.

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Correspondence concerning this article should be addressed to Margarita G. Filippova. St. Petersburg State University. Universitetskaya nab. 7/9. 199034 St. Petersburg. (Russian Federation). Phone: +7 -812- 3289401. E-mail: box4fox@yandex.ru

Priming is the effect of previous information on the perception of subsequent information, accomplished without the active participation of the perceiving subject. This is a process as a result of which recent stimuli strengthen the 'accessibility' of information associatively connected with them. Being based on the use of an unclear prompt, priming does not require the actualisation of explicit memory, i.e., conscious and task-oriented reproduction, but only involves the implicit memory.

In order to understand the conceptual basis of priming, as Bryant and Thompson note, 'it is necessary to imagine the memory in the form of a complicated network connecting perceptions, thoughts, feelings and ideas' (Bryant & Thompson, 2004, p. 107), where each piece of newly received information activates the elements associated with it. It is generally though that the reason for priming is the spreading of activation in the memory, the memory itself being viewed as a network of interconnected elements or 'nodes' (Collins & Loftus, 1975). The elements are activated by external influences and are able also to activate one another. In the priming process previously formed ideas, thoughts and knowledge associated with the content of the incoming information assume an active state. 'Imagine that our memories are tangled up with associations and are stored in a sort of spider web,' says Myers, 'when we want to extract anything from our memory we have to 'tug' one of the strands leading to this episode' (Myers, 2008, p. 131).

The phenomenon mentioned has been known to psychologists for a long time. Thus, in the opinion of Myers, it is precisely priming that the philosopher and psychologist W. James described as the 'arousal of associations'. In essence, the priming-effect is also close to the concept of 'set' proposed by Uznadze inasmuch as, like the latter, it presupposes the passive influence of past experience on the creation of a state of internal preparedness. But priming became the subject of close attention in the cognitive science after the experimental description by Meyer and Schvaneveldt (1971) of the effect of increased effectiveness in solving cognitive tasks associated with context. To explain the given effect, a theory of activation was used in which it is assumed that after the presentation of any word (for example, BUTTER), the idea-node itself is activated in the memory's network, from which the activation spreads to associated nodes in the network (for example, BREAD). That is, those elements which are not directly linked with the node from which the activation emanates also become active (though to a lesser degree). Such 'pre-activation' facilitates subsequent processes requiring access to associated ideas, which is also the reason for semantic priming. And, inasmuch as activation, as confirmed in this theory, spreads automatically, subjective control over which ideas initially become activated is impossible (for example, Falikman, & Koifman,2005).

Several theoretical metaphors are proposed for a description of the priming-effect (Bryant & Thompson, 2004). In one of them, named the 'basket model', it is suggested the memory be viewed by analogy to a large basket in which recently activated ideas are placed on top. When new ideas are laid down, the earlier ones shift to the bottom. In this model a special role is allocated to the novelty factor.

The following metaphor, having the name of the 'battery model', emphasises another factor – the frequency factor. Frequent activation of specific ideas is in this model viewed in the role of 'recharging' actualising associated information. According to the given model, the more often the 'recharging' occurs (i.e., work with these or other ideas), the stronger the effect.

It is generally thought that ideas recently subjected to priming are more active within a short time period, i.e., they have a short-term effect, whereas ideas frequently subjected to priming have a long-term impact.

Priming is combined with a series of specially developed experimental tasks: task of naming stimuli; their categorisation; task of searching for certain letters in words; word-stem completion test; task of selecting words having an identical beginning; word-fragment completion test; lexical decision task, and others.

One of the most common forms of tasks used in the methodology of priming is the 'lexical decision task' where subjects are required to determine whether combinations of letters presented to them on a screen are words or senseless sequences. Sets of letters are presented to the subjects under two different conditions: with previous prompting or with a preceding neutral stimulus. The difference in speed and accuracy of reactions under these conditions is the priming-effect.

A stimulus for which the speed and accuracy of reaction is measured is called the 'target', and the prompt itself, i.e., the stimulus, the preceding acquaintance with which leads to a change in reaction – the 'prime'. Usually used as primes are a selection of stimuli associated with the target, a selection of examples of the same category.

The prime stimulus affecting the results of subsequent cognitive activity may be perceived or may be presented also at an unconscious level. As certain research demonstrates (for example, Palmer & Jonides, 1988)), unconscious stimulation is not only processed at the semantic level, but also may determine subsequent conscious reactions. Illustrative in this regard is the research of Khachapuridze (in Kostandov, 1977, p. 102). Setting himself the aim of determining the degree of influence of unperceived stimuli on the formation of set, he used subliminal presentation of the following phrases: 'I'll look in the mirror', 'I'll cut paper', 'I'll look at the album'. In Khachapuridze's research the certain phrase was presented to subjects 700-800 times within 10 minutes. After this the experimenter pulled back a curtain and asked the subjects to perform any action on the objects hidden behind it. The results of the given experiment showed that subjects more frequently than at

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random performed the action which had been prescribed to them in the unperceived phrase.

In the classical experimental procedure using the priming methodology and subliminal priming stimuli such effects are often observed, as if clear supraliminal stimuli had been used. Thus, for example, using a word-stem completion test, Foster and his colleagues observed an acceleration in the solving of this task if it was preceded by the presentation of subliminal primes coinciding with the target stimuli (Foster, Booker, Schacter, & Davis, 1990). Therefore, if the target word is preceded by a prime associated with it (including a subliminal one), decisions, as a rule, are more quickly taken and with less mistakes. However, it is not always so – a prime may not only facilitate, but also hinder the identification of target words associated with it. On the basis if whether a prime improves identification of a subsequent stimulus or, on the contrary, impairs it, positive and negative priming-effects are differentiated.

A negative priming-effect was first recorded by Dalrymple-Alford and Budayr (1966) in research using the Stroop phenomenon. Subjects in this research named colours in which words were painted, ignoring the reading of the words themselves which designated the names of other colours. Dalrymple-Alford and Budayr compared the speed of reading two lists of words: one in which the colour of the ink of each subsequent colour corresponded to the ignored word in the previous experiment, and the classical Stroop test procedure (without use of such relations between sequential stimuli). As it transpired, the subjects required significantly more time to read the first list. Despite the fact that the researchers did not use the term 'priming-effect', many classical experiments were subsequently constructed according to their scheme with the demonstration of negative priming-effects. Later, for example, it was shown that a negative priming-effect is observed in Stroop-like tasks even in the case where the prime is presented under conditions excluding its perception (for instance, MacLeod & Hagan, 1992; Pavese & Umilta, 1999; Rozin & Royzman, 2001).

The results of Dalrymple-Alford and Budayr were extended by Tipper and his colleagues (Allport, Tipper, & Chmiel, 1985; Tipper & Driver, 1988) to tasks in which it was required to identify one of two letters, words or contour drawings laid on top of each other, Since then a negative priming-effect has been demonstrated in experiments with so-called distractors. In these experiments, an increase in reaction time to the target stimulus is observed if in the previous experiment this stimulus appeared as ignored (distractor). To explain the results obtained by Tipper (1985), a distractor inhibition model was proposed. This model assumes that the representations of ignored objects are suppressed during operation of selective attention: when we come across irrelevant information and we do not need to activate meanings associated with it, inhibition comes into force.

The results of experiments with distractors has allowed researchers to suggest that 'over the course of processing information from perception to action' distractor inhibition occurs at the later stages (for example, Tipper & Cranston, 1985). At least, after allocating it (the distractor) to some category or other. Tipper and Driver mention that: 'initial analysis of two objects takes place in parallel at least to the level of categorical representation if they are familiar and have well-established internal representations. Subsequent to this analysis, the selected object receives further processing enabling overt action to be directed to it. The internal representations of the ignored objects also receive further processing, rather than passively decaying back to resting levels. In this case, however, the internal representations are inhibited. Such inhibition prevents action from being inappropriately directed by ignored objects' (Tipper & Driver, 1988, p. 69).

Apart from the inhibition model, there is one other influential model explaining the negative priming-effect. This is the episodic reconstruction model. If the inhibition model emphasises the attention process, the focus of which determines the suppression of these or other representations, then the episodic retrieval model places the memory at the forefront. The given model asserts that under repeated encounters with a stimulus a previously formed memory trace is reconstructed, and when the reconstructed information contradicts that newly received, activity slows down. And if in the inhibition model the negative priming-effect is the suppression of internal representations of a distractor in the prime-experiment (i.e., in experiment $n - 1$), then the frequent reconstruction model is the result of the intervention of information reconstructed in the target experiment (i.e., in experiment n) (Kramer, & Strayer, 2001).

After prolonged disputes about which of the two dominating models more precisely describes the negative prime-effect, researchers more and more frequently came to recognise that these models do not stand in opposition to one another. Thus, for example, Tipper asserts that inhibition of representations and their reconstruction are two sides of the same coin (Tipper, 2001). These processes are strewn over time: in the beginning, coding of the incoming information is necessary, which presupposes the inhibition of irrelevant representations in experiment $n - 1$, and then, in experiment n, the reverse action – the reconstruction of previous memory traces concerning the newly met stimulus. Inhibition is viewed by Tipper as a process of flexible adaptation to the need to select a goal which serves to prevent interference.

The concept of 'inhibition' is used also regarding the perception of polysemantic information. Many authors have postulated the a priori existence of passive prohibiting links between alternative meanings of word homonyms, such as 'FAIR', 'PLAIN', etc. (Balota & Paul, 1996; Simpson & Kang, 1994). These links, as is confirmed, serve to

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suppress contextually inappropriate interpretations. One of the first and most significant works using the experimental priming paradigm to study the perception of polysemantic information was the research of Marcel (Marcel, 1980). Using the lexical decision task to study the specifics of perceiving word homonyms, Marcel discovered that with supraliminal presentation, unperceived meanings of polysemantic words cause a negative priming-effect (i.e., they complicate the identification of words associated with them), whereas with subliminal presentation both meanings of the word homonyms cause a positive priming-effect (facilitating the identification of words associated with them). In the given research a polysemantic word stood in second position in a triad (for example, CIRCUS-FAIR-BLOND). After the first word had inclined interpretation of the second to one of its two meanings, identification of the third word, associated with the second meaning, was slower under conditions of supraliminal presentation and faster in conditions of subliminal presentation of the second word. The results of the given experiment assume that under subliminal perception inhibition has not yet been activated (as under conscious perception), as a result of which both meanings of polysemantic words are accessible.

That a negative priming-effect caused by unnoticed meanings of polysemanticity at an unconscious level is replaced by a positive one, gives grounds to assume the significance for understanding the dynamics of perception of polysemanticity of the 'conscious' concept (as a transition from an unconscious to a conscious state). This concept, as a rule, is not examined in classical literature on priming.

In the theory of Allakhverdov the process of realisation is paid close attention, where to describe the perception of polysemantic information the term 'unconscious negative selection' is used (Allakhverdov, 2000). The given theory postulates the existence of a mechanism (which the author calls the 'realisation mechanism') able to take decisions about which part of the perceived information will be realised, and which – not. Positive and negative selections are also such decisions, their help in the examined concept explains the mechanisms which provide the final results of conscious activity, themselves at the same time remaining unperceived. Thus, according to Allakhverdov, during perception of polysemanticity a negative selection occurs (active rejection of one of its meanings). This process assumes an act of removing contradictions inasmuch as the realisation itself performs the function of constructing a single, non-contradictory picture of the world – it advances its hypotheses on what is reality and then strives to confirm them. In contradistinction to the inhibition model aimed more at describing the physiological component of information processing, the negative selection model explains this process exclusively by the logic of cognitive activity. The concept of 'negative selection' is not limited to the perception of polysemantic information, it also permits an explanation of a series of other psychical phenomena, among which are: the realisation of what previously was already realised and the non-realisation of that which was not realised; the consequence of figure and background; the existence of a natural repetition of errors in cognitive activity, including errors of omission. For example, a natural repetition of errors of omission, i.e., a tendency not to reproduce one and the same stimulus signs even after a prolonged time when the subjects repeatedly face the previous task, is in this model a natural consequence of taking a decision on non-realisation. Repetitive errors of omission demonstrate that it must somehow be remembered what is not to be realised, and they cannot be explained exclusively by inhibition of irrelevant interpretations in the information-processing system. Similar ideas are advanced by other authors. For example, Agafonov asserts that realisation is 'possible only under condition of selecting from patterns of understanding of an external influence already at the disposal of the conscious but unperceived'(Agafonov, 2006, p. 305). Realisation is viewed by the given author as the conclusion of the process of searching for an interpretation of an unperceived external influence.

So, let us return to homonyms. In the research of Balota and Paul (1996), also devoted to the perception of homonyms, a polysemantic word was in the third position in the triad (for example, CIRCUS-BLOND-FAIR). In the given research, apart from lexical decision tasks, tasks of naming and judging the presence of a link between the presented concepts were used. The results of the given research, contrary to the authors' expectations, showed that in the first two cases when analysing polysemantic target words (as also when using monosemantic words), an 'additivity' of primes on the performance of test tasks associated with them was observed, i.e., two primes accelerated the identification of word homonyms two times as strongly as each of them individually. And only in the 1st case (when using the task of establishing a semantic link) is this influence 'underadditive', i.e., the two primes have no more effect on the speed of identification of the word homonym than each of them individually. Results obtained by Balota and Paul explain the presence only of lexical associations at a low level when subjects perform the first two tasks (lexical decision task and naming), capable of activating both meanings of the homonym, whereas the task of establishing the connection of concepts, in the authors' opinion, induced the subjects to activate high-level semantic structures, as a result of which additivity of primes is graded.

We do not think as indisputable the authors' *a priori* expectation of the research under examination into the underadditive influence of primes associated with different meanings of word homonyms on the identification of the word homonym itself. Inhibition of an alternative interpretation of a monosemantic stimulus, according to our submissions, is possible only after meeting the

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stimulus itself, but not before that moment. This assumes the negative selection model examined above, a leading role in which is realisation. The given model predicts that before meeting a polysemantic object, neither one of its interpretations is negatively chosen (rejected), and therefore cannot be inhibited. A different explanation of the obtained results, according to which only in conditions requiring a clear choice does inhibition of alternative interpretations of polysemantic target words occur, was taken into account by the authors of the examined research themselves, however this variant was not obvious for them.

We would explain the lack of additivity of primes when using the task of establishing the interconnection of presented words not by the inclusion in the processing of the semantic level (apart from lexical, activated when using the previous tasks), but by the increase in the influence of conscious processes ('top-down') on the results of processing word homonyms, which could weaken access to automatic processes. In our view, the semantic level of information processing is activated also when performing lexical decision tasks and naming. This is clearly demonstrated by experiments where priming-effects when using as tasks both naming (Kudelkina, 2008) and also lexical decision tasks (for example, Filippova 2006, 2009), monitor between words and images, i.e., when the prime and target have no common specifics, apart from the conceptual.

In particular, in the latter of the works mentioned, we reproduced the results of Marcel in research where as primes, instead of word homonyms ambiguous images were used (drawings which may be interpreted as representing two different classes of objects). The tasks to be solved by the subjects in this research, apart from lexical decision tasks, were also several types of cognitive tasks (anagram solving, identification of pictures and words appearing in the background, picture-fragment completion tests) (Filippova, 2009). The results of the experiments conducted showed that unperceived meanings of polysemantic images negatively tells on a person's current conscious activity. As was discovered, this negative influence is manifest not only in the negative priming-effect which unperceived meanings have on the identification of stimuli semantically associated with them, but also in the general interference effect on the execution of other cognitive tasks for which these unperceived meanings serve as context. In the research under examination it was established that after perceiving previously unnoticed meanings of polysemantic information the interference effect disappears.

The results obtained were interpreted by us as confirmation of the negative choice model which assumes that unconscious meanings of polysemantic stimuli are not equivalent to those lacking. Explaining the general reduction in the efficiency of performing conscious activity where there are unperceived meanings, we assumed that 'negative choice' is an active process of information processing which is accomplished in parallel with the solution of cognitive tasks, thereby creating a situation of simultaneous execution of several actions. These ideas may be considered an addition to the Allakhverdov model inasmuch as such an understanding of negative choice has previously not been examined in the given concept.

In the new research a comparison was planned of the specifics of perceiving unconscious meanings of polysemantic information and other situations in which the subject for some reason cannot pay attention to a stimulus, namely, with the perception of subliminal stimuli, and also with the perception of ignored distractors. It is possible to detect common traits of the one and the other phenomenon with the perception of polysemanticity, in the process of which the non-recognition of one of the meanings occurs. With subliminal perception, the latter unifies what the subject has not guessed about the existence of the meanings which he does not recognise. Thus, in one of the experiments conducted we compared the process of perceiving polysemanticity with the situation where the possibility to realise a key stimulus was knowingly excluded (inasmuch as the subject does not recognise the effect itself), i.e., with subliminal presentation of monosemantic images. In the given experiment, we also checked the presence of a general interference effect under subliminal perception. With this purpose a supraliminal presentation to the subjects of the very same stimuli was used as a control condition.

The perception of polysemantic information and ignored distractors unifies the necessity to choose and the presence of the possibility to recognise an alternative meaning. The difference between perception of polysemantic information and ignored distractors consists in the fact that in the first case a person does not suspect the presence of alternative meanings, and in the second purposefully ignores them. In other words, the first task requires arbitrary – and the second non-arbitrary attention. After experimenting with various ways of presenting distractors for the given comparison, a procedure was chosen similar to that used by Tipper and Driver (1988). To check the presence of a general interference effect where there is a need to ignore the distractor, a condition was used without significant limitation in the duration of presentation of stimuli (target and distractor), i.e., where the subjects had sufficient time to examine (and, accordingly, recognise) both drawings.

Thus three experiments were conducted, in the first of which the subjects were presented with ambiguous images. In the second, at the subliminal level (time of presentation 30 ms), they were exposed to monosemantic images. In the third experiment, two monosemantic images laid one on the other were presented (different meanings of initial polysemantic images without ambiguity), to one of which a reaction was required, and the second – purposefully ignored. In all the experiments lexical decision tasks were used. In the first and third experiment lexical decision tasks were alternated with image classification tasks.

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EXPERIMENT 1

Method

Purpose of First Experiment. In as much as we had previously obtained data on the negative effect of unconscious meanings of polysemantic information on the performance of occurring cognitive activity (Filippova, 2009), we expected a repeat of these results in the present research also. Consequently, the purpose of the first experiment was to check the hypotheses regarding the negative effect of unconscious meanings of ambiguous images on the solution of cognitive tasks both associated and non-associated with them.

Design

In the first experiment lexical decision tasks were used in combination with image classification tasks.

The checking of the hypotheses of the present experiment assumed a comparison of the efficiency of the performance by the subjects of the lexical decision tasks (speed and number of errors) where there were (experimental condition) and were not (control condition) unconscious meanings of ambiguous images. Subjects in the control group before commencement of the experiment were shown ambiguous images with a request to find both their meanings.

Thus, if the subjects in the control group in the process of conducting the experiment recognised both meanings of the ambiguous image, the subjects in the experimental group recognised, as a rule, only one of them. In order to determine which meaning of the ambiguous image each subject in the experimental group recognised, an image classification task was introduced. From known ambiguous images we chose those which combined a drawing of a land and a water animal (see figure 1). If the subject categorised the ambiguous image as a land animal, the second meaning of this image (corresponding to a water animal) was considered unconscious for this subject, and vice versa.

To keep to a minimum the possibility of the subjects detecting the polysemanticity of the drawings used, ambiguous images were presented to them in alternation with unambiguous ones (see figure 2).

In all, 12 monosemantic (6 in the training series and 6 in the main) and 6 polysemantic images were used. For each image words associated with them were chosen, for the ambiguous images – two words, associated with both their meanings. Apart from the words associated with the images, words not related to the images were also used. In each category of words (‘associated with the meanings of ambiguous images’, ‘associated with unambiguous images’, and ‘not associated with the images’) an identical number of words was used consisting of 4, 5, and 6 letters. The words were presented to the subjects in alternation with pseudo-words (meaningless sequences of letters), and

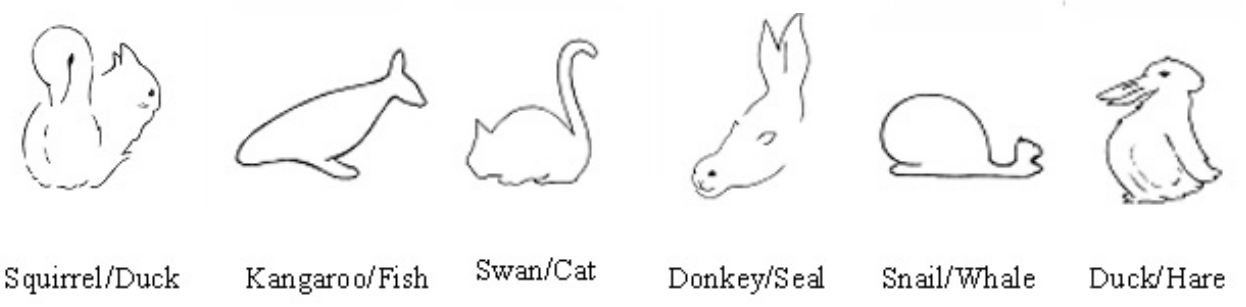

Figure 1. Examples of ambiguous stimuli.

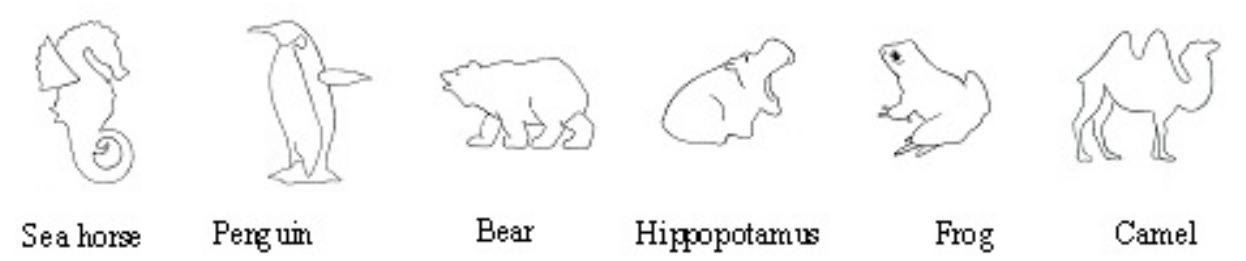

Figure 2. Examples of unambiguous stimuli.

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the length of the pseudo-words also comprised 4-6 letters. For example, the sequence of letters presented after the first figure (Squirrel/Duck) was: 'skapa' (pseudo-word), 'bird' (word associated with one of its meanings), 'taraka' (pseudo-word), 'lawyer' (word not associated with one of the given figure's meanings). With the appearance on the screen of a series of letters, the subjects' task was to determine if they were being presented with a word or a random sequence of letters.

Each image in the course of the experiment was presented 4-5 times. Monosemantic images – 4 times (once before the associated word, once before a non-associated word, and twice before a pseudo-word), polysemantic images – 5 times (once before a word associated with the first meaning, once before a word associated with the second meaning, once before a non-associated word, and twice before a pseudo-word).

All together, the subjects were presented with 148 tasks (including image classification and letter-series tasks), and the experiment lasted approximately 7 minutes.

Participants.

Fifty adults (33 in the experimental group and 17 in the control group) voluntarily participating in the research. Of these, 21 were men and 29 women, aged from 18 to 55. All the subjects had normal or corrected to normal sight.

Materials and Equipment

1) Monosemantic and polysemantic (combining a drawing of a land and a water animal) contour images, 283 x 283 pixels in size.
2) Letter series 4-6 symbols in length: words associated with the images used; words non-associated with the images; and also pseudo-words (meaningless sequences of letters).

Stimulus material was presented to the subjects visually using a computer.

Experiment Procedure

The subjects were alternately presented drawings with images of animals and a series of letters. The subjects' task was the classification of the animals into land and water animals, and the series of letters – into words and pseudo-words. The 'right' and 'left' leys in the lower right part of the keyboard were used for the classification. The subjects received instructions to react as quickly as possible, the time of the reaction was limited to two seconds. The experiment began after the subjects had undergone a training exercise including 20 tasks with image classification of animals and 20 lexical decision tasks.

The control-group subjects before commencement of the experiment were shown ambiguous images with the request to find both their meanings, and only after they had found both meanings of the ambiguous images did the experiment begin (which also included a training series). The control-group subjects were instructed to classify the ambiguous images in accordance with the meaning which was easier for them to identify. Words associated with the meanings of an ambiguous image during the process of the control-group data were considered associated with perceived meanings.

The time and number of errors when classifying unambiguous and ambiguous images and the determination of the status of word categories was recorded: associated with unambiguous images; associated with perceived meanings of ambiguous images; associated with unperceived meanings of ambiguous images, and not associated with the images used. According to the difference between the efficiency (speed and number of errors made by the subjects) of performing the lexical decision task for words associated and non-associated with the images used, conclusions were drawn on the presence or absence of positive and negative priming-effects in the conditions used. Pseudo-words were used to create a choice situation, therefore the speed and number of errors when identifying them did not have any independent value. However, pseudo-words were taken into consideration when comparing the average time of performing all lexical decision tasks in the experimental and control groups.

Results

As anticipated, subjects in both groups, the control and experimental, demonstrated a more rapid time for determining the status of a word associated with a context perceived by them (i.e., with unambiguous images and perceived meanings of ambiguous images) (see Table 1). This is the key moment in the experimental priming paradigm, the so-called 'priming-effect'. From the point of view of the purposes of the present experiment though, this result was not so significant as the fact that the words associated with unperceived meanings of unambiguous images were identified by subjects in the experimental group, on the contrary, longer than all the others, including longer than words not associated with ambiguous images (differences at a level of statistical tendency, $t = -1.773$, $df = 897$, $p < .1$). In the given case a negative priming-effect was recorded comprising 40 ms (1,555 ms – 1,595 ms).

Deserving of special intention is the fact that in the words associated with unperceived meanings of ambiguous images the subjects committed the largest number of errors (Table 2). The number of errors associated with unperceived meanings is significantly higher than in words not related to the images ($\chi^2 = 6.011$, $df = 1$, $p < .05$).

The obtained result speaks of the inherent tendency of subjects in the experimental group to categorise words associated with meanings unperceived by them as pseudo-words. That is, in limited-time conditions the subjects were

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Table 1
Average time of making a lexical decision depending on the nature of the association of letter series with the images, ms

Words	Experimental Group	Control Group
Words associated with unperceived meanings of ambiguous images	1,595.8 ms	-
Words associated with perceived meanings of ambiguous images	1,444.9 ms	1,411.9 ms
Words associated with unambiguous images	1,431.8 ms	1,408.3 ms
Words not associated with the images	1,555.7 ms	1,463.2 ms

Table 2
Average number of errors when performing a lexical decision task depending on the nature of the association of letter series with the images, ms

Words	Experimental Group	Control Group
Words associated with unperceived meanings of ambiguous images	9.1 %	-
Words associated with perceived meanings of ambiguous images	3.5 %	3.9 %
Words associated with unambiguous images	4.0 %	2.0 %
Words not associated with the images	3.8 %	3.4 %

Table 3
Speed of classifying unambiguous and ambiguous images in the experimental and control groups, ms

Images	Experimental Group	Control Group
Unambiguous images	1,513.6 ms	1,536.5 ms
Ambiguous images	1,667.0 ms	1,975.0 ms

inclined not to recognise words well known to them if these words were associated with meanings of polysemantic information previously unperceived by them.

Goals of the present research also included a comparison of the average speed of the execution by the subjects of all lexical decision tasks with and without unperceived meanings of polysemantic images. If our theoretical theoretical considerations that in parallel with conscious activity, there is a retention of negatively chosen meanings in the unconscious state, are true, this ought to slow the speed of all occurring activity, and not only that which is associated with negatively chosen information. In other words, in the experimental group a longer time for making a lexical decision should be observed for all categories of letter series in comparison with the control group. Precisely such a result was indeed obtained in the present experiment: the time for solving all cognitive tasks where there were unperceived meanings was significantly longer than the time for solving the very same tasks by subjects perceiving both meanings of an ambiguous image ($t = 1.987$, $df = 2{,}698$, $p < .05$) (see Fig.3).

As an unexpected result, it should be noted that the speed of classifying polysemantic images was much lower in the control group in comparison with that of the experimental ($t = -2.044$, $df = 1649$, $p < .05$), whereas the speed of classifying monosemantic images in the experimental and control groups did not statistically differ (Table 3). This means that the subjects required a significantly longer time to classify an ambiguous image in accordance with any of its meanings, if they knew both these meanings, in comparison with the situation where the ambiguous image was perceived by the subject as unambiguous.

Discussion

The results of the present experiment demonstrate the negative effect of unperceived meanings of ambiguous images on the efficiency of a person's occurring cognitive activity. This negative effect spreads, in the first instance, to information directly associated with the unperceived meanings. In the given experiment, this was manifest in the increase in time and number of errors committed by

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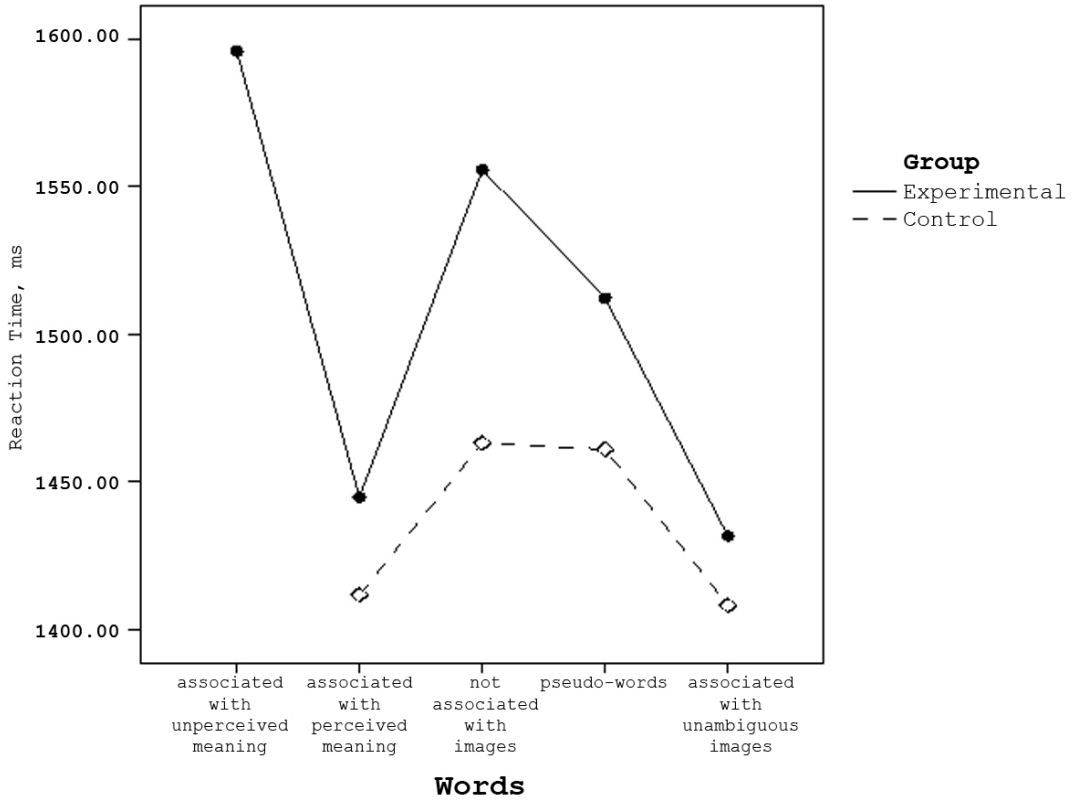

Figure 3. Average time of making a lexical decision depending on the nature of the association of letter series with the images in the experimental and control groups, ms.

the subjects when determining the lexical status of words related to meanings of ambiguous images unperceived by them. And, inasmuch as the classification of ambiguous images in the experimental group (when the subjects recognised only one of the two meanings) was performed significantly quicker than in the control group (when the subjects knew both meanings), presupposes that they did not require additional time to examine the polysemantic context, and this, in turn, confirms the lack of understanding the very fact of the presence of any polysemanticity. Despite this fact, in the experimental group there occurred an inhibition of unperceived meanings, as witnessed by the reduction in the speed of determining the lexical status of words associated with them. The presence though of the maximum number of mistakes, demonstrating a tendency of the subjects not to recognise words well known to them if these words were associated with polysemantic meanings previously unperceived by them, assumes also a certain semantic rejection of these very meanings by the subjects.

Apart from the negative effect of unperceived meanings of polysemanticity on information directly associated with them, the results of the present experiment confirm also the general interference effect of unnoticed meanings on occurring cognitive activity. Specifically, where there were unperceived meanings, the time for the execution by the subjects of all lexical decision tasks (both associated and non-associated with ambiguous images) in the conducted experiment turned out to be significantly greater than in control conditions where there were no unperceived meanings. Such an effect of unnoticed meanings of polysemantic images on the efficiency of occurring conscious activity cannot be explained exclusively by inhibition of irrelevant meanings in the information-processing system. Inhibition, intended to reduce interference (or, as is affirmed in the theory of inhibition, 'to prevent the execution of automatically activated non-relevant meanings of reactions' (Tipper, 1991), should not have any consequence, i.e., facilitate new interference effects such as, in particular, the general reduction in the speed of completing cognitive tasks in the experimental group. A clearer understanding of the results of the present experiment is provided, in our view, using a negative-choice model, assuming the taking of a special decision on the non-recognition of alternative meanings of polysemanticity. In order, coming across the same images each time, to continue to see the previously conscious and

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not see the previously unconscious one, it is necessary among other things, to retain the once rejected meanings in the unconscious state which, according to our submissions, also occurs in the present experiment. The delay in performing cognitive activity where there are unperceived meanings of polysemanticity may testify to a retention of negatively chosen meanings in the unconscious state in parallel with the solving of cognitive tasks. This process is partly reminiscent of the psychoanalytical repression of unacceptable information for the personality.

EXPERIMENT 2

Method

Goal of Experiment 2: Determination of the effect of subliminal stimuli on the results of occurring cognitive activity both associated and non-associated with them.

Design

Unambiguous drawings with images of animals (see Figure 4) serves as 'prompts' for lexical decision tasks in the present experiment. These were the same drawings as in the previous experiment, but without polysemanticity (elements creating ambiguity were removed from the polysemantic images). In the given case, the images were presented to the subjects at a level precluding their recognition (exposure time of 30 ms). The appearance of a contour image-prime was accompanied by simultaneous overlay of a masking grid consisting of transparent and non-transparent cells (pixels). The colour of the non-transparent cells was identical to that of the background on which the image appeared. Then without delay (inter-stimulus interval of 0 ms) the lexical decision task window was opened in the same place. As a result the flashing of images remained unnoticed by the subjects, and their task was exclusively to classify the letter series into words and pseudo-words.

Fifteen images were used in the experiment (5 in the training series and 10 in the main one). Undergoing the training, the subjects completed 20 lexical decision tasks, each of which was preceded by one of five subliminal images. In the main series each of the 10 images was presented to the subjects four times: once before a word associated with it, once before a non-associated word, and twice before a pseudo-word.

All together, including the 10 tasks in the training series, subjects completed 50 lexical decision tasks, each of which was preceded by the subliminal presentation of images. The experiment lasted approximately four minutes.

A similar experimental plan was used in the control group, with the exception that the images were introduced at the conscious level and presented to the subjects for 120 ms.

Participants

Fifty-four adults (21 in the experimental group and 33 in the control group) voluntarily participating in the research. Of these, 23 were men and 31 women, aged from 18 to 48. All the subjects had normal or corrected to normal sight.

Materials and Equipment.

1) Unambiguous contour images, 283 x 283 pixels in size.

2) Letter series 4-6 symbols in length: words associated with the images used; words non-associated with the images; and also pseudo-words.

Stimulus material was presented to the subjects visually using a computer.

Experiment Procedure

The experiment commenced after undergoing a training series. The subjects were alternately presented unambiguous drawings with images of animals and a series of letters. As the subjects in the experimental group could not see the drawings, the exposure time of which was 30 ms, they were instructed exclusively to perform a lexical decision task. The 'right' and 'left' leys in the lower right part of the keyboard were used for the classification of the letter series into words and pseudo-words. The subjects received instructions to react as quickly as possible, the time of the reaction was limited to two seconds.

The procedure for the experiment in the control group was identical, with the exception that unambiguous

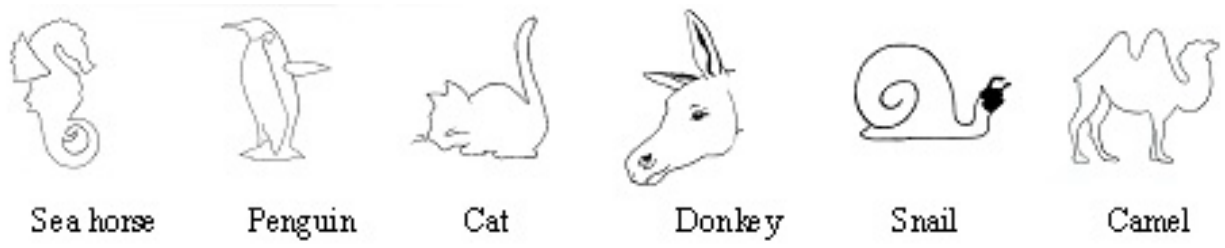

Figure 4. Examples of subliminal stimuli

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images were presented to subjects at the conscious level (exposure time of 120 ms). As in the experimental group the subjects did not see these images, the control group was also given the instruction not to react to the flashing drawings of animals, but exclusively to complete the lexical decision task.

Both in the experimental and in the control group, the time and number of errors committed by the subjects when determining the lexical status of words associated and non-associated with the unambiguous images used in the experiment was recorded. According to the difference in the efficiency of completing the lexical decision tasks in these conditions, conclusions were drawn on the presence or absence in the experiment of positive and negative priming-effects. Also compared was the average time for completing all lexical decision tasks (including pseudo-words) in the experimental and control groups.

Results

What strikes the eye in the first instance is the fact that in the studied conditions, i.e., where there was use of just one task, lexical decision tasks, the subjects required practically twice as less time for their completion than in the previous experiment where this task was alternated with the image classification. The necessity to switch from one task to another, which the conditions of the first experiment presupposes, delays the speed of solving both tasks.

The results of the present experiment showed that subliminal presentation of images does not have a negative effect on occurring cognitive activity similar to the unperceived meanings of polysemanticity (Tables 4 and 5). On the contrary, unambiguous subliminal images do not simply not hinder, but even facilitate the identification of information associated with them. The determination of the lexical status of words associated in idea with unambiguous images presented to subjects subliminally, was performed in the present experiment more quickly than the determination of the lexical status of words not related to these images (t = -1.969, df = 438, p < .05) (Table 4). This coincides with data frequently demonstrated before in various studies of subliminal perception.

The distribution of the frequency of errors and correct responses under the mentioned conditions (when determining the lexical status of words associated and not associated with subliminal images) does not statistically differ. Data on the number of errors committed by subjects when determining the lexical status of different categories of words are presented in Table 5.

A general interference effect was not discovered that could be rendered by subliminal stimuli on the completion of occurring cognitive activity, to which a comparison of the obtained results with data from the control group testifies. The average time for a lexical decision task in the experimental group was 820.8 ms, whereas in the control group it was 844.6 ms (not significant differences). If one compares the amount of the negative priming-effect under subliminal and supraliminal presentation of unambiguous prime-images, it is possible to discover that under subliminal presentation a priming-effect is more clearly expressed: 97 ms in conditions of subliminal (830.9 ms – 743.9 ms) and 32 ms in conditions of supraliminal presentation (819.1 мс – 787.8 ms).

Discussion

Despite the fact that the unperceived meanings of polysemantic images have general features with subliminal

Table 4
Average time of completing a lexical decision task depending on the nature of the association of letter series with subliminal images, ms

Words	Experimental Group	Control Group
Words associated with unambiguous images	743.9 ms	787.8 ms
Words not associated with unambiguous images	830.9 ms	819.1 ms

Table 5
Number of errors when performing a lexical decision task depending on the nature of the association of letter series with subliminal images, %

Words	Experimental Group	Control Group
Words associated with unambiguous images	2.9 %	3.0 %
Words not associated with unambiguous images	2.4 %	3.4 %

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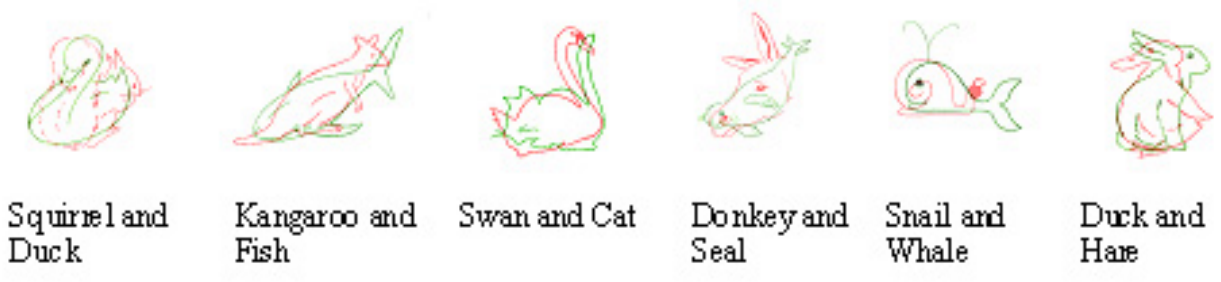

Figure 5. Examples of distractor stimuli.

stimuli (when presented, the subject does not guess the existence of meanings which he does not perceive), these types of stimuli differ in their effect on the results of occurring cognitive activity. In contradistinction to the consequence of non-perception of polysemantic meanings well known to the subject, the non-perception of monosemantic information, taking place where there is a time limit in its presentation, is not accompanied by a reduction either in speed or in accuracy of the solving of tasks semantically associated with it. On the contrary, subliminally presented information facilitates the determination of the lexical status of words associated with it, which confirms the data from previous research on the possibility of the spread of activation in the memory, avoiding the perception and response stage. This assumes that monosemantic images presented at the subliminal level, despite their non-perception, are discerned and facilitate the identification of information directly associated with them.

Such obtained results demonstrate the lack of a general interference effect of subliminally presented information on occurring cognitive activity, and testify to the fact that if information cannot be perceived by virtue of its physical properties, the positive priming-effect is even more expressed than under supraliminal presentation of the prime.

EXPERIMENT 3

Method

Goal of Experiment 3: Checking of hypotheses on the inhibition of information associated with distractors, and also the determination of the effect of distractors on the results of cognitive activity not associated with them.

Design

In the present experiment a lexical decision task was used in combination with a classification task of images with a distractor.

Serving as 'prompts' for the determination of the lexical status of the letter series were two overlaid monosemantic images (different meanings of the polysemantic drawings used in the first experiment, without ambiguity). Drawings painted in two colours with an image of two animals, a land one and a water one, were presented to the subjects with a request to classify (into land and water animals) those which were depicted in red. Subjects were asked not to pay attention to the second animal, drawn in green. Images were presented to the subjects in the experimental group for 120 ms. Subjects in the control group had the possibility more attentively to study the images: their presentation in this case was limited by the time of classification. In both cases the task of classifying the animals was alternated with the lexical decision task.

Both in the control and experimental group, eleven drawings with an image of two animals was used, painted in different colours. Each drawing had two variants, in one of which the red contour depicted a land animal, and in the other – a water animal. An example of the images used can be seen in Figure 5.

Taking into consideration the two variants of the drawings used, their total number in the experiment was 22 (10 in the training series, and 12 in the main one).

In the training series, each image was presented to subjects either once or twice. After exposure of the image and its classification by the subject, there followed one of four types of letter series: a word associated with the 'red' animal; a word associated with the 'green' animal (distractor); and a word not associated with the drawing, or a pseudo-word. In the main series each image was presented five times: once before a word associated with the 'red' animal; once before a word associated with the 'green' animal (distractor); once before a word not associated with the given drawing, and twice before a pseudo-word).

All together, the subjects were presented with 148 tasks (including image classification and letter-series tasks), and the experiment lasted approximately 7 minutes.

Participants

Fifty-four adults (22 in the experimental group and 32 in the control group) voluntarily participating in the research.

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Of these, 26 were men and 28 women, aged from 17 to 53. All the subjects had normal or corrected to normal sight.

Materials and Equipment

1) Images 283 x 283 pixels in size with two overlaid contour drawings representing unambiguous images of land and water animals. The animal drawings were created by means of removing elements creating an ambiguity from polysemantic images in the first experiment. Both animals in each image in the present experiment corresponded to one of the polysemantic images in the first experiment.

2) Letter series 4-6 symbols in length: words associated with the images used; words non-associated with the images; and also pseudo-words.

Stimulus material was presented to the subjects visually using a computer.

Experiment Procedure

The procedure in the present experiment is reminiscent of that used in the Tipper and Driver study (Tipper & Driver, 1988). The main differences in our procedure was in the use of other experimental tasks (moreover, different for prime-images and target words), and also in the fact that in our experiment a reaction to the prime was required directly after its presentation, whereas in the Tipper and Driver experiments subjects classified the prime by memory after the classification of the target stimulus.

Subjects in our experiment were alternately exposed to drawings with an image of two overlaid coloured animals and series of letters. The subjects' task was the classification of those animals drawn in red into land and water animals, and the ignoring of animals drawn in green. The series of letters had to be classified into words and pseudo-words. The 'right' and 'left' leys in the lower right part of the keyboard were used for the classification. In the experimental group the exposure of the images, as with Tipper and Driver (1988), was limited to 120-th ms. After this the subjects were allotted two seconds to classify this 'flashing' image. In the control group, no significant limitation in the exposure time of the stimulus material was used: the image remained on the screen right up until the subject pressed the 'right' or 'left' arrow key, i.e., it was restricted by the reaction time limited to two seconds. In the allocated time, subjects in the control group managed to process both drawings (both the target and the distractor) attentively. Subjects in both groups received instructions to react as quickly as possible. The experiment began after the subjects had undergone a training exercise including 14 tasks with image classification of the 'red' animals and 14 lexical decision tasks.

As in the studies of Tipper and his colleagues (Tipper, 1985; Tipper & Driver, 1988), the latest test of the present experiment was to check if the testee was able to give an account of the ignored drawing. To this purpose, immediately after classification by a testee of the last red drawing, instead of the next target word following it, an editing window was presented with a question about which animal in the previous test had been drawn in green.

In the experimental and control groups we recorded the time and number of errors committed during classification of the 'red animals' (and simultaneous ignoring of the green distractor) and the determination of the lexical status of different word categories: associated with the target (red) drawing; associated with the distractor (green drawing), and not associated with the images used in the experiment. According to the difference between the efficiency of performing the lexical decision task for words associated and non-associated with the images used, conclusions were drawn on the presence or absence of positive and negative priming-effects in the conditions used. Also compared was the average time for completing all lexical decision tasks (including pseudo-words) in the experimental and control groups.

Results

As the results showed, testees in the experimental group were unable to remember the distractor (only 1 of 22 people correctly reproduced the last green drawing), which coincides with Tipper's data according to which the probability of remembering the ignored stimulus does not exceed the random level (Tipper, 1985; Tipper & Driver, 1988). This result contrasts with data from the control group where the number of testees able to remember the distractor drawing was significantly higher – 19%. The reduction in exposure time of the image to 120 ms led to the distractor not being processed attentively.

In the control group, in the absence of a time limit on the exposure of the images where the distractor was comparatively easy to ignore, its inhibition, apparently, was not activated. As it turned out, the image classification task with the distractor took less time for testees in the control group (1,567 ms) than the classification of polysemantic images in the case where the testees did not notice the polysemanticity (1,667 ms). We are referring to the experimental group in the first experiment where, as the data obtained show, testees did not require additional time to study the polysemantic images. The lack of differences in these conditions assumes that the testees in the control group without any special difficulty managed the task of ignoring the distractor, which is not possible to say regarding the experimental group. Whereas in the control conditions during classification of images with a distractor testees committed only 4.9% of errors, in experimental conditions this number reached 22.3%. And the time for identifying words associated with the distractor was significantly greater than the time for identifying words having no relation to the images used in the experiment

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Table 6
Average time of completing a lexical decision task depending on the nature of the association of letter series with images, ms

Words	Experimental Group	Control Group
Words associated with the distractor drawing	1,088.8 ms	1,058.4 ms
Words associated with the target image	1,038.6 ms	1,073.4 ms
Words not associated with the images	999.7 ms	1,090.5 ms

Table 7
Average number of errors when performing a lexical decision task depending on the nature of the association of letter series with the images, %

Words	Experimental Group	Control Group
Words associated with the distractor drawing	2.1 %	2.1 %
Words associated with the target image	2.1 %	2.3 %
Words not associated with the images	3.3 %	2.9 %

(t = -1.773, df = 465, p < .05) (Table 6). Thus, in experimental conditions a negative priming-effect at 88 ms was revealed, rendered by distractors on the identification of words associated with them, which speaks of an inhibition of the distractors themselves and of information semantically associated with them.

The large number of errors when classifying the target image in the experimental group testifies to the complexity of performing this task for testees and demonstrates the presence of the strong interference which the distractor has on the identification of the target image. As a result of such interference, in accordance with our submissions, the positive effect of the target image on the determination of the lexical status of words associated with it (positive priming-effect) also disappears. Words associated with the target image in the experimental group took longer to identify than neutral ones (not significantly), whereas in the control group we can speak of the tendency of the positive effect of both drawings (both the target and the distractor) on the identification of information associated with them – only a 'tendency', though, as a significance in the difference between the speed of identifying words associated with both drawings and not associated with them was not reached.

We note that initially we used a distractor situated outside the attention focus of the testees: in this case coloured contour drawings were not overlaid on each other, but were spatially separated. But despite the fact that such a method of presenting irrelevant information would seem in some way to be even closer to the perception of unconscious meanings of polysemanticity than the overlaying of a distractor requiring maximum arbitrary attention and purposeful ignoring – its use showed no similar effects to that of the situation where there were unconscious meanings of polysemanticity. In the conditions of which we are referring, the results were similar to the results of the control group in the present experiment where there was no negative effect of the distractor on the determination of the lexical status of words associated with it, but on the contrary, a tendency was observed also of both the target drawing and the distractor to have a positive effect on solving tasks associated with them. When using spatial separation of drawings the target image caused a positive priming-effect at 39 ms, and the distractor – 48 ms. The obtained results allowed us to assume that the possibility of attentive processing and, accordingly, of recognising the distractor leads to the fact that the negative priming-effect changes to a positive one, and inhibition does not occur. Moreover, this supposes that the key factor triggering inhibition is a significant reduction in the time, stimulating the person to make significant conscious efforts intended to suppress a part of the incoming information.

Inhibition in the present experiment was not reflected in the number of errors committed by testees when determining the lexical status of words associated with distractors. The error frequency for different categories of words in the experimental group does not significantly differ (Table 7).

And, finally, it was established that the average time for completing a lexical decision task in the experimental group (1,045 ms) does not statistically differ from that in the control group (1,063 ms), and this assumes that the presence of the distractor does not have even a general interference effect on a person's occurring cognitive activity, as in the case with polysemanticity. Testifying to this is the fact that in the present experiment testees in the experimental group on the whole more quickly managed the lexical decision task (1,045 ms), than where there was a polysemantic context (1,529.1 ms) (t = 9.802, df = 7892, p < .001).

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Discussion

As could be anticipated in accordance with the theory of inhibition, the present experiment revealed a negative effect of the distractor on the perception of information associated with it. This result speaks of the fact that despite the inability of testees to describe the ignored distractor, the distractor itself, nevertheless, is perceived, and moreover, this result links the situation where the distractor is ignored with the situation where unconscious meanings of polysemanticity are perceived. They are united by the necessity to choose one of several alternatives which, however, in the first case is conscious, and in the second – not.

The use of conditions without a significant time limit for presentation of images, and also the spatial separation of the target drawing and the distractor drawing, leads to a negative priming-effect not appearing, and even, on the contrary, a tendency is revealed for the distractor drawing to have a positive effect on the identification of information associated with it. We explain this result by a change of the negative effect of the distractor to a positive one where there is the possibility of it being attentively processed.

The research procedure used in the present experiment does not allow the discovery of the traditionally observed positive priming-effect rendered by the target drawing on the perception of information associated with it. Presumably, this is explained by the presence of the distractor's strong interference with the target drawing, as a result of which the reaction time to words associated with target drawings was equal to the reaction time to words non-associated with the drawings used.

A comparison of the obtained data with the results of the first experiment shows that ignoring the distractor is not accompanied by a rise in the number of errors in determining the lexical status of words associated with it, as with the perception of polysemantic information in the case where the testee is not conscious of one of its meanings. Also, in the case with the distractor there is no common interference effect which the presence of the distractor could have on the results of occurring cognitive activity.

General Discussion

A comparison of the three types of stimulation of which the testees were not aware, showed that they are all perceived and receive further processing. However, the effect on occurring cognitive activity of stimuli, for various reasons not consciously perceived, is different. Thus, stimuli not noticed due to their physical properties (subliminal) aid the identification of information associated with them: where there is subliminal presentation of the prime, when the possibility of its recognition is excluded, activation in the memory of information associated with this prime occurs automatically, which facilitates a still greater intensity of the priming-effect than supraliminal presentation of the prime.

Unconscious meanings of polysemantic information and distractors have a negative effect on the results of occurring cognitive activity. Moreover, what is surprising is that the greatest similarity is observed between the perception of unconscious meanings and the ignoring of complex (and not easy) distractors. The use specifically of distractors, the ignoring of which sets off the control processes of arbitrary attention and motivates a person the act at the limit of his capabilities, led in our study to negative priming-effects which testifies to the presence of inhibition of the distractor in the information-processing system.

In the case, though, with unconscious meanings of polysemanticity, despite the lack of a subjective sensation of a hindrance, inhibition of these meanings which have slipped from the attention also takes place. This speaks of the fact that inhibition may occur regardless of the intentions of the recipient.

Despite the similarity of distractors and unconscious meanings of polysemanticity, there are differences between them. Whereas the negative effect of distractors on the results of occurring cognitive activity appears in the reduction of the speed of solving tasks associated with them, the effect of unconscious meanings of polysemanticity in the first instance is in the increase in the number of errors in these tasks. Moreover, the presence even of a complex distractor does not cause a general interference effect like that which in our research was registered where there was non-recognition of one of the meanings of polysemantic information. This effect consisted in the fact that where there were unconscious meanings, the time for the testees to complete all the lexical decision tasks (both associated and non-associated with polysemantic information) rose in comparison with the conditions in which the testees recognised the polysemanticity. Such an effect of unnoticed meanings of polysemantic images on the efficiency of occurring conscious activity cannot be explained exclusively by inhibition of irrelevant meanings in the information-processing system: after all, if inhibition arising with the purpose of preventing interference leads to new interference effects, this places in doubt it purpose. The consequence of unnoticed meanings of polysemanticity, in our view, is more accurately reflected by the model of unconscious negative choice, presupposing the taking of a decision on non-recognition. The given model, a presentation of which is given in Allakhverdov's theory, assumes that the reason for non-recognition in the conditions examined is our demand to perceive what is occurring unambiguously and without contradictions. This demand motivates us to suppress alternative interpretations of polysemantic information and, judging by the experimental data obtained, is still more rigorous than in the case of ignoring a distractor about whose presence, at least, we know, even if we do not recognise what exactly it is. In other words, in actuality we

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notice polysemanticity, but stubbornly do not recognise it. And, inasmuch as in this case there are no objective reasons for preferring one and ignoring the other of its meanings, which nevertheless happens, this assumes the necessity to make a subjective choice even before the moment of realising one of the polysemantic meanings. Such an unconscious negative choice has a consequence which presupposes the need to preserve the once taken decision of non-recognition, i.e., further ignoring the negatively chosen stimulus and the information associated with it. And also (as we assume, developing the unconscious negative choice model), interference, which invariably should take place when ignoring a part of the information in the focus of attention, also transfers to the unconscious level and appears in a general reduction in the effectiveness of occurring cognitive activity (similar to psychoanalytical repression). In other words, it is assumed that unconscious negative choice, just as conscious activity, is linked with an expenditure of mental resources, and with parallel processes creates a situation of simultaneous execution of several tasks, and therefore is also accompanied by interference.

Conclusions:

1. Unconscious information (such as subliminal signals, 'unnoticed' meanings of polysemanticity, and also ignored distractors) are perceived and undergo further processing, but the effect of types of unconscious information on occurring cognitive activity differs. Thus, subliminally presented stimuli facilitate, and distractors, on the contrary, hinder, the solving of cognitive tasks associated with them, whereas unconscious meanings of polysemantic information hinder not only the solving of tasks directly associated with them, but also the completion of any other cognitive activity for which they serve as a context. This assumes the participation in the processing procedure of types of unconscious stimulation of various mechanisms.
2. When perceiving subliminal information there takes place the spreading of activation in the memory, as a result of which the solving of tasks associated with subliminal stimulation is accomplished more quickly. Where there is a need to ignore distractors causing hindrance, on the contrary, the solving of tasks associated with them is delayed, which is explained by the involvement of inhibition of the distractor. The processing of unconscious meanings of polysemantic information is best explained using the unconscious negative choice model, presupposing the taking of a special decision on non-recognition.
3. Despite the similarity between the distractors and unconscious meanings of polysemanticity, consisting in the fact that both types of stimuli have a negative effect on the results of occurring cognitive activity, there are differences between them. Whereas distractors influence speed, unconscious meanings of polysemanticity in the first instance influence the accuracy of identifying information associated with them. Moreover, where there are unconscious meanings there arises a general interference effect which consists in a delay in occurring cognitive activity with a parallel unconscious ignoring of contradictions (negative choice).

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