research papers

Intuitive Feeling of Closeness to Solution Preceding Insight in Anagram Tasks

Alexey Medyntsev
Institute of Psychology RAS, Moscow, Russia

Olga Dyatlova
Institute of Psychology RAS, Moscow, Russia

Alena Kogan
Lomonosov Moscow State University, Moscow, Russia

Svetlana Nemirova
Lomonosov Moscow State University, Moscow, Russia

Pavel Sabadosh
Institute of Psychology RAS, Moscow, Russia

Diana Kayutina
Lomonosov Moscow State University, Moscow, Russia

Abstract. One of the main research questions related to creativity is the dilemma of specificity vs. non-specificity of the mechanisms underlying insight solutions as compared to analytical solutions of a problem. The first goal of our study was to verify insight solution specificity on solving anagram tasks. The second goal was to test a hypothesis about the existence of unconscious processing prior to insight solutions. We presented two types of stimuli to participants: anagrams and pseudowords. During the experiment, participants had to perform two successive tasks. First they had to judge whether they were being shown an anagram or a pseudoword, and then they had to solve the anagram. Anagrams and pseudowords differed in some visual features, of which the participants were not aware. It was expected that unconscious processing (if it exists) would be influenced by the implicit difference between the appearance of stimulus categories. During the solving process, participants had to rate how close they were to a solution. After a successful solution, they also had to indicate which way they found it: analytically or with insight. Our results showed that prior to an insight solution, participants felt that they were farther from the final solution than in the case of an analytical solution. These results confirm Metcalfe and Wiebe's (1987) conclusions on the difference between insight and analytical solutions. According to these data, we can propose different specific mechanisms for insight solutions and analytical solutions in anagram tasks. At the same time, the presence of visual differences between stimulus categories did not influence the anagram solving process. The current results did not show evidence for an important role of unconscious processing before insight solutions of anagrams.

Correspondence: Alexey Medyntsev, medintseff@yandex.ru, Institute of Psychology RAS, 13 Yaroslavskay str., 129366 Moscow, Russia; Alena Kogan, cohanalia@gmail.com, Pavel Sabadosh, psabadosh@yandex.ru, Olga Dyatlova, dyatlovaolga@gmail.com, Svetlana Nemirova, nemirova-sveta@yandex.ru, Diana Kayutina, dia_diaa@mail.ru

Keywords: problem solving, insight solution, analytical solution, anagrams, metacognition, warmth rating, closeness to solution

Copyright © 2019. Alexey Medyntsev, Alena Kogan, Pavel Sabadosh, Olga Dyatlova, Svetlana Nemirova, Diana Kayutina. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY), which permits unrestricted use, distribution, and reproduction in any medium, provided that the original author is credited and that the original publication in this journal is cited, in accordance with accepted academic practice.

Note. The article is partially based on an earlier paper reporting preliminary results in the conference proceedings volume: Kogan, A. A., Medincev, A. A., Diatlova, O. V., Kaiutina, D. V., Rybchinchuk, M. A., & Nemirova, S. A. (2019). [Subjective feeling of approaching a solution in insight problem solving of anagrams]. In E. V. Pechenkova & M. V. Falikman (Eds.), *[Cognitive Science in Moscow: New Research. 2019 Conference proceedings]* (pp. 241–245). Moscow: Buki Vedi, IPPiP.

Acknowledgements. This study was funded by RFBR, according to Research Project № 18-00-01100(18-00-01029).

Received September 30, 2019, accepted December 25, 2019.

Introduction

Studies of problem solving mechanisms (especially in creative thinking) are an important direction of modern science. Insight solutions represent the most well known phenomenon in this area directly related to creative thinking. Operationally, the insight solution can be defined as an unexpected solution appearing in the solver's mind. The solver cannot provide a subjective report about how they came to the solution (Topolinski & Reber, 2010). An alternative to the insight solution is the analytical solution, which involves using a well known algorithm or the trial and error method (Bowden & Jung-Beeman, 2003).

Since Duncker's studies (1926), researchers have held the opinion that insight solutions have a specific psychological background. The insight solution is often considered to be the result of a rapid change of the mental representation of a problem (Spiridonov & Lifanova, 2013).

Later, another approach appeared in which the insight solution was considered to be the result of some gradual ongoing processes: progress monitoring (MacGregor, Omerod, & Chronicle, 2001) or a "gradual accumulation of knowledge" (Ellis, Glaholt, & Reingold, 2011, p. 768). From this perspective, an insight solution does not really differ from an analytical solution. And this idea has received some experimental support. In the research of Ellis et al. (2011), for instance, participants were asked to solve anagrams. After successfully solving them, they also had to indicate how they found the solution. Analysis of eye tracking activity prior to the solution did not reveal any difference between analytical and insightful methods (Ellis et al., 2011).

On the other hand, Knoblich, Ohlsson, Haider, and Rhenius (1999) in their study with matchstick arithmetic problems (participants had to transform an incorrect arithmetic statement expressed in Roman numerals and constructed out of matchsticks into the correct solution by moving one matchstick) showed that changing an initial representation (reflected in "relaxing of constraints" and "decomposing unhelpful perceptual chunks") lead to a successful solution (Knoblich et al., 1999, p. 1539). These data provide evidence for the specificity of insight solutions. Discussions between supporters of the two approaches are ongoing.

In 1987, Metcalfe and Wiebe showed that insight and analytical problem solving are different in the subjective feeling of closeness to a solution (warmth rating) experienced by the solvers. During analytical task solving, the warmth rating increases gradually up to the solution itself. Meanwhile, insight solutions are accompanied by a spontaneous rise of the warmth rating immediately before the solution (Metcalfe & Wiebe, 1987).

These results showed that insight solutions occur suddenly and unexpectedly to the solver, and not as the result of a gradual ongoing process. It became the argument for the so-called specific approach that advocates specific mechanisms are involved in different types of solutions. It is important to note that there were two types of tasks in the Metcalfe and Weibe study: arithmetic and so-called insight tasks. From the authors' point of view, an arithmetic task (algebra problems) can only be solved analytically, while insight tasks (tasks with a trick) can be solved by insight.

The first goal of our study was to corroborate Metcalfe and Weibe's conclusions on the difference between analytical and insight solutions in the subjective feeling of closeness to a solution for the same type of tasks.

As tasks for our study we chose anagrams. Anagrams are sets of letters which can be transformed into a familiar word. Notably, anagram tasks may be solved both analytically and via insight. This makes the anagram solving task ideal material for exploring the difference between insight and analytical solutions (Bowden, 1997; Ellis et al., 2011).

According to the non-specific approach (i. e., the idea that any solution is the result of gradual ongoing processes), insight solutions should be preceded by processes, the nature of which is related somehow with unconsciousness processing of input information. Bowers, Regehr, Balthazard, and Parker (1990) used word triads (three different words) similar to RAT tasks (Mednick & Mednick, 1967). One half of such triads had a solution-word associated with them, and the other half did not. Participants had to correctly categorize triads as semantically coherent or incoherent (does it have a solution-word or not). It was shown that participants can perform the task even when they are not able to name the fourth word. These data showed that before the conscious answer itself appeared, implicit processing leading to the answer had already taken place. The authors' opinion was that this processing involves the previous unconscious activation of mnemonic and semantic networks which participate in solving the task (Bowers et al., 1990).

In a study by Ellis and colleagues (2011), participants had to solve anagrams with one extra letter (a distractor which must be removed for a successful solution). Using an eye tracking technique, they showed that several seconds prior to the conscious response (insight and analytical solutions), the viewing times of the distractor consonant decreased in a gradual manner. According to the authors, these results showed the availability of partial knowledge of the solution prior to such information being accessible to subjective phenomenal awareness (Ellis et al., 2011).

The second goal of our study was to test the presence of unconscious processing prior to insight solutions. To achieve this goal we used two types of stimuli: anagrams and pseudowords (sets of letters which cannot be transformed into a familiar word). The stimuli differed in certain visual features, but participants were not aware of this. If there are any processes (the process of encoding of visual features, for example) followed by the insight solution, then implicit anagram recognition (based on visual features) may initiate them. Such preprocessing may lead to an increase of the number of insight solutions. On the other hand, the removal of an inter-stimulus difference between anagram and pseudowords may lead to a decrease in the efficiency of preprocessing which may lead to a lower number of insight solutions.

Method

Participants

Seventeen healthy, right-handed, native Russian-speaking under- and postgraduate students of Moscow universities

took part in our study (9 female; mean age 26.5 years old). All were volunteers interested in participating in the study.

Design

All participants took part in six experimental blocks. The first was a practice block and its data were not included in the final data analysis. During the practice block, participants solved 17 anagram tasks without pseudowords.

Blocks 2 to 5 were the main task blocks. During each of them, participants were shown 46 stimuli (36 anagrams and 10 pseudowords). In these blocks, anagrams and pseudowords differed in their visual features.

The sixth block was a control block. Participants were shown 36 anagrams and 10 pseudowords as in blocks 2 to 5, but in this block the anagrams and pseudowords did not differ in their visual features. All stimuli had equal anagram-like visual features.

After the last block, participants were asked the following questions:

- Did you notice any difference between the anagrams and pseudowords?
- Did you notice any difference in the pattern of uppercase and lowercase letter locations between anagrams and pseudowords?
- Did uppercase and lowercase letters in the stimuli help you in finding a solution?

Stimuli

For the present study, we took anagrams from the study of our colleagues (Lapteva, Bondarenko, & Ushakov, 2016) and selected a subgroup of Russian anagrams of approximately the same difficulty (solution frequency: 40 to 60 %; average solution time: 8 seconds). Overall, 197 unique anagrams from 5 to 8 letters long were selected.

Pseudowords were generated using special software that recombined the syllables and changed letters of real words. After that, all pseudowords were tested for the possibility of transformation into words. If any recombination of letters in the stimuli led to any word, this pseudoword was excluded from the stimuli list. Overall, 50 unique pseudowords from 5 to 8 letters long were created.

Next, some letters in the stimuli were changed to uppercase. Anagrams and pseudowords differed in the location of uppercase and lowercase letters. All pseudowords began with an uppercase letter ("ZnTUdx"), and anagrams began with a lowercase letter followed by an uppercase letter ("cTOrdO" — "DOCTOR").

This difference in the letter patterns was the visual feature manipulated in the two categories of stimuli. Participants were not informed about such a difference.

Apparatus

During the experiment, each participant sat in front of a monitor (ACER 23.8" Nitro with 1920 × 1080 resolution) at a distance of 65 cm from the screen. For the stimulus presentation and data collection, E-Prime software (Psychology Software Tools Inc., Sharpsburg, PA) was used. Stimuli and all inscriptions and words were presented on the display in large black letters (font: Arial 18) with a white background. For the registration of behavioral measures, a computer mouse was used.

Procedure

Prior to the experimental blocks, participants were told what an insight solution is: "The answer suddenly comes to mind. You are unable to give a subjective report on how you achieved the solution." During the experimental blocks, stimuli (anagrams and pseudowords) were presented to participants in a random order. Each presentation lasted for 8 seconds. During that time, the participant had to find the solution and report it by pushing a response key; they could give up if deciding that the task had no solution.

If the participant made no response during the first four seconds, a question about the subjective feeling of closeness to a solution appeared on the screen: "How close are you to the final solution? Close, far or very far?" After answering, the participant received another four seconds for anagram solving.

If the participant reported that he or she found the solution (by pressing a response key), they had to indicate the first, second and last letter in the solution word within the set of letters presented on the screen. After that, they had to indicate which way the solution had been found: analytically or by insight.

If the participant decided to give up, he or she received feedback. In the case of anagrams, they saw the correct anagram solution on the screen; in the case of pseudowords, they saw the message "The anagram cannot be solved."

Data Analysis

The following dependent variables were used as behavioral measures of problem solving:

Number of give up responses. This measure shows the number of pseudoword trials (not anagram trials) on which participants gave up finding a solution. Such claims were taken into account only when made within the initial eight seconds of the trial (i. e., before the offset of stimulus presentation).

Number of successful solutions. The number of solved successfully anagrams. During analysis, this number was considered for insight and analytical solutions separately.

Anagram solution time. The time interval between anagram onset and response key pressing (in the case of correct solution). During analysis, this indicator was considered for insight and analytical solutions separately. It is important to note that the time for answering the warmth question was removed from this time interval.

Warmth rating response. The proportion of three answers to the question "How close are you to the final solution? Close, far or very far?" that popped up four seconds after the stimulus onset.

Results

On average, participants solved 12 % of all anagrams (Table 1); 54 % of them were insight solutions.

Post-experimental interview results showed that no one noticed the difference between stimulus categories. Also, most of the participants (13 people; 76 % of the sample) noticed that the presence of the uppercase and lowercase letters in the stimuli made the solution more difficult.

Table 1. Proportion of Successful Anagram Solutions

Block No.	Mean	*SD*	Min	Max
2	.09	.07	0	.19
3	.08	.07	0	.22
4	.16	.07	0	.25
5	.12	.08	0	.28
6	.16	.08	.03	.31
All Blocks	.12	.06	.01	.21

Note. Data for $N = 17$ participants.

Table 2. Number of Give up Responses Across All Blocks

Block No.	Mean	*SD*	Min	Max
2	5.41	2.79	0	9
3	6.00	3.10	0	9
4	5.88	3.24	0	10
5	6.18	3.28	0	10
6	6.06	3.07	0	10

Note. Data for $N = 17$ participants, 36 anagram trials per block.

Table 3. Proportions of Warmth Ratings on Give up Responses

Rating	Block No.	Mean	*SD*	Min	Max
Close	2	.08	.08	0	.22
	3	.09	.16	0	.50
	4	.10	.16	0	.57
	5	.08	.12	0	.30
	6	.07	.10	0	.30
Far	2	.30	.29	0	.80
	3	.17	.27	0	.80
	4	.15	.24	0	.89
	5	.18	.25	0	.80
	6	.21	.27	0	.90

Note. Data for $N = 17$ participants.

Dynamics of Behavioral Measures on Series

Comparing the number of give up responses in Blocks 2 to 6 showed no statistical differences between the blocks (Friedman $\chi^2(4) = 2.21$, $p = .698$; Table 2).

For comparing the warmth ratings before give up responses, we excluded from analysis the trials in which the give up response time was less than four seconds after stimulus onset (because it happened before a question appeared).

The frequency of "Very far" responses was the highest among all questions (Table 3). That is why we compared the number of "Very far" answers across all blocks. The same analysis was not necessary for the remaining questions because their frequency was inversely proportional to the selected question frequency. Comparing the number of "Very far" answers across series did not show any significant difference (Friedman $\chi^2(4) = 1.20$, $p = .879$).

Analysis of the number of insight and analytical solutions presented us with two problems:

First, two participants did not understand the instruction about the difference between insight and analytical solutions. Their data were excluded from further analysis.

Second, only eight participants had insight solutions in every block of trials. Therefore, for comparing the average number of insight solutions, we used data from only these eight people (Table 4). Comparing the number of insight solutions across all series did not show significant differences (Friedman $\chi^2(4) = 8.50$, $p = .075$).

Table 4. Number of Insight Solutions Across All Blocks

Block No.	Mean	Median	*SD*	Min	Max
2	3.50	3.5	1.93	1	7
3	2.88	2.0	2.30	1	7
4	4.38	4.0	1.92	2	8
5	4.00	4.0	2.33	1	7
6	4.38	4.0	2.13	2	7

Note. Data for $n = 8$ participants, 36 anagram trials per block.

Anagram Solution Times in Insight and Analytical Solutions

The distribution of median solution times differed from normal (Shapiro-Wilk test: for analytical solutions $W = 0.66$, $p < .001$; for insight solutions $W = 0.83$, $p = .009$). For comparing the two types of solutions, we used data aggregated across blocks (Table 5).

The time of insight anagram solutions was significantly less than for analytical solutions (one-sided Wilcoxon signed rank test: $T = 26$, $p = .028$).

Table 5. Anagram Solution Times (Insight vs Analytical), ms

Solution	Mean	*SD*	Min	Max
Analytical	6432	800	3925	7207
Insight	5370	1750	2734	7209

Note. Data for $n = 15$ participants.

Warmth Rating on Analytical and Insight Solutions

To analyze the difference in warmth ratings on analytical and insight solutions, the data aggregated across all blocks were taken (Table 6). After that, all solutions that has been made less than four seconds after stimulus onset were excluded. The average number of "Very far" and "Far" responses on insight solutions was significantly greater than on analytical solutions (one-sided Wilcoxon signed rank test: $T = 3$, $p < .001$).

Table 6. Proportions of Warmth Ratings on Types of Decisions

Solution	Answer	Mean	*SD*	Min	Max
Insight	Close	.57	.26	0	1
	Far	.12	.12	0	.33
	Very Far	.31	.26	0	1
Analytical	Close	.71	.28	.25	1
	Far	.11	.15	0	.46
	Very Far	.18	.24	0	.67

Note. Data for $n = 15$ participants.

Discussion and Conclusions

The Implicit Effect of Visual Features of Stimuli on Insight Solutions

To assess the implicit learning of differences between stimulus categories, we measured the number of give up responses. In accordance with the results of some studies (Reber & Squire,1994), we expected that the number of give up responses should increase from Block 2 to Block 5 and decrease from Block 5 to Block 6 (because there is no visual difference between stimulus categories in Block 6). Exactly this measure would be an indicator of implicit processing. However, we did not observe such dynamics. The warmth rating for pseudowords did not show significant dynamics, either. Moreover, the difference in number of insight solutions across blocks was not significant.

We cannot argue that unconscious processing prior to insight solutions does not exist, since there is no evidence that participants used (or did not use) implicit visual features of the stimulus categories. They might have not used them because of the implicit nature of differences in such features, which was irrelevant to the main goal of the activity.

Consider two examples from the literature. In Kudelkina and Agafonov (2009), research participants tried to solve anagrams presented on a computer screen. At 500 ms before the anagram onset, a prime stimulus was presented. The duration of the prime presentation was 25 ms. It was shown that if primes contained the solution to the anagram, participants solved the following anagram faster and with greater accuracy (Kudelkina & Agafonov, 2009).

In Mendelson and Grinswold's study (1964) participants were divided into several groups depending on their creativity potential (assessed by Mednick's RAT test) and solved a list of anagrams. Before that, they also had to memorize a list of words and to listen to some words played on a tape recorder without any instructions. Some of these words (in the memorization list and on tape) were solutions to the anagrams. It was found that only highly creative people unconsciously used the words played on tape as cues for the anagram solutions (Mendelson & Griswold, 1964).

The first example indicates usage of a hint which was highly relevant to the goal of the participant's activity. Even the experimental procedure was organized in such a way that the participant had to use this hint. The situation in the second example is different. Recently heard words were not directly relevant to the anagram task. Not all words were solutions. And participants could either use or not use such hints in their solution process. Moreover, the Mendelson and Grinsfold study showed that the ability to use irrelevant hints depends on a participant's personality traits.

The superficial visual features of the stimulus categories were irrelevant to the participants in our study, since they did not contain solutions to the anagrams. Therefore we suggest that some of our participants (highly creative ones, for example) might have used this distinction, thereby improving their performance. However, most of them did not use it.

Subjective Feeling of Closeness to a Solution on Insight and Analytical Solutions

Analysis of the warmth rating indices shows that insight and analytical solutions are different. Before the insight solution, a participant more often feels that they are far or very far from solving the problem. These data partly replicate Metcalfe and Wiebe's (1987) data.

It is necessary to point out that there was an attempt to reproduce these results for one type of task. In the study by Hedne, Norman, and Metcalfe (2016), participants had to find the solution to magic tricks. The participants also had to indicate their perceived closeness to the solution. Moreover, they also had to report how they found the solution (via insight or analytically), and their confidence level for the suggested solution (Hedne et al., 2016).

This study did not show any difference in intuitive feelings of closeness to solutions between insight and analytic solutions. In our opinion, this could be due to methodological issues.

First, in this study the confidence level of the solution was measured. Participants were free to give an answer with low confidence. As the authors point out in the discussion, that means that some participants could give responses of low quality (for time economy, perhaps; Hedne et al., 2016).

Second, in this study participants had to type the solution in an on-screen text box. After the experiment, special raters scored solutions independently on a 4-alternative scale (from completely incorrect — 1 to completely correct — 4). From our perspective, such a procedure is too complex (because of the subjective factor of raters, firstly) and could lead to a high number of mistakes.

In our study, participants solved anagrams. Each trial had only one correct solution, and a participant had to be totally sure before claiming that the solution had been found. Moreover, for the evaluation of response accuracy we did not need ratings, and the influence of researchers' subjective factors on our study was minimal. Using anagram tasks in the study generated the data, which suggest that insight solutions were not preceded by some gradual ongoing cognitive processes.

Another question that arises in connection with this interpretation is whether metacognition tells us something about underlying cognitive processes. Data from the literature give quite a clear answer. In the study by Colier and Beeman (2012), the authors investigated whether intuition would relate to improvements in problem solving. The experiment lasted two days. On the first day, participants attempted to solve tasks from the RAT test. If they failed to solve some problem, participants reported whether or not they had a subjective feeling similar to a tip-of-the-tongue experience (a feeling that "The solution is stuck on the tip of your tongue, but you cannot tell it"). On the second day, participants attempted to solve the unsolved problems from the previous day (mixed in among new problems). It was shown that participants solved more old problems for which they reported about tip-of-the-tongue experience than other old problems (Colier & Beeman 2012). These data clearly show that metacognition could be a good indicator of the dynamics of underlying cognitive processes.

Thus, we can conclude that our data are consistent with those of Metcalfe and Wiebe (1987) and, in the case of anagram tasks, insight solutions differ from analytical solutions in their underlying mechanisms.

References

Bowden, E. M. (1997). The effect of reportable and unreportable hints on anagram solution and the Aha! experience. *Consciousness and Cognition, 6*(4), 545–573. doi:10.1006/ccog.1997.0325

Bowden, E. M., & Jung-Beeman, M. (2003). Aha! Insight experience correlates with solution activation in the right hemisphere. *Psychonomic Bulletin and Review, 10*(3), 730–737. doi:10.3758/bf03196539

Bowers, K. S., Regehr, G., Balthazard, C., & Parker, K. (1990). Intuition in the context of discovery. *Cognitive Psychology, 22*(1), 72–110. doi:10.1016/0010-0285(90)90004-n

Collier, A. K., & Beeman, M. (2012). Intuitive tip of the tongue judgments predict subsequent problem solving one day later. *The Journal of Problem Solving, 4*(2), 154–168. doi:10.7771/1932-6246.1130

Duncker, K. (1926). A qualitative (experimental and theoretical) study of productive thinking (solving of comprehensible problems). *The Pedagogical Seminary and Journal of Genetic Psychology, 33*(4), 642–708. doi:10.1080/08856559.1926.10533052

Ellis, J. J., Glaholt, M. G., & Reingold, E. M. (2011). Eye movements reveal solution knowledge prior to insight. *Consciousness and Cognition, 20*(3), 768–776. doi:10.1016/j.concog.2010.12.007

Hedne, M. R., Norman, E., & Metcalfe, J. (2016). Intuitive feelings of warmth and confidence in insight and noninsight problem solving of magic tricks. *Frontiers in Psychology, 7*, 1314:1–13. doi:10.3389/fpsyg.2016.01314

Knoblich, G., Ohlsson, S., Haider, H., & Rhenius, D. (1999). Constraint relaxation and chunk decomposition in insight problem solving. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 25*(6), 1534–1555. doi:10.1037/0278-7393.25.6.1534

Kudelkina, N. S., & Agafonov, A. Y. (2009). [What is the "cognitive unconscious" capable of?] In A. Y. Agafonov, & V. V. Shpuntova (Eds.), *Psikhologicheskie issledovaniya. Sbornik nauchnykh trudov [Psychological studies. Research paper collection]* (Vol. 7, pp. 49–56). Samara. Univers-Group (In Russian). Retrieved from http://psycheya.ru/lib/ps_is_7.pdf#page=49

Lapteva, E. M., Bondarenko, Y. A., & Ushakov, D. V. (2016). [Theories of consciousness and anagrams solution]. *Peterburgskij psihologičeskij žurnal, 2016*(17), 48–68. (In Russian).

MacGregor, J. N., Ormerod, T. C., & Chronicle, E. P. (2001). Information processing and insight: A process model of performance on the nine-dot and related problems. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 27*(1), 176–201. doi:10.1037/0278-7393.27.1.176

Mednick, S. A., & Mednick, M. T. (1967). *Examiner's manual: Remote Associates Test.* Boston: Houghton Mifflin.

Mendelsohn, G. A., & Griswold, B. B. (1964). Differential use of incidental stimuli in problem solving as a function of creativity. *The Journal of Abnormal and Social Psychology, 68*(4), 431–436. doi:10.1037/h0040166

Metcalfe, J., & Wiebe, D. (1987). Intuition in insight and noninsight problem solving. *Memory and Cognition, 15*(3), 238–246. doi:10.3758/bf03197722

Reber, P. J., & Squire, L. R. (1994). Parallel brain systems for learning with and without awareness. *Learning and Memory, 1*(4), 217–229. doi:10.1101/lm.1.4.217

Spiridonov, V. F., & Lifanova, S. S. (2013). Insait i mentalnye operatory, ili mozhno li poshagovo reshit insaitnuyu zadachu [Insight and mental operators: Are step-by-step solutions of insight tasks possible?] *Psychology. Journal of Higher School of Economics, 10*(3), 54–63. (In Russian).

Topolinski, S., & Reber, R. (2010). Gaining insight into the "Aha" experience. *Current Directions in Psychological Science, 19*(6), 402–405. doi:10.1177/0963721410388803

экспериментальные сообщения

Чувство близости ответа при инсайтных решениях в задаче на разгадывание анаграмм

Алексей Алексеевич Медынцев
Институт психологии РАН, Москва, Россия

Ольга Вадимовна Дятлова
Институт психологии РАН, Москва, Россия

Алёна Андреевна Коган
Московский государственный университет имени М. В. Ломоносова, Москва, Россия

Светлана Андреевна Немирова
Московский государственный университет имени М. В. Ломоносова, Москва, Россия

Павел Александрович Сабадош
Институт психологии РАН, Москва, Россия

Диана Владимировна Каютина
Московский государственный университет имени М. В. Ломоносова, Москва, Россия

Аннотация. Одним из важных вопросов, связанных с творчеством, является дилемма специфичности / неспецифичности психологических механизмов, лежащих в основе инсайтных решений задач. Главной целью настоящего исследования была проверка гипотезы о специфичности механизмов инсайтных решений в задаче на разгадывание анаграмм. Побочной целью являлось выявление роли неосознаваемых процессов, предшествующих инсайтному решению в его принятии. В ходе эксперимента участникам предъявлялись два типа стимулов: анаграммы и псевдослова. При этом участники должны были выполнить два задания: решить, является ли стимул анаграммой или псевдословом; в случае предъявления анаграммы разгадать ее. Анаграммы и псевдослова имели визуальные различия, о которых участникам не сообщалось. Ожидалось, что эти различия окажут влияние на предшествующие решению несознаваемые процессы, что отразится и на самом решении. В ходе разгадывания анаграммы участники оценивали, насколько, с их точки зрения, они приблизились к окончательному решению. В случае если анаграмма была разгадана успешно, участники указывали тип решения: аналитический или инсайтный. Результаты исследования показали, что перед инсайтными решениями участники чувствовали большую отдаленность от окончательного решения по сравнению с аналитическими решениями. Эти результаты согласуются с данными исследования Меткалф и Вибе (Metcalfe,Wiebe, 1987). Полученные данные говорят в пользу специфического механизма инсайтных решений в задаче на разгадывание анаграмм. В то же время наличие имплицитных визуальных различий между типами стимулов не повлияло на процесс поиска решения.

Контактная информация: Алексей Алексеевич Медынцев, medintseff@yandex.ru, 129366, Москва, ул. Ярославская, д. 13, Институт психологии РАН; Алёна Андреевна Коган, cohanalia@gmail.com, Павел Александрович Сабадош, psabadosh@yandex.ru, Ольга Вадимовна Дятлова, dyatlovaolga@gmail.com, Светлана Андреевна Немирова, nemirova-sveta@yandex.ru, Диана Владимировна Каютина, dia_diaa@mail.ru.

Ключевые слова: решение задач, анаграммы, инсайт, аналитическое решение, метакогнитивные процессы

© 2019 Алексей Алексеевич Медынцев, Алёна Андреевна Коган, Павел Александрович Сабадош, Ольга Вадимовна Дятлова, Светлана Андреевна Немирова, Диана Владимировна Каютина. Данная статья доступна по лицензии Creative Commons "Attribution" («Атрибуция») 4.0. всемирная, согласно которой возможно неограниченное распространение и воспроизведение этой статьи на любых носителях при условии указания автора и ссылки на исходную публикацию статьи в данном журнале в соответствии с канонами научного цитирования.

Статья частично основана на материалах более ранней публикации предварительных результатов в сборнике конференции: *Коган А. А., Медынцев А. А., Дятлова О. В., Каютина Д. В., Рыбинчук М. А., Немирова С. А.* Ощущение близости решения при решении анаграмм с помощью инсайта // Когнитивная наука в Москве: новые исследования. Материалы конференции 19 июня 2019 г. / Под ред. Е. В. Печенковой, М. В. Фаликман. М.: Буки Веди, ИППиП. С. 241–245.

Благодарности. Исследование поддержано РФФИ, исследовательский проект № 18-00-01100(18-00-01029).

Статья поступила в редакцию 30 сентября 2019 г. Принята в печать 25 декабря 2019 г.

Литература

Куделькина Н. С., Агафонов А. Ю. На что способно «когнитивное бессознательное»? // Психологические исследования. Сборник научных трудов. Выпуск 7 / Под ред. А. Ю. Агафонова, В. В. Шпунтовой. Самара: Универс-Групп, 2009. С. 49–56. URL: http://psycheya.ru/lib/ps_is_7.pdf#page=49.

Лаптева Е. М., Бондаренко Я. А., Ушаков Д. В. Теории сознания и решение анаграмм // Петербургский психологический журнал. 2016. № 17. С. 48–68.

Спиридонов В. Ф., Лифанова С. С. Инсайт и ментальные операторы, или Можно ли пошагово решить инсайтную задачу // Психология. Журнал Высшей школы экономики. 2013. Т. 10. № 3. С. 54–63.

Bowden E. M. The effect of reportable and unreportable hints on anagram solution and the Aha! experience // Consciousness and Cognition. 1997. Vol. 6. No. 4. P. 545–573. doi:10.1006/ccog.1997.0325

Bowden E. M., Jung-Beeman M. Aha! Insight experience correlates with solution activation in the right hemisphere // Psychonomic Bulletin and Review. 2003. Vol. 10. No. 3. P. 730–737. doi:10.3758/bf03196539

Bowers K. S., Regehr G., Balthazard C., Parker K. Intuition in the context of discovery // Cognitive Psychology. 1990. Vol. 22. No. 1. P. 72–110. doi:10.1016/0010-0285(90)90004-n

Collier A. K., Beeman M. Intuitive tip of the tongue judgments predict subsequent problem solving one day later // The Journal of Problem Solving. 2012. Vol. 4. No. 2. P. 154–168. doi:10.7771/1932-6246.1130

Duncker K. A qualitative (experimental and theoretical) study of productive thinking (solving of comprehensible problems) // The Pedagogical Seminary and Journal of Genetic Psychology. 1926. Vol. 33. No. 4. P. 642–708. doi:10.1080/08856559.1926.10533052

Ellis J. J., Glaholt M. G., Reingold E. M. Eye movements reveal solution knowledge prior to insight // Consciousness and Cognition. 2011. Vol. 20. No. 3. P. 768–776. doi:10.1016/j.concog.2010.12.007

Hedne M. R., Norman E., Metcalfe J. Intuitive feelings of warmth and confidence in insight and noninsight problem solving of magic tricks // Frontiers in Psychology. 2016. Vol. 7. P. 1314:1–13. doi:10.3389/fpsyg.2016.01314

Knoblich G., Ohlsson S., Haider H., Rhenius D. Constraint relaxation and chunk decomposition in insight problem solving // Journal of Experimental Psychology: Learning, Memory, and Cognition. 1999. Vol. 25. No. 6. P. 1534–1555. doi:10.1037/0278-7393.25.6.1534

MacGregor J. N., Ormerod T. C., Chronicle E. P. Information processing and insight: A process model of performance on the nine-dot and related problems // Journal of Experimental Psychology: Learning, Memory, and Cognition. 2001. Vol. 27. No. 1. P. 176–201. doi:10.1037/0278-7393.27.1.176

Mednick S. A., Mednick M. T. Examiner's manual: Remote Associates Test. Boston: Houghton Mifflin, 1967.

Mendelsohn G. A., Griswold B. B. Differential use of incidental stimuli in problem solving as a function of creativity // The Journal of Abnormal and Social Psychology. 1964. Vol. 68. No. 4. P. 431–436. doi:10.1037/h0040166

Metcalfe J., Wiebe D. Intuition in insight and noninsight problem solving // Memory and Cognition. 1987. Vol. 15. No. 3. P. 238–246. doi:10.3758/bf03197722

Reber P. J., Squire L. R. Parallel brain systems for learning with and without awareness // Learning and Memory. 1994. Vol. 1. No. 4. P. 217–229. doi:10.1101/lm.1.4.217

Topolinski S., Reber R. Gaining insight into the "Aha" experience // Current Directions in Psychological Science. 2010. Vol. 19. No. 6. P. 402–405. doi:10.1177/0963721410388803