

*Psychology*

## Temporal Parameter of the Set and Probabilistic Judgment

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**ABSTRACT.** Investigation of psychical mechanisms of probabilistic thinking revealed its limited rationality, reflecting specificity of subjective comprehension of one or other problem by people. The concepts satisfying the theory of probabilistic thinking are impersonal, and determined by psychic mechanisms are personal. In case of personal rationality cognitive activity of people serves to satisfaction of different needs people have. Besides when making decision they reveal purposiveness playing an important role in assessment of alternatives out of multiple possible choices. Considering the main principles of set theory we assume that functioning of probabilistic judgments is determined by relevant set, formed in the process of purposive activity of human. As to temporary parameter two forms of the set can be defined: prospective (orientation on the result of future event) and situational (orientation of the result of current event). In the conducted experiment the influence of the above mentioned sets on probabilistic judgments and confidence in correctness of the choice taking into account feedback factor (mark of the fulfilled task) was studied. Investigation was conducted by the method of two-times questionnaires, dividing the respondents in two experimental and one control groups. The obtained data showed: (a) prospective set compared with situational, made significant compensative impact on probabilistic judgments; (b) medium stage of confidence in compensated decisions was detected with availability of prospective set, while situational set contributed to detection of self-confidence concerning quite unsuccessful decisions; (c) in the process of functioning of prospective set stimulating impact of feedback on probabilistic judgments was revealed. It indicates the importance of cognitive fixation of instrumental dependence between primary and secondary expected results. © 2015 Bull. Georg. Natl. Acad. Sci.

**Key words:** *probabilistic judgment, prospective set, situational set, personal rationality, correction of judgments.*

For a long time being under the influence of philosophy of logical analysis the investigators of cognitive processes identified everyday thinking with logical reasoning. However, modern psychological research directed on the detection of the peculiarities of reasoning in different life situations, evidenced the irregularity of the above identity. The whole di-

rection was formed. It was, the so-called, investigation of social cognition, meaning the empiric study of the peculiarities of comprehension, consciousness and interpreting, concerning the own behavior of a human and actions of the other people [1]. In our case, we are interested in the problem of social probabilistic judgment performed by a human under

the conditions of uncertainty. The main assumption we are keeping to consists in the fact that probabilistic judgment as the evaluation of probable results is determined by the corresponding set, formed in the process of targeted activity of a human.

In general psychological theory of the set together with unconscious processes the property of reasonability is underlined, i.e., in determination of molar behavior, the decisive role is derived to consciousness. Considering the question concerning the definition of functioning of the set, the author of the theory of the set Dimitri Uznadze comes to the following conclusion: "Thus, specific peculiarity of a human vitally differentiating him/her from an animal, is that consciousness plays the leading role in his/her life. He is aware of his own behavior ahead and any action he does with the account of what he can get in a result of such consciousness." [2, p. 91]. Knowledge acquisition by students in high institutions is an evident example of the task-oriented behavior. This process means student's oriented comprehension of the specific of future profession, acquisition of professional skills, which should be achieved on the basis of application of multisided educational methods. Learning the educational subjects by the students is done, of course, on the basis of task-oriented behavior. They have one common goal: to finish the study and get corresponding certificate. Besides, achievement of this final goal is possible only with the help of, so-called, achievement of intermediate goals (for example, count of weekly seminars, monthly tests indexes and total examination marks on different subjects for definite periods of time). It is clear, that this process requires task-oriented behavior from students, meaning adequate consciousness of instrumental significance of intermediate goals for achievement of common expected result. Taking into account temporal parameter, two forms of the set can be indicated: prospective (orientation on the result of future event) and situational (orientation on the result of current event). Thus, the task-oriented behavior is the process, in which by means of situational and prospective sets

in views, step by step achievement of preliminary results short and longtime occurs (that is the instrumental meaning), which at least provides achievement of the final result. Besides, being the sets oriented on the solution of one and the same problem, they possess also the property of intentionality.

Theoretical and experimental investigations on peculiarities of the task-oriented actions, in particular, in the process of thinking, were conducted by Georgian psychologists. The subjects of the investigations were such essential properties of thinking as the processes of generalization, subjective comprehension and corresponding denomination. The obtained results of the conducted investigations are important for detection and description of psychic mechanisms, determining formation and functioning of everyday concepts. The above mentioned works mainly concerned the detection of psychological peculiarities of different forms of judgment. It should be mentioned that for quite a definite time little attention was paid to thinking processes. However, the situation gradually changed to a better side. The evidence of this are analytical and empiric investigations, in which the following questions were studied: influence of different emotional states on formal logical conclusions, intuitional comprehension of the quantitative material, in evaluation judgment, such as "difference-likeness", existence of asymmetry phenomenon, the problem of generalization in modern conceptions of forming the concepts. Earlier and further investigations in fact did not take into account the most important property of the inductive thinking, i.e. specificity of probabilistic judgment (for instance, the assessment of probability of successful achievement in business, expected results of surgical operation, probability of success in sport events, etc.).

Having studied the peculiarities of formal logical and psycho-logical judgments the investigators defined impersonal and personal rationality [3]. Under impersonal rationality it is meant cognitive activity of a human, based on normative rules worked out in the formal logics and in the theory of probabilities.

Detection of the second form of the rationality is conditioned by the following: multitude of experimental investigations concerning psychic determinants of functioning of probabilistic judgments revealed vividly the expressed tendency of ignoring the people of those logical (normative) demands, which should provide optimal decision of targeted vital problems. Due to that the subject in experimental conditions usually accept “illogical” decisions. Generally speaking, people in real vital situations do definite conclusions basing on their own needs, beliefs, value attitudes and aims. This is how their personal rationality is revealed.

Probabilistic judgments appear in the conditions of uncertainty, i.e., in the situations in which there are no strict normative limitations in possible choice. In formal logical reasoning criterion of objective truth has decisive meaning, and in case of probabilistic conclusion from psychological point of view the degree of subjective confidence of a human in validity of his/her choice is essential. On the basis of multitude psychological investigations concerning probabilistic judgments a general conclusion can be formulated: when predicting, people do not use principles of theory of probabilities, but they use cognitive heuristic rules. Heuristics are simple and often quite approximate strategies for solution of that or other problem [4]. These strategies are less accurate than the principles of theory of probabilities, and their application does not always make a good choice. However, they have one big advantage: they are simple and do not require great mental consumption. The investigations show that use of heuristic strategies often leads to specific erroneous decisions. The examples of such decisions can be the effects of representativity, psychological accessibility, ignoring of casual events and word framing alternatives. Using the rule of representativity, people doing their choice ascertain level of comparison between events, sampling and population in which it is kept. The event is more representative, the more it remembered population. Besides, often the reason of erroneous decision is misunderstanding of the fact that combina-

tion of two events (conjunctive judgment) cannot have bigger probability than every event separately. When solving that or other problem, people often are oriented by strategy of psychological accessibility, according to which the event is more probabilistic and it is easier and faster stamped in the memory. The application by people of the given heuristic strategy explains why evident and bright descriptions of the events are more convincing for people than real statistical data. Such tendency is mainly explained due to their rules of disagreement with ordinary knowledge and intuition of a human. An important factor, which influences on effectiveness of the choice is the formulation of the problem. The erroneous choice in this case is determined by the fact that people reveal the tendency of giving different responses on different formulated, but logical identical problems. This effect is well explained by so called “conception of perspective”, according to which people usually reveal the tendency of risk avoidance. Consequently, while adopting the decision they consider any possible loses as more algetic than equivalent profit they would like to get.

Having studied the peculiarities of the probabilistic judgment except the indicated heuristic effects the factors of feedback also should be taken into account. Feedback reflects the information concerning the correctness of the fulfilled judgments, which can then correct these judgments. Note, that this factor is the chain, which mediates causal link between the set and probabilistic judgment.

### **Experimental Investigation**

Basing on the above mentioned theoretical assumption and considering the existing empiric data we conducted the investigation, the aim of which consisted in comparative study of impact of prospective and situational set on probabilistic judgments taking into account feedback factor. In the given case the indicated forms of sets are independent variables. The correctness of choice and subjective confidence in it are dependence variables and feedback link presents intermediate variable.

**Procedure of the investigation.** The participants of the experiment were 144 (75 female and 69 male) students of one private university in Tbilisi. During one semester (subject “Organizational Psychology”) two questionnaires were conducted with two-month intervals. A) Respondents were divided into two experimental and one control groups. On the first stage of investigation the respondents of one of the experimental groups were told that some questions in every week questionnaire were given as “problems-exercises” and their understanding and given responses would by all means contribute to learning of teaching material. Besides, it was underlined that special attention in the teaching program itself is given to fulfillment of this task for the final mark on the studied subject (formation of the prospective set). The respondents of the other experimental group were told that the responses on the given questions reflected quick wittedness and skills to solve concrete problems (formation of situational set). The probabilistic judgments of the participants of the control group were tested twice: the first and third questionnaires. B) Feedback was provided by means of information both experimental groups about the marks received by them during the first questionnaire.

**The material used in experimental groups.** The material used in the first and third questionnaires consisted of identical heuristic effects. Here we give some examples (in each questionnaire every respondent received twelve items). The first: X worker at the plant is 40 years old. He is devoted family man highly appreciating friendship. He was an active participant of the movement for human rights, took part in the demonstrations against discrimination laws. The question: what is the probability of that a) X engineer at the plant b) X engineer at the plant and active member for human rights movement? (Effect of representativity). Second: Where are more people living: in Italy or Australia? (Effect of psychological accessibility). Third: Assume the lottery of winning combinations takes place. Which variant would you prefer: a) 3, 4, 5, 6, 7, 8, 9 b) 3, 12, 26, 42, 49, 56, 82 (The effect of ignoring of casual events). Fourth: The re-

spondent is given the description of the following situation: a man must decide to do or not to do surgical operation and he addresses to two doctors for help. One of them in the process of examination informs him that only 10% of people die during such an operation. The other doctor informs him that 90% of patients survive after this operation. The respondent must determine which variant of two arguments will influence more on agreement of the patient to do operation (Effect of word formulation of alternatives).

## The Obtained Results

First, let us address to the data of primary indexes taking into account the data of three groups tested in the experiment. The data are presented in Table 1. General result indicates that most of the participants of the experiment had cognitive mistakes. In fact, it reveals that probabilistic judgments of the respondents concerning real life events (the experimental material used by us was as such) were quite unsuccessful. The difference between control and situational groups was insignificant. The difference between control and the group of prospective set was statistically reliable, 32% ( $P < 0.01$ ). Statistically significant difference between indexes of experimental groups, which is 19% is worth paying attention to.

**Table 1. Indexes of primary cognitive mistakes**

| Group           | N  | Data |
|-----------------|----|------|
| Prospective set | 51 | 55%  |
| Situational set | 48 | 74%  |
| Control         | 45 | 87%  |

This result indicates that respondents with prospective set due to significant increase of the quantity of cognitive mistakes, really improved the quality of their probabilistic judgments.

**Table 2. Indexes of secondary cognitive mistakes taking into account feedback**

| Group           | N  | 1 <sup>st</sup> inquiry | 2 <sup>nd</sup> inquiry |
|-----------------|----|-------------------------|-------------------------|
| Prospective set | 51 | 55%                     | 26%                     |
| Situational set | 48 | 74%                     | 66%                     |
| Control         | 45 | 87%                     | 75%                     |

The data in Table 2 represent the connection between feedback and probabilistic judgments functioning. Note, that in the given case the respondents were informed about general mark on the task without explanation of the reason of the obtained mark. The indexes in the table indicate that feedback had statistically significant influence on the group of respondents of prospective set, 29% ( $P < 0.02$ ). Thus, we can say that feedback is quite effective in case of prospective set, i.e. the respondent realized the importance of qualitative fulfillment of experimental task in order to achieve positive result in future (the right mark).

**Table 3. Indexes of the primary and secondary marks of confidence in probabilistic judgments taking into account feedback**

| Group           | N  | 1 <sup>st</sup> inquiry | 2 <sup>nd</sup> inquiry |
|-----------------|----|-------------------------|-------------------------|
| Prospective set | 51 | 3.10                    | 2.80                    |
| Situational set | 48 | 3.64                    | 3.28                    |
| Control         | 45 | 3.63                    | 3.36                    |

According to the obtained general result statistically significant differences between indexes of prospective and situational set groups in both inquiries are equal to 0.54 ( $P < 0.01$ ) and 0.48 ( $P < 0.01$ ). These indexes show definite influence of feedback on the degree of dignity of the respondents in their own choices. Fulfilling the same task, respondents of experimental groups evaluated dignity in correctness of their decisions differently. Oriented on the situation respondents revealed more dignity in their decisions than oriented on the future. For example, participants of the first group in their probabilistic judgments reflecting the effect of heuristic representativity based on clearness of the perceived information without “any critics”. The other tendency is observed in participants of prospective set group. They are less confident in their own decisions, cautious and are not tempted to straight adoption of decision.

## General Conclusions

Most of the participants of the experiment in probabilistic judgments revealed tendentiousness relevant to heuristics of representativity, psychological accessibility, ignorance of possibility of casual

events and forming of chosen alternatives. The indicated forms of tendentiousness compared to respondents having situational sets were relevant to the respondents with prospective sets in less degree.

In a result of experimental introduction of feedback factor in respondents with prospective sets the quantity of cognitive mistakes significantly decreased. This shows noticeable stimulating impact of not explainable, but stating evaluation of feedback on cognitive activity of respondents. Such influence of feedback is reflected in that case, if instrumental meaning of concrete cognitive actions in achievement of the expected result is realized.

Significant difference between indexes of dignity in experimental groups was detected: oriented on situation respondents compared to the oriented on future revealed more dignity in correctness of their decisions. This indicates really undeserved self-dignity of the respondents of the first group and more realistic assessment of the attempts of the participants of the second group. The action of feedback factor on dignity in correctness of probabilistic judgments was significant in case of prospective sets functioning.

The obtained data show that probabilistic judgments in everyday and in nonstandard (of course, and in experimental conditions) are far from strictly logical construction. However, it does not exclude its possibility of the improvement of their quality, as the construction of conditions contributing to reconstruction of erroneous cognitive activity can give positive result. The following should be taken into account: in the conditions of uncertainty of intentional evaluation of social personal phenomena, the alternative in fact does not exist. Such phenomena, as, for example, the possibility of breaking of the war, profitable investments to that or other events, repentance of the criminal, are meant. There are no objective assessment criteria in these cases. The most important is that probabilistic judgment determines targeted behavior and the process of decision making. That is why investigation of means of the improvement of effectiveness of probabilistic judgments stays acute problem even in the future.

*ფსიქოლოგია*

## განწყობის დროის პარამეტრი და ალბათური მსჯელობა

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გამოკვლევის მიზანს წარმოადგენს ალბათური მსჯელობის ეფექტურობაზე, მის სისწორეში დარწმუნებულობაზე პროსპექტული (მომავალში განსახორციელებელი მოქმედების შედეგზე მიმართული) და სიტუაციური (აწმყოში მიმდინარე მოქმედების შედეგზე მიმართული) განწყობის ზემოქმედების შესწავლა. მიღებულმა შედეგმა გვიჩვენა: ა) პროსპექტულმა განწყობამ სიტუაციურთან შედარებით, ალბათურ მსჯელობაზე მნიშვნელოვანი მაკორეირებელი ზემოქმედება მოახდინა; ბ) გადაწყვეტილების სისწორეში დარწმუნების საშუალო ხარისხი პროსპექტული განწყობის შემთხვევაში გამოვლინდა, ხოლო სიტუაციურმა განწყობამ მსჯელობაში თვითდაჯერების თვალსაჩინო ეფექტი განაპირობა. გ) მოსალოდნელ შედეგებს შორის ინსტრუმენტული კავშირის სათანადო გააზრება, ძირითადად, პროსპექტული განწყობის ფუნქციონირებამ უზრუნველყო.

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