Chapter #15

COGNITIVE AND MOTIVATIONAL DETERMINANTS OF INTUITION

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ABSTRACT
The objective of the study was to identify cognitive and motivational components of intuition. The methodology was based on the meaning system, which enables identifying cognitive variables involved in a specific cognitive act, and on the cognitive orientation (CO) theory which enables assessing cognitions supporting specific behaviors. The hypotheses were that the findings would enable identifying cognitive and motivational variables unique for intuition. We expected that the cognitive and motivational variables separately would predict intuition and that both together would enable a better prediction than each separately. A set of cognitive variables related to intuition was identified and accounted for 29.2% of the variance. It included variables indicating interpersonally-shared and personal meanings, attending to overall general contexts and specific details, to the abstract and the concrete. The four belief types of the CO predicted intuition and accounted for 30.4% of the variance. The four types referred to the themes concerning emotions, opening-up, fast solutions, comprehensive view, and self reliance. Both sets of the cognitive and motivational variables together accounted for 39.19% of the variance. The findings show that both cognition and motivation contribute to intuition and need to be considered for predicting intuition, assessing it, and intervening for its improvement.

Keywords: intuition, cognitive orientation, beliefs, motivation.

1. INTRODUCTION

Intuitive thinking is a common type of thinking, usually described as a kind of inner perception which enables reaching conclusions, decisions and solutions to problems without awareness or logical inferences. It is often described as based on unconscious, illogical, uncontrolled cognition, which represents tacit knowledge (Polanyi, 1966) and proceeds in a fast, effortless, and easy manner as compared with rational, evidence-based and deliberate thinking (Kahneman, 2003). It is involved in various cognitive activities, including decision making, planning, problem solving, and mathematics (Heintzelman & King, 2016; Sagiv, Amit, Ein-Gar, &Arieli, 2014) and is correlated with creativity, humor, aesthetic judgment, empathy and social popularity (Norris & Epstein, 2011). As may be expected, it was found to be responsible for biases, overconfidence in judgments (Hansson, Rönnlund, Juslin, & Nilsson, 2008), and wrong conclusions in diagnoses (Gäbler, 2017). It is manifested neurally in desynchronized alpha waves in the posterior cortex (Razumnikova & Yashanina, 2017). Intuition is often observed complementing rational thinking when a decision is required in situations involving time pressure, risk, or insufficient information (Thompson, Prowse Turner, & Pennycook, 2011). Intuition is subject to individual differences but little is known about its psychological correlates. It is the objective of this study to examine the cognitive and motivational correlates of intuition which would provide insight into the tendencies underlying intuition, enabling identifying individuals who rely on intuition and even training those who do not.

2. THE THEORETICAL APPROACH

The basic theoretical approach in regard to cognition is designed to enable explaining, predicting and changing cognitive acts. For this purpose, it is necessary to consider several aspects or components of the cognitive acts. The major ones are the processes of which the cognitive act consists and the motivation for the cognitive act. The processes answer the implied question "how" and the motivation refers to "why". These two aspects differ in their constituents and hence also in the tools that need to be applied for their assessment (Kreitler, 2013).

2.1. The meaning system

The meaning system consists of a set of variables of different kinds that have been identified as constituting the understructure of cognitive acts (Kreitler, 2014a, 2020). These variables are involved in the manner in which an individual functions cognitively in regard to one's inner and external environment, They are assessed by means of the meaning test and include 56 variables of the following five sets: (a) content categories (called meaning dimensions), such as contextual allocation (e.g., chair – a piece of furniture), range of inclusion (e.g., art – dance), function (e.g., telephone – for transmitting messages), locational qualities (Tel-Aviv – on the sea shore), feelings (bicycle – I love it), judgments and evaluations (e.g., laws – very important); (b) types of relation between the referent and the content, such as direct relation (attributive), by means of comparisons or by means of examples or metaphors; (c) forms of relation, such as positive, negative (e.g., bicycle – is not a car), normative (life – should be pleasant); (d) forms of expression, such as verbal or graphic; and (e) shifts in referent, such as shifts to synonyms, contrasts (e.g., to take – to give)or grammatical variations (to take – taking is recommended). Each individual uses preferentially some of these processes which define the individual's meaning profile. This can be assessed on the basis of the individual's responses to the meaning test (see Tools). The performance of different cognitive acts is implemented by different cognitive processes. These can be identified by comparing the meaning profiles of individuals who score high or low on the performance of the cognitive act in question. The comparison yields the list of meaning variables that characterize those who perform well the specific cognitive act. These variables constitute the meaning profile of the cognitive act. In order to predict whether an individual would manifest the cognitive act in question it is necessary to establish the individual's meaning profile and to compare it to the meaning profile of the specific cognitive act. The higher the correspondence between these two meaning profiles the higher the chances that the individual would perform well the cognitive act. Previous studies showed that meaning profiles of cognitive acts provided good predictions of performance in different tasks, such as planning and creativity (Casakin & Kreitler, 2011; Kreitler & Kreitler, 1990, 1987).

2.2. The cognitive orientation theory

The cognitive orientation (CO) approach is a theory and methodology which provides an explanation for the behavior of individuals as a function of specific beliefs that orient toward the behavior without the involvement of conscious intention or decision based on considering benefits and utility (Kreitler, 2004; Kreitler & Kreitler, 1976, 1982). The beliefs are characterized in terms of form and contents. Formally the beliefs are of four kinds: beliefs about oneself that describe traits, events and other facts referring to oneself; general beliefs that deal with information about others and reality in general; beliefs about rules and norms

which refer to ethical, social, esthetical and functional rules and standards; and goal beliefs which refer to actions or states desired or undesired by the individual. In terms of contents the beliefs refer to deep underlying meanings of the involved inputs rather than to their obvious and explicit surface meanings. These underlying meanings are called motives and are identified for the behavior in question by means of a standard guided three-step interviewing procedure conducted with pretest subjects. The motives are selected as the responses that appear in the third step of interviewing in at least 50% of those who manifest the behavior and in less than in 20% of those who do not manifest it. The motives represent the underlying meanings of the behavior but do not refer to it directly. The motives are formulated in the form of statements corresponding to the four belief types and are used for constructing a CO questionnarie in which the individual is asked about his or her acceptance of each satatement (see Tools). For example, a motive such as striving for success could be formulated in the following statements: "Success is the most important thing in my life", "Success is difficult to attain", "One should never stop striving for success", and "I would like more than anything else to be successful", referring to beliefs about self, general beliefs, norm beliefs and goal beliefs, respectively. If all four or at least three belief types support the action, a cluster of beliefs is formed orienting toward the particular act. It generates a unified tendency or vector which represents the motivational disposition orienting toward the performance of the action. Previous studies showed that questionnaires constructed on the basis of the CO theory provided significant predictions of various cognitive, emotional, behavioral and physiologic variables (Kreitler, 2004, 2014b; Kreitler & Kreitler, 1982).

2.3. The hypotheses

The hypotheses of the study were that the scores based on the meaning profiles of intuition – the meaning variables correlated with scores on intuition - and of the CO questionnaire of intuition –the four belief types and the factors based on the motives – will be correlated with the scores of intuition assessed by an intuition questionnaire. In regard to meaning, the expectation was that there would be a set of meaning variables correlated significantly with the intuition score which could be considered as the meaning profile of intuition. In regard to the CO variables, it was expected that they too would be related significantly to the intuition score. In addition to the hypotheses that each set of independent variables (i.e., meaning and CO) would be related to intuition each separately, it was expected that both together would provide a better prediction score of intuition than each separately (Kreitler, 2020).

3. METHOD

3.1. Design

The first part of the study was based on a correlational design and the second on a multiple regression design. The independent variables were the meaning variables and the CO variables, and the dependent variable was the summative score on the intuition scale.

3.2. Participants

The participants were 90 undergraduate students (55 women, 45 men) in the behavioral sciences, in the age range 21-25 years. They were administered three questionnaires in random order, in the google.docs online format. Questionnaires that had over 5% of missing responses (16%) were deleted from the final file.

3.3. Tools

The meaning profile was assessed by the Meaning Test (Kreitler & Kreitler, 1990). The test consists of 11 familiar words (e.g., street, bicycle, life, to create, feeling, to take, friendship). The respondent is requested to communicate the interpersonally-shared and personal-subjective meanings of these words to someone else of one's choice who is not present, as comprehensively as possible, by using any preferred means of communication (e.g., by writing or drawing or describing drawings). The responses are elaborated by computer in two steps. In the first, the responses are divided into units, each of which consists of a referent and some content attributed to it (e.g., the response "Street is a place in a city" includes the following two units: "Street is a place" and "Street is in a city"). The second stage consists in characterizing each unit in terms of the five sets of variables described above (Meaning system). The codings are summed for each set of meaning variables. The individual's meaning profile consists of the sums of the meaning variables used by the respondent in the meaning test.

A second questionnaire the subjects got was the CO questionnaire of intuition (see Appendix). It included four parts corresponding to the four belief types with 18 items in each. The following are examples of statements in the CO questionnarie: 'I like to open-up to things, to grasp the solution dictated by the situation' (belief about self), 'Best solutions to problems may be due to emtionally-based impressions' (General belief), 'It is necessary to deal with the comprehensive view rather than with the details' (Belief about norms), 'To let emotions rule my thinking rather than reason alone' (Belief about goals). The response format consisted of 4 response alternatives ranging from not at all true (=1) to very true (=4). Thus, each individual got four scores for beliefs about self, general beliefs, norms and goals. The 18 items in each part of the questionnaire represented 18 motives. These yielded five factors (principal component; accounting for 68% of the variance) labelled as: emotions, opening-up, fast solutions, comprehensive view, self reliance. Thus, each subject got also five scores for the five motive factors.

Intuition was assessed by The Types of Intuition Scale (TIntS) (Pretz et al., 2014). The scale includes 29 items in the form of statements to which the respondents were asked to respond by checking one of 5 alternatives ranging from definitely false (=1) to definitely true (=5). The scale measures three types of intuition holistic (8 items), inferential (12 items), and affective (9 items). Holistic intuitions integrate diverse sources of information in a Gestalt-like, non-analytical manner; inferential intuitions are based on previously analytical processes that have become automatic; and affective intuitions are based on feelings. Since a previous stage of the study showed that the results for the three subscales were similar and that they were correlated significantly, in the present stage we used for this scale a summative score.

3.4. Procedure

The three questionnaries were adminsitered online in google.doc format in random order to the respondents who got credits for their participation. The study got the authorization of the university ethics committee.

4. RESULTS

4.1. Control analyses

Preliminary analyses showed the four basic intuition measures of the CO questionnaire had satisfactory reliability coefficients (α Cronbach ≥.70), as well as the meaning test, and the intuition score (both α Cronbach ≥.75). Further, correlation analyses showed that of the four belief types of the CO questionnaire only beliefs about self and goal beliefs were correlated significantly ($r=.25$, $p<.05$). There were no significant differences between the genders in more than 5% of the variables which does not deviate significantly from chance.

4.2. Relations between the meaning test and the intuition score

The responses of the participants to the meaning test were coded in line with the standard procedure. In the final stage all responses for each meaning variable were summed, each separately. The set of all the meaning variables for any one individual is called the individual's meaning profile. In order to identify the meaning profile of intuition the scores of the meaning profiles were correlated with the scores of the intuition scale for the different individuals. The meaning variables correlated significantly with the intuition score are considered as the constituents of the meaning profile of intuition.

The meaning profile of intuition includes the following meaning variables (only correlations ≥.42, $p<.001$ are presented): contextual allocation (i.e., specifies to which context or category an object belongs), results and consequences, domain of application (e.g., who or what are involved in the situation), state (e.g., is the object strong, healthy, empty, stable, complete?), temporal qualities (e.g. when does it occur? how long does it last?), sensory qualities (e.g., what is the color, shape, sound, smell of the object?), judgements and evaluations (avoiding issues such as, is it true, valid, reliable?), attributive type of relation (i.e., assigning some proposition directly to the subject), comparative: similarity type of relation (i.e., comparing situations or objects to each other), exemplifying-illustrative type of relation (i.e., attending to exemplifying items or situations), metaphoric type of relation (i.e., considering things in terms of metaphors), partial form of relation (i.e., relating things in terms such as sometimes, partly), conjunctive form of relation, close referent shifts (avoiding attending to the inputs as presented), medium referent shifts (i.e., deviating to some degree from the presented inputs, for example, to associations, or modifying them by additions). The range of correlations for the different variables in the meaning profile of intuition was .42 to .67. A mean of the correlation coefficients computed by means of Fisher's Z scores yielded an average of .54, which indicates that the meaning profile accounted for 29.16% of the variance in intuition. A factor analysis of the meaning variables included in the meaning profile of intuition show that the variables form two factors: a major factor that accounts for 49.01% of the variance and represents the variables which deal with formal aspects of cognitive elaboration, and a secondary factor that accounts for 14.57% of the variance and represents variables that deal with different contents aspects in situations and objects.

Table 1.
The results of factor analysis of the meaning variables correlated significantly with the mean sum of the Intuition scale (TIntS).

Meaning variables	Component 1	Component 2
(TR) Attributive	.802	
(TR) Comparative: similarity	.735	
(TR) Exemplifying-Illustrative	.711	
(TR) Metaphoric	.692	
(FR) Partial relation	.603	
(FR) Conjunctive	.533	
(SR) Close	-.512	
(SR) Medium	.492	
(Dim) Contextual allocation		.485
(Dim) Results and consequences		.406
(Dim) State		.372
(Dim) Domain of application		.359
(Dim) Temporal qualities		.344
(Dim) Sensory qualities		.322
(Dim) Judgements and evaluations		-.270
Eigenvalue	3.225	1.006
Percent of variance	49.01	14.57

Extraction method: Principal component analysis. Rotation method: Oblimin with Kaiser normalization.
Notes: (Dim)=Meaning dimension; (TR)=Types of relation; (FR)=Forms of relation; (SR)=Shifts of referent.

4.3. Relations between the CO of Intuition and the intuition score

Table 2 presents the results of the regression analyses performed with regard to the intuition score as the dependent variable. In the first part of the table the predictors are the four types of CO beliefs. The results show that the CO beliefs yielded a significant prediction of the intuition variable, accounting for 30.4% of the variance. All four types of beliefs had a significant contribution, in the following descending order: beliefs about self, about norms, about goals and general beliefs. The second part of table 2 presents the results of a regression analysis based on both the CO variables and the two meaning factors. The overall prediction based on the six variables was significant and accounted for 39.9% of the variance. Only the contribution of the factor representing the formal variables was significant. Adding the meaning factors to the model increased the total amount of variance accounted for (R^2=9.5%, F change =2.52, p<.01).

In order to provide additional information about the contribution of the CO variables to intuition, a regression analysis was done in regard to the score of intuition as the dependent variable with the five factors of the motives of the CO questionnaire of intuition as predictors. The five factors provided a significant prediction of the four intuition, accounting for 32.37% of the variance. All five factors had significant contributions to the prediction, in the following descending order, starting with the highest contribution for the factor of Comprehensive view, followed by the factors of Opening-up, Self-reliance, Emotions and Fast solutions.

Table 2.
Regression analyses of the cognitive orientation variables and the two meaning factors with the score of the Intuition scale (TIntS) as the dependent variable.

	Dependent variable: Types of Intuition scale (TIntS) R=.551 R^2 =.304 F (df=4/85) = 4.32**		
Coefficients	Unstandardized	Standardized	t-test
Constant	5.849		
Beliefs about self	.359	.335	2.470**
General beliefs	.281	.204	2.001*
Beliefs about norms	.349	.314	2.281**
Goal beliefs	.301	.225	2.217*
	Dependent variable: Types of Intuition scale (TIntS) and meaning variables R=.632 R^2 =.399 F (df=5/83) =5.25**		
Constant	5.441		
Beliefs about self	.341	.157	2.342**
General beliefs	.250	.106	2.055*
Beliefs about norms	.304	.216	2.103*
Goal beliefs	.283	.136	2.012*
Factor of meaning 1: Meaning dimensions	.199	.027	1.951
Factor of meaning 2: Types of relation, forms of relation and referent shifts	.451	.188	3.251**

Note. *p<.05 **p<.01

5. DISCUSSION

The results showed that both the cognitive variables and the motivational ones are related to intuition and affect its performance. The hypothesis about the contribution of cognitive variables to intuition was supported by the findings about the cognitive profile of intuition. The profile includes two types of variables, one of which represents contents and the other formal variables of functioning. The different kinds of variables are included in practically all meaning profiles of cognitive acts. The exceptional feature in the present findings is the binary clustering of the variables into two classes of form variables and contents variables. In predicting intuition, it is only the factor representing the form variables that has a significant contribution. It is evident that the formal variables do not function in

the void but depend on the content variables whose function it implements. Thus, the findings indicate that what matters most in regard to intuition is how the individual approaches the situation or the object rather than what he or she attend to. The manner of attending that characterizes intuitive individuals is focusing on concrete examples and instances, comparing perceptions in terms of similarity or metaphors, attending to relations that are possibly maybe acceptable rather than always true, combining different possibilities conjunctively and attempting to consider aspects related to the present situation indirectly. Notably, intuitive individuals access equally the interpersonally-shared mode of meaning (represented by the attributive and comparative types of relation) and the personal-subjective mode of meaning (represented by the exemplifying-illustrative and metaphoric types of relation). In this respect they resemble creative individuals (Kreitler, 2020). In terms of contents the major aspects that individuals with intuition are likely to attend to are the overall context to which an issue belongs, and the identity, state, results, temporal and sensory qualities of the objects involved in the situation. They have a tendency to avoid judgements and evaluations. There is evidence for combining the abstract approach (e.g., contextual allocation with the concrete one (e.g., who or what is in the situation, sensory qualities). It is likely that the described formal and content variables of the meaning profile of intuition may promote intuition directly (e.g., accessing both the general and personal modes of meaning, conjunction, associations) as well as indirectly (e.g., avoiding judgements, focusing on the general overall context and the sensory qualities).

The findings provide support also to the hypothesis about the contribution of motivational factors to intuition. The motivational factors were assessed in terms of four belief types referring to themes concerning emotions, opening-up, fast solutions, comprehensive view, and self reliance. The results show that the four belief types enabled a significant prediction of the intuition score accounting for 30.4% of the variance in intuition. All four belief types had a significant contribution to the prediction, with beliefs about self with the relatively largest contribution, followed by beliefs about norms, goal beliefs and general beliefs in descending order. These findings indicate that intuition is embedded in a network of personal tendencies and attitudes which constitute the motivational source for the disposition to rely on intuition in regard to the different domains of life. The earmarks of these motivationally relevant tendencies are focusing on emotions, opening-up to situations, preference for fast and easy solutions, promoting the overall comprehensive view of things and self-reliance. These themes together provide a prediction of intuition accounting for 32.37% of the variance, a percentage that barely deviates from that accounted for by the four belief types. The power of these tendencies to orient toward intuition is due to the fact that they represent deep underlying meanings of intuition and operate in the form of a four-pronged vector defined by beliefs about self, general beliefs, beliefs about norms and beliefs about goals.

Notably, the contributions of the cognitive variables and the motivational ones to intuition appear to be similar. While the cognitive variables account for 29.16% of the variance in intuition, the four belief types account for 30.4%. Equal contributions of cognition and motivation to the performance of cognitive acts are a common phenomenon (Kreitler, 2013). This indicates that both tendencies or skills are necessary for supporting intuition. As expected, applying both cognition and motivation to the prediction of intuition yielded results that were better than the results based on applying only cognition or motivation separately. However, the improvement in prediction reached only the level of 39.19% of variance accounted for, which entails an improvement of only 9.5%. Possible reasons for this relatively low enhancement despite conjoint application of the predictors could be correlations between them or individual tendencies to rely mainly on one or another kind of

variables thus lowering the impact of other variables. Additionally, it should be noted that a conjoint application of variables in prediction provides no information about the manner in which these cognition and motivation interact in the course of the process of intuition-based enactment.

6. CONCLUSIONS

The study showed that intuition is a cognitive tendency embedded in a motivational network of beliefs and meanings. As such it can be considered as a personality disposition. The findings provided a clear definition of the specific and unique cognitive and motivational components that constitute the groundwork of intuition. The characteristic cognitive features are first, the prominence of the formal tendencies rather than those that deal with contents, secondly, the salience of both the interpersonally-shared and personal-subjective modes of meaning, and thirdly, the use of both the abstract or general meanings together with the concrete and specific ones. The characteristic motivational tendencies are the complementary themes of reliance on oneself and especially on one's emotions, preference of a comprehensive overall view of issues and of fast solutions, supported by opening-up to situations, forming a four-pronged vector of the multiple belief types. A most basic conclusion of the findings is that both cognition and motivation are involved in producing intuition and that both aspects need to be considered in predicting intuition and in exploring its nature and manner of functioning. This conclusion is important not only theoretically but also has practical implications. It enables assessing intuition in a comprehensive manner, in terms of both cognition and motivation, both of which enable assessment in a manner that is not subject to the effects of social desirability. The assessment may shed light on the particular domains of strength or weakness of the factors contributing to intuition in specific individuals. The findings of the study also enable the training of intuition when the enhancement of intuition is desired or considered advisable. The training can target both constituents of intuition or any one of them. When the training targets cognition, it will be done in line with the systematic procedure developed for the training of meaning variables, and will focus on the major meaning variables relevant for intuition that may be identified as weak in the individual's meaning profile (Kreitler, 2020). When the training targets the motivational component of intuition it will be performed in line with the systematic procedure developed for training of motivational contents and will focus on those themes that will be identified as weak in the individual's CO profile (Kreitler, 2004, 2014b). At present both intervention methodologies are available in digital form so that they can be applied by individuals on their own after minimal instruction.

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KEY TERMS AND DEFINITIONS

For instructions and application of the meaning system used in the study on intuition please refer to http://kreitlermeaningsystem.tau.ac.il/

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