Modulation of the Imaginary Perceptive Maps and Its Effect on the Cognitive Attitude of Medical Students

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Abstract
The perception maps affect the analysis process of information which is base on an individual's previous exposure and purpose of events that influence the cognitive attitude, i.e. the response to the facts. The processing of external sensory inputs is formulated and encapsulated at different mind levels in the form of various experience modules (Pylyshyn, 1999; Raftopoulos, 2015). This study aims to investigate when these perception domains are resilient to changes in adverse conditions, regulates cognitive dimensions positively. We tested this hypothesis of self-modification by devising SPIMA technique by combining different elements of cognitive therapy. Forty medical students with South Asian ethnic status from age 19 to 26 (M=22.5, SD=2.44) were selected voluntarily without gender discrimination and assigned to their respective group of problems that participants identified to occur in the therapeutic environment. Then they completed a 15 item questionnaire and group discussion and counseling session on problems. Results (based on quantitative analysis including t-test and f-ratio, and descriptive analysis) showed when participants could recognize problems and open to self-improvement, and respond accordingly, have a positive impact on cognitive attitude. The research data reflects when perception involves the analysis of situations through various domains of self learning, produces resilience in cognitive behavior which provides an opportunity to acquire reflective and flexible knowledge that is needed to adopt according to the demand of situation. The categorization of problems in well structured format increases the intrinsic motivation, and fosters the flexibility of thinking that permits the participants to appraise the knowledge.

Keywords: Perceptive Maps, Cognition, SPIMA

Introduction

The perceptive maps of the mind can elucidate as sequential concepts that are built on the assimilation of information and acquired experiences. They can also be referred to the imaginary maps, cognitive maps, and frames of references. These are strategic tools of the brain to process information received through various senses and to gain memory at different levels based on prioritization of information. The complex incoming information processes into manageable portions of spatial arrangement to simplify the information and to infer the sense. This is the basis of cognitive development which not only improves memory but also procures knowledge.

The perceptive map influences the mental process of information analysis. It works as a coping mechanism in various uncertain situations which helps in building memory, and also explains, how does the nervous system work in co-ordination to make a strategic decision? This acquired cognitive level affects further inputs from the environment which describe the cue and priority of information which is based on the purpose, perception, and reasoning, and stored as memory i.e. functional neuroplasticity. Although, perception and cognition are two different entities at a neurological level, namely, perception is the processing of information at various mind levels, and cognition is the conclusion of this processed information. This distinction reinforces the point of selectivity of information i.e. the filter process of mind, which further elucidates the selective acquisition of knowledge or judgment based on previous observant experiences of an individual.

Besides the clear distinction, perception and cognition are closely interrelated. The processing of external sensory inputs is formulated and encapsulated at different mind levels in the form of various experience modules (Pylyshyn, 1999; Raftopoulos, 2015). These subjective experiences in different situations at various life stages are integrated to create cognition maps i.e. cognitive penetrability (Raftopoulos, 2014). On the contrary, the cognitive process affects the perceptual processes i.e. late perception which regulates the flow of information and influences cognitive integration through selective awareness and attention to the sensory inputs i.e. perception-cognition architecture.

This perceptive architecture is very crucial and complex for learning at different academic levels, which is influenced by the factors i.e. aspiration, attitude, opinion, and speculation. These factors are influenced by determination and emotional guidelines. These create a space between perception and cognitive penetration which navigate sensory inputs. This strengthen the point of information integration at various neurological levels for the execution of task i.e. sensory-motor co-ordination. When mind is overwhelmed by the information based on these factors, this demarcation between these two interfaces reduces which is expressed as the cognitive load. This reduces the reaction time of cognitive architecture, and so the response to various learning stimuli is also affected i.e. attention. This explains the subject in which top down attention influences the bottom up attention (Vetter and Newen, 2014).When this process is influenced negatively by factors which affect perceptive architecture, co-ordination between the perceptual processes and higher cognitive brain functions is distorted that can be termed as negative stress. The autonomic nervous system override and overlap of these two interfaces endorse the point that it reduces analytical capacity of brain, so the learning process 1.

Academic stress has been the subject of many researches on various aspects of stressors i.e. the influencing factors, and their effects on cognitive skills. According to Murphy and Archer

(1996), if the perception of stress is negative, it leads to the psychological and physical ailments. Higher education especially medical education, presents a disturbing scenario of negative stress. Intense academic demand and performance pressure act as stimuli to evoke stress in terms of depression and anxiety. According to Suor (2015) the long term stress levels influence the stress hormone i.e. cortisol levels and the evidences explicitly establish its role in neuro-cognitive impairments. This stress is the consequence of conflict between individual stressors and external stressors. The individual stressors are the factors that are acquired over a period of time i.e. opinion, attitude, habits, desires which, from philosophical point of view are the personality traits, and individual health issues. The external stimulus can be the environment, time, or finance. The academic stress stimulus also includes the interaction between assimilation of extensive knowledge and time required to generate perception from this (Carveth, Gesse,& Moss, 1996). For example, when an individual has a transition of situations i.e. new opportunity, moving from one class to another, changing direction to the higher education etc., that individual evaluates the whole situation and scenario according to a perceptive map in the mind, and tries to deal with the situation by making modifications and adjustments to get best out of it. When this transition fails, it creates a web of inarticulate thinking patterns which influences the perception negatively, and reduces the cognitive possibilities which further perpetuates the stress on somatic and mental health (Brosschot JF, Pieper S, Thayer JF 2010; Smyth J, Zawadzki M, Gerin W. 2020).

The cognitive capabilities are affected by individual perception according to which a person respond in a variety of ways to stressful situations. This indicates the existence of difference in vulnerability of individuals according to their cognitive responses. These cognitive changes based on their perceptive mind presentations, are influenced by predisposing factors i.e. life experiences, and individual factors like genetic characteristics (Palumbo ML, et al 2010), personality traits, and age. This complex interaction affects the thinking patterns, although in mild cases and problem solving reflections, it can be adaptive. But, continuous maladaptive patterns impose cognitive load and cause anxiety and depression among individuals. The cognitive behavioral therapy strives to control these patterns which are generally divided into listening, motivational discourses, medications i.e. supportive care.

The perceptive presentations regulate the attitude and responses in changing circumstances, which in turn affected by the personal traits and predisposing factors. This hypothesis assumes that perception maps and their modulation affect the cognitive capabilities. The sustainability of behavioral therapy depends upon the flexibility of these cognitive maps which in turn, depends largely on the personal factors. The personal attitude influences the dynamic equilibrium between perception and cognition. The more will be flexible personal attitude towards changing situations in personal, academic, or social environments, the better will be the outcome of therapy. This flexibility can be termed as acceptance of the conflict in cognitive architecture or disturbed equilibrium between perceptive presentations and cognitive response. This jumbled pattern amplifies the emotional-stress response and reduces the resiliency of acceptance. This affects results of cognitive therapy negatively which results in reoccurrence of anxiety and depression.

The SPIMA (Self Problem Identification and Modulation Approach) a devised technique by combining the different components of cognitive therapy, the authors tries to fill this loop of conflict and investigate how does perception map affect the cognitive attitude? The medical academic environment presents such possibilities for investigation. This technique tests the hypothesis in a three way process in a cyclic manner in which the first step provides not only the primary step for identification of conflict i.e. acceptance, but also serves as a counseling

tool. Second, it identifies the external factors and their categorization based on individual's perception. The second step helps in creating problem oriented questionnaires and feedback forms, and also sets the direction of discussion. Third, it combines the personal factors and external factors through heuristic, and records and rectifies the responses. In order to understand heuristic and rectification, third step includes in depth interview of participants which also checks the attitude and degree of acceptance of the process.

Methodology

Participants

40 medical students from European University, Tbilisi were involved, who shared relatively same background in terms of social status, academic status and environment. The age group with South Asian ethnic status, was selected from age 19 to 26 (M=22.5, SD=2.44) without gender discrimination. The participants were second and third year regular medical students without any previous involvement in such behavioral and modulation studies or workshops. They were selected on the basis of voluntary participation as a research group. They were explained about the perception, and its influence on the cognitive behavior. For example, perception of a situation and self affirmation can change the way of dealing with the harsh conditions, and help to modulate thinking to get best out of the situations, and improve the quality of life.

Material

The questionnaire was developed by modifying the standard cognitive behavior therapy questionnaire according to the requirement of the study process. The format of the questionnaire includes fifteen questions which are divided into seven (1, 2, 5, 9, 10, 11, 15) leading questions, and eight follow up or supportive items. This division was done to reduce the chances of biased answers by analyzing the equilibrium among leading items and their follow up items. It helped in handling and increasing the sensitivity of data.

The construction of questionnaire was based on the equilibrium between identified problems of the academic environment and the categorized perception of the participants. This creates a possibility of semantic difference (Snider & Osgood, 1969) which not only helps to produce problem oriented material but also focuses on the cognitive behavioral process. This differentiation helps in understanding the disparity of answers between leading and supportive items, and directs the rectification and response re-arrangement process in the response scale. This also helps in explaining the qualitative fluctuations of responses, thought modulation, and self assessment.

This construction provided the practical approach, and avoidance of idea control, perception-action interaction, and negative self appraisal. The responses of these items were assessed on a six point Likert scale with grades from 1 to 6, e.g.1 never true; 2 usually not true; 3 sometimes true; 4 usually true; 5 always true; and 6 not important. The sixth grade is very important in this approach as it explains the effectiveness and sustainability of perception modulation while dealing with problems, and positive direction of in depth interview and counseling on self addressed problems.

Modified Version of Cognitive and behavioral Process Questionnaire (CBP-Q):

1. The academic environment motivates you to increase contextual insight on learned issues.
2. Are you clear about the learning objectives and outcomes of the course?
3. The content seems to match with learning objectives what we are supposed to practice.
4. The provided content presents a fine sense of academic and research development.
5. Are you able to relate information what you have learnt?
6. Do peer review and group discussion help you to increase your understanding?
7. Are you able to work comfortable with academic groups?
8. Are you able to get opportunities to express important ideas and academic issues?
9. Are you able to balance between feedback and what is expected regarding your work?
10. Are you able to comprehend assigned work?
11. Are you able to draw and explain conclusions from your academic observations?
12. Are you able to organize time according to your academic requirements?
13. Do you use organized plan to learn complex medical content?
14. Do you find difficulty to keep pace with assigned work during medical health issues?
15. Do you get support to get over from these medical health issues (i.e. administrative and academic staff)?

Procedure

After receiving ethical approval from the university, students were recruited on the basis of voluntary participation in the study and signed the consent form with a privacy clause of not to share personal information. The three steps procedure was explained to them, which included discussion, response recording on Likert scale, and in depth interview and counseling session.

During the first phase of the procedure, the researcher had a discussion with participants on those academic problems students were facing in the education environment. The participants identified five problems; one was academic environment which further subdivided into administrative and academic environment, the second was complex medical syllabus, third included difficulty in managing time during strenuous study process, fourth had personal psycho-social problems that limit the personal-social interaction, and fifth involved other medical situations that not only affect the student's physical conditioning but also affect the mental performance. The second step of first phase was the categorization of these problems in groups because philosophically and practically, a single person cannot have a single problem when they are involved in self problem identification process. The four groups were made on the basis of each individual response and perception of the problems. The participants were assigned to their corresponding group based on the self affirmation discussion with the researcher.

Table 1 : The groups according to Individual response and perception of problem.

Sr. No.	Group	No. of Students
1.	Administrative environment, time management, and psycho-social problems	12
2.	Academic environment, complex medical syllabus, and time management	17
3.	Administrative environment, complex syllabus, and other medical conditions	7
4.	Environment (both sub-category), other medical conditions	4

The second step involved the formulation of questionnaire and scale to record the responses according to the identified problems. The individuals selected to record the responses, were blind to the participation format and procedure. They were assigned to fill the responses in likert scale that were gathered as a feedback of questionnaire based on personal interaction feedback collection method that was used to avoid the bias of feedback adulteration by the participants.

The third step included the in depth interview and discussion between the researcher and the participants. This was the qualitative part which had the self expression counseling session with each group separately. This discussion implied the presentation and attitude of participants towards problem, and their self-established solutions to those problems within a time frame, and the groups worked as a control to each other. In the end of the session, the feedback responses were tallied and rectified by the experimenter through a brief discussion with each participant of that group. Every week, this procedure was followed in a cyclic manner.

Data Analysis

The data was analyzed by performing **t-test** for each group separately, and **F- ratio** was used for comparison among groups. Both tests were performed manually for leading questions as well as for supportive questions to check the coherency of data between each other. This comparison provided deductive and inductive explanation of the data fluctuations within the period of study. The quantitative analysis was used to interpret, and to modulate the direction of qualitative analysis. Cronbach's alpha was examined of each group to ensure the internal consistency because each category has different sample size, and the sample size affect the reading.

Results

Reliability

The Cronbach's alpha reading for each group varied. The internal consistency for group one and two was high (α= 0.93, 0.90) but, for group three and four it was under acceptable range (α= 0.70, 0.74) which may be due to the low sample size.

Quantitative Analysis

In accordance with the requirement of the study, **t-test** for each group and **F-ratio** were adopted as explained earlier. The statistic results were positive and rejected the null hypothesis i.e. there is no change in perceptive maps, and it has no effect on cognitive attitude. As per data of **t-test** data in table 2 for all questions, the values (gp1, M=20.33, SD=2.53; gp2, M=13.65, SD=3.95; gp3, M=9.43, SD=3.31; gp4, M=22.00, SD= 1.15) showed the significant improvement. The **t-test** data in table 3 for leading questions followed the pattern in same way. But, the average change in all groups for leading questions was significant as per table 4, which signifies the difference in the improvement level among groups over the period of study. The fluctuations in weekly average response score were registered up to the six week but, after sixth week the results sustained with no significant difference.

Table 2: All groups t-test for all questions.

	n	Mean	sd	Observed t	Sig level	Decision
Gp1-All Qs	12	20.33	2.53	27.79	0.05	H1 = there is improvement
Gp2-All Qs	17	13.65	3.95	14.24	0.05	H1 = there is improvement
Gp3-All Qs	7	9.43	3.31	7.54	0.05	H1 = there is improvement
Gp4-All Qs	4	22.00	1.15	38.11	0.05	H1 = there is improvement

Table 3: All groups t-test for Leading questions.

	n	Mean	sd	Observed t	Sig level	Decision
Gp1-lead Qs	12	11.92	1.68	24.62	0.05	H1 = there is improvement
Gp2-lead Qs	17	7.76	2.91	11.02	0.05	H1 = there is improvement
Gp3-lead Qs	7	5.71	2.14	7.07	0.05	H1 = there is improvement
Gp4-lead Qs	4	13.00	1.41	18.38	0.05	H1 = there is improvement

Table 4: Weekly comparison of performance within and among the four groups.

Group	**Average score-Wk1**	**Average score-Wk2**	**Average score-Wk3**	**Average score-Wk4**	**Average score-Wk5**	**Average score-Wk6**	**Average score-Wk7**	**Average score-Wk8**	**Average score-Wk9**	**Average score-Wk10**
Group1	8.75	12.08	12.92	15.17	14.42	15.42	16.83	18.75	19.50	20.67
Group2	14.12	14.41	16.47	18.00	17.29	18.12	19.06	21.00	20.71	21.88
Group3	21.00	21.00	21.29	22.71	23.43	23.71	23.57	23.71	25.86	26.71
Group4	21.00	21.00	22.50	23.75	24.75	26.00	25.75	29.25	31.75	34.00

As per table 5, the **f-ratio** (all Questions=60; lead questions=39) with significance level of 0.05 noted the huge difference among the groups which suggested that each group has different approach to the same procedure. The results showed the significant positive attitude towards outlined methodological approach and procedure.

Table 5: f-ratio (all questions; lead questions).

	Between column variance	**Within column variance**	**F-ratio**	**Sig level**	**Conclusion**
All Qs	677	11	60	0.05	Different methods have different effects

	Between column variance	**Within column variance**	**F-ratio**	**Sig level**	**Conclusion**
Lead Qs	285	7	39	0.05	Different methods have different effects

Descriptive analysis

The descriptive references of the results showed the presentation of problem, and helped in categorization and explanation of problems within a time frame, and participant's attitude towards the procedure. The voluntary participation and in depth counseling discussion provided a possibility for understanding and intervention of problem. The modulation of perception starts with acceptance of the problem, and belief to change the scenario of problem according to the demand of need and time. This influences their sensitivity towards change of situations.

The fluctuations of the response data endorse the fact of participant's involvement in the process of self identification. The reduction of average score in initial weeks established that the participants appraised the modulation counseling method which involved the articulation of self identified solutions for the problems under problem presentation, quality of work, problem explanatory skills within a time frame procedure, and their attitude to deal with the problem. This fluctuation also explained the conflict between their perception based on previous experiences and the need to change it to adapt according to present situations to get best out of it. Although, it seemed to create stress but, this created a positive equilibrium to work efficiently among groups, and capability to discriminate between correctable and non-correctable situation. This process set a buffer of activity in stressed conditions. The sustained results during last week's indicated this. This is the main foundation of modulation of perception with self affirmation. The data also indicated the active participation of participants in the study procedure.

Discussion

The study focused on changing the preformed perception that is the result of previous experiences gained at different periods of time. When, a person with these deep rooted thoughts encounters with similar situation but at large level, these perceptive maps affects the response, which in turn affects the cognitive capabilities. These predefined directions post the challenge to adopt according to new high scale situations, which creates the negative stress

which has been the part of many research studies. Most of the techniques are focused on how to control the behavior and thought process which in the form of psychotherapy help but for a certain period of time because this doesn't break the taboo of preformed perception. The quantitative analysis shows this conflict in the form of data fluctuations. This research helped in formulating new technique SPIMA which presents a possibility for the modification of perceptive domains. This suggests when the person is able to identify the problem at internal as well as external stressors level that uncover the potential of acceptance which is the resistant part. At this transition point the problem oriented cognitive approach plays the crucial role in maintaining the dynamic balance between identification and multi-directed solutions of the problem. Hence, this study suggests that this opens the probability of modification in perceptive zone which increase the resilience to deal with stressful conditions.

Secondly, this research suggests the categorization of problems in well structured format increases the intrinsic motivation and foster the flexibility of thinking that permits the participants to appraise the knowledge, reasoning, and learning tools. This process ensures the students active participation in learning process. The direct in depth interaction helped not only in building a confidence between experimenter and the participants but also it helped in creating a positive attitude towards the problem. This opens the new dimensions of solution from various angles of ideas, and when the individual is ready to accept new prospects, the modulation of perception starts which creates a buffer of response according to demand of situation. Although, there are certain barriers like vast information collection, previous exposure experience, acquired belief system and minds' processing ability to balance between thoughts and information at intrinsic level which affect the flexibility of perception. The external factors i.e. the problems to which participants were responding are non modifiable. The difference in average among groups indicates that disparity of perception in spite of being exposed to the same procedure. The individual data between groups also shows the difference and established the fact that exposure to the same situation and procedure doesn't mean the possibility of equality of response.

The reflection of this study is to create flexible perception that organize the learning process across the multiple dimensions, and generate a working memory that can be applied under varying and appropriate situations (CTGV, 1997; Kolodner, 1993). This process encourages individuals to use this coherent flexible learning, and self evaluation in negative situations. The challenges of this study are voluntary participation i.e. the reason of small sample size, self approval to the problem and its categorization, and execution of the self recognized solution guidelines. The disparity in individual data response confirms this finding. Based on the findings, the participants need to be prepared thoroughly on the importance of flexibility of perception in producing flexible knowledge to compensate the non-modifiable factors, and being able to set learning goals and strategies to get the best from the task they are engaged in.

The present study tries to explore how flexible perceptive mind maps affects the individual capacity to deal with external factors identified subjectively to have negative effect on cognitive skills by using SPIMA, a devised method by authors. This provides a subjective as well as objective ground to inspect intrinsic as well as extrinsic discrepancies, their categorization, and helps in mapping a problem oriented plan. This also provides an insight to understand cognitive patterns by facilitating the open exchange of ideas among the members of a group (Cohen, 1994; Wenger, 1998) which opens a possibility of methodology modification.

This strategy helps in controlling quantitative as well as qualitative data through continuous assessment of progress of each group at subjective level (small scale) and objective level (large scale). This serves a purpose of intrinsic motivation for both experimenter and participants by working on the task of their own interests which require their active participation, group interaction, deep understanding, and independent thoughts. According to Bandura(1997) and Dweck (1991), the participants are more motivated when they believe the outcome of learning is in their control. This produces an opportunity to apply this strategy clinically, academically, and as a research tool at the same frame of time by incorporating other meta-cognitive strategies, a possibility to be tested by further research. The SPIMA system provides an integrated environment of self problem analysis and solution, and individualistic explanation which creates a sense of psychological rationalization and satisfaction of ideas that ease the process of perception modulation and affects cognitive domain positively.

Conclusion

This study discusses the effects of perception flexibility on cognitive skills to deal with subjective problems efficiently which count on combined research methodology. The research data reflects when perception involves the analysis of situations through various domains of self learning, produces resilience in cognitive behavior which provides an opportunity to acquire reflective and flexible knowledge that is needed to adopt according to the demand of situation. Although, research findings exhibit positive effects still, further investigations are required by incorporating gender discrimination, age factor, educational and academic levels, and social interaction to realize its potential and to check the sensitivity, and precision of study data.

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