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A Study On Parenting Stress Of Mentally Retarded Children Of Below 12 Years Using Augmented Fuzzy Cognitive Map

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ABSTRACT

Children are treasures of the family. Children give joy and contentment of life for the parents. So it is the expectation of the parents to possess a child and spend their life, energy, wealth in rearing the child and dreaming for shining future. Naturally there is disappointment and stress in the parents with mentally retarded children. Good parenting is a challenging process especially lower middle class and middle class people face difficulties in giving extra physical, emotional, psychological and intellectual care. The challenges of the mentally retarded children are wide enough to accept and dealt with. In this paper, the stress causing factors are discussed and the most impacting factor is obtained using augmented fuzzy cognitive map. The results obtained are compared with the results of the samples of Abidin's Parenting Stress Index (PSI – short form) collected from parents using Minimization of Regret with Intuitionistic Fuzzy Multiple Attribute Decision making algorithm.

KEY WORDS:Mentally retarded, augmented fuzzy, parenting stress, intuitionistic fuzzy

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INTRODUCTION

Every parent expects a child with lots of dreams. They are satisfied when they are blessed with normal children. But the dream of the mentally retarded child's parent is shattered. Parents of normal children plan the child rearing and satisfied when it is accomplished step by step whereas the stress to accept the mentally retarded children and child rearing is difficult. Everything does not go on well with the expectations, they experience disappointment. Especially the attitude of the parents in accepting them in the family and in the society is challenging. They are challenged with social stigmatization. They are uncomfortable with interactions especially when they are avoided, face hostile look, sympathy inquiry for personal information and judgmental comments. They are feeling the burden of prolonged care. The discrepancy between the child's structure and mental function worries the parents to the high. Thus mentally retarded children bring enormous stress and may impress family functioning.

Dalto Russel(2002) says, the important factors like emotions expressed toward the child, income of the parent and age of the child are associated with burden.[1] Gupta and Jain (2002) found that the parents of rural area with low income and less education face more problems with their spastic mentally retarded children.Upadhaya (2008) studied that mothers experience higher level of stress than fathers regarding caring, emotional and social factors but both experience financial stress equally. According to Lopez (2008), demanding dependence for daily activities, finding chances to make the child friendly and to orchestrate more activities for socializing are the stress producing factors.Baker et.al (2003) says that it is stressful for the parents of pre-schoolers who experience delay than those who don't. Parents experience inability in coping with the demands of daily care. This challenges the worry of unpromising future. Hence this qualitative research is carried on in which various factors causing parenting stress are analyzed to find the most impact factor among the factors framed with the opinion of experts using Augmented FCM in the first section, the factors framed by the experts are explained in the second section, the third section deals with the implementation of the problem,the fourth section deals with comparative study using the application of intuitionistic fuzzy cognitive map, discussion in the fifth section and conclusion in the sixth section

METHODOLOGY

There are many factors contributing to Parenting Stress of the mentally retarded children and all the stress inducing factors will lead to the same. It is known that all the stressors affect the parenting stress in some degree. Twelve stress inducing factors are derived from various study on this topic and from expert's opinion categorizing them under three subscales Parental Distress, Parent – Child Dysfunctional Interaction and Difficult child of Abidin's PSI-short formin order to find out which stressor has more influence in provoking the other stress inducing factors and result in parenting stress. With the help of expert's opinion the data is obtained. The factors are framed with the opinion of the experts. The experts' opinion was sort to find out how much each factor influences the other by giving fuzzy values.The most influencing factor is found using augmented fuzzy cognitive map which is an extension of FCM method. Two experts opinion was got based on the Likert values. These values are converted to linguistic variables varying between0 to1 and the adjacency matrix is formed.

Factors causing Parenting Stress are

C1. Prolonged burden of care/ rearing difficulties
C2. Parental grieving
C3 . Lack of competence in managing uncomfortable social interactions
C4. Economical insufficiency
C5. Difficulty in identifying and guiding the behavior patterns
C6. Expectations on child's developmental progression
C7. Child management problems
C8. Anxiety of future security and guardianship
C9. Struggle to cultivate the regular habits
C10. Lack of regular professional counseling
C11. Need for formal educational/ vocational needs
C12. Demands of child from parents

AUGMENTED FUZZY COGNITIVE MAP

Fuzzy Cognitive Map

The fuzzy cognitive map works with the opinion of experts. They constitute neuro fuzzy systems through which expert's knowledge is in corporate with two characteristics. Firstly causal relationships are represented from 0 to 1 which has different intensities between walls. The sign plus or minus is given as we analyze the causal value. But these signs are substituted by FCM values

between -1 and +1 where zero value indicates the absence of causality. Secondly involving feedback, the effect of a change in a concept node may affect other concept nodes.[12]

Augmented Fuzzy Cognitive Map

Augmented FCM approach is anadditive method. This approach consists in adding the FCMgenerated by each expert. The augmented adjacency matrix is builtadding the adjacency matrix of each expert. Theresulting augmented matrix includes the union of thecausal nodes for all of the experts.The adjacency matrix (A) represents is a matrix that the different relationships among factors.

$$A=\begin{pmatrix} - & - & - \\ - & e_{ij} & - \\ - & - & - \end{pmatrix}; \quad e_{ij}\epsilon\,[-1, +1] \text{ for each i and j}$$

Here e_{ij} indicates the relationship between the i&j concepts, in order to obtain the values between [-1 and +1]. Three types of relationships are involved namely (i)$e_{ij} > 0$ indicates a positive relationship. (ii) $e_{ij} < 0$ indicates a negative one. (iii) $e_{ij} = 0$ where no relationship exists. Therefore three issues are considered when an expert assigns a value. Firsly the e_{ij} intensely to indicate how strong the i concept is in j. Secondly the sign + / - is decided, if the relationship is direct or inverse. To assume at a consensus many methods, logics could be used. The augmented adjacency matrix got by adding the adjacency matrix of each expert. Let two FCM's with common nodes FCM_A with C_i^A as nodes. $FCM_A = \{C_i^A\}$ and FCM_B with C_j^B as nodes $FCM_B = \{C_j^B\}$. The adjacency matrix of FCM_A is $A_A = (W_{ij}^A)$ and the adjacency matrix of FCM_B is $A_B = (W_{ij}^B)$.

The Augmented Matrix is

$$A = \begin{pmatrix} W_{ij}^A & 0 \\ 0 & W_{ij}^B \end{pmatrix}$$

If there are common nodes then the element W_{ij}^{Aug}in the Augmented Matrix is

$$W_{ij}^{Aug} = \frac{\sum_{k=1}^{n} W_{ij}^k}{n},$$

n being the number of FCMs added, one by expert,k the identifier of each expert, and i and j the identifier of the relationships.[14]

According to the algorithm of augmented fuzzy cognitive map, for this problem opinion of the two domain experts,who are the psychologists were obtained and converted into adjacency matrix as givenbelow :

Adjacency Matrix of Expert 1

$A_A =$

-	0	0.8	1	0.8	0.2	1	0.8	0.8	0.8	0.8	0.8
1	-	1	1	0.6	0.8	0.8	0.8	0.6	0.6	0.8	0.6
0.8	0.8	-	0.4	0.8	0.4	1	0.8	0.8	0.8	0.6	0.2
1	1	0.6	-	0.2	0.4	0.6	1	0.4	0.2	0.6	0.8
1	0.8	0.8	0.6	-	0.8	0.8	0.6	0.8	0.6	0.6	0.4
0.6	0.8	0.8	0.6	0.8	-	0.8	0.8	1	0.6	0.6	0.4
0.4	1	1	0.8	1	0.8	-	0.8	0.8	0.8	0.6	0.6
0.8	1	0.6	1	0.6	0.8	0.6	-	0.6	0.6	0.6	0.6
0.8	1	0.8	0.6	0.8	0.8	1	0.8	-	0.8	0.8	0.6
0.8	0.8	0.8	0.4	0.6	0.6	0.8	0.8	0.6	-	0.6	0.6
0.8	0.8	0.6	0.8	0.6	0.8	0.8	0.8	0.8	1	-	0.4
0.8	1	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.6	0.6	-

Adjacency Matrix of Expert 2

$A_B =$

-	0.4	0.8	1	0.8	1	0.8	0.8	0.8	0.8	0.6	0.6
0.8	-	0.8	0.6	0.4	0.6	1	1	0.8	0.8	0.8	0.8
0.8	0.6	-	0.8	0.8	0.8	0.4	0.8	0.8	0.8	0.6	0.6
0	0.8	0.8	-	0.8	0.8	0.8	0.8	0.8	0.4	0.8	0.8
0.4	0.8	1	0.8	-	0.8	0.8	0.6	0.8	0.8	0.8	0.6
0.6	0.8	0.8	0.8	0.6	-	0.6	1	0.8	0.8	0.6	0.8
0.8	0.8	0.6	0.6	0.8	0.8	-	0.8	0.6	0.8	0.8	0.6
0.8	0.6	0.6	1	0.8	0.8	0.6	-	0.6	0.6	0.6	0.4
0.6	0.6	0.8	0.6	0.8	0.8	0.4	0.4	-	0.6	0.6	0.6
0.4	0.8	0.4	1	0.6	0.4	0.6	0.6	0.4	-	0.4	0.6
0.4	0.2	0.4	0.6	0.6	0.8	0.4	0.4	0.8	0.6	-	0.4
0.8	0.6	0.8	0.4	0.8	0.6	1	0.8	0.8	0.8	0.6	-

Augmented Matrix

$A =$

-	0.2	0.8	1	0.8	0.6	0.9	0.8	0.8	0.8	0.7	0.7
0.9	-	0.9	0.8	0.5	0.7	0.9	0.9	0.7	0.7	0.8	0.7
0.8	0.7	-	0.6	0.8	0.6	0.8	0.8	0.8	0.8	0.6	0.4
0.5	0.9	0.7	-	0.5	0.6	0.7	0.8	0.6	0.5	0.7	0.8
0.7	0.8	0.9	0.7	-	0.8	0.8	0.6	0.8	0.7	0.7	0.5
0.6	0.8	0.8	0.7	0.7	-	0.7	0.9	0.9	0.7	0.6	0.6
0.6	0.9	0.8	0.7	0.9	0.8	-	0.8	0.7	0.8	0.7	0.6
0.8	0.8	0.6	1	0.7	0.8	06	-	0.6	0.6	0.6	0.5
0.7	0.8	0.8	0.6	0.8	0.8	0.7	0.6	-	0.7	0.7	0.6
0.6	0.8	0.6	0.7	0.6	0.5	0.7	0.7	0.5	-	0.5	0.6
0.6	0.5	0.5	0.7	0.6	0.8	0.6	0.6	0.8	0.8	-	0.4
0.8	0.8	0.8	0.6	0.8	0.6	0.9	0.8	0.7	0.7	0.6	-

INTUITIONISTIC FUZZY SET

Atanassovintroduced intuitionistic fuzzy which is viewed as the generalization of fuzzy set proposed by Zadeh. IFS can model better comparing with conventional fuzzy model in case of imperfect information and uncertainty to deal with multiple decision making problems.The comparative study was carried out with the help of Abidin's (1995) Parenting Stress Index Short Form (PSI-short form) [10] samples collected from the parents of mentally retarded children. Using Minimization of Regret with Intuitionistic Fuzzy Multiple Attribute Decision making the best alternative is found , applying the following algorithm[8].

Step1

Obtain the decision matrix from the experts

	A	B	C	D	E
S1	[0.4,0.3]	[0.6,0.2]	[0.4,0.3]	[0.4,0.3]	[0.4,0.3]
S2	[0.3,0.1]	[0.3,0.1]	[0.4,0.3]	[0.6,0.2]	[0.7,0.3]
S3	[0.5,0.5]	[0.6,0.2]	[0.3,0.1]	[0.3,0.1]	[0.5,0.5]
S4	[0.3,0.1]	[0.5,0.5]	[0.4,0.3]	[0.4,0.3]	[0.5,0.5]
S5	[0.4,0.3]	[0.6,0.2]	[0.3,0.1]	[0.5,0.5]	[0.5,0.5]
S6	[0.5,0.5]	[0.6,0.2]	[0.4,0.3]	[0.4,0.3]	[0.4,0.3]
S7	[0.3,0.1]	[0.5,0.5]	[0.4,0.3]	[0.6,0.2]	[0.5,0.5]
S8	[0.6,0.2]	[0.7,0.3]	[0.3,0.1]	[0.4,0.3]	[0.3,0.1]
S9.	[0.5,0.5]	[0.7,0.3]	[0.3,0.1]	[0.4,0.3]	[0.4,0.3]
S10.	[0.6,0.2]	[0.7,0.3]	[0.3,0.1]	[0.3,0.1]	[0.3,0.1]
S11.	[0.4,0.3]	[0.7,0.3]	[0.4,0.3]	[0.4,0.3]	[0.3,0.1]
S12.	[0.4,0.3]	[0.7,0.3]	[0.4,0.3]	[0.4,0.3]	[0.3,0.1]
S13.	[0.4,0.3]	[0.4,0.3]	[0.5,0.5]	[0.7,0.3]	[0.3,0.1]
S14.	[0.7,0.3]	[0.6,0.2]	[0.3,0.1]	[0.3,0.1]	[0.3,0.1]
S15.	[0.5,0.5]	[0.6,0.2]	[0.3,0.1]	[0.5,0.5]	[0.3,0.1]
S16.	[0.4,0.3]	[0.7,0.3]	[0.4,0.3]	[0.4,0.3]	[0.3,0.1]
S17.	[0.6,0.2]	[0.7,0.3]	[0.3,0.1]	[0.3,0.1]	[0.3,0.1]
S18.	[0.3,0.1]	[0.4,0.3]	[0.5,0.5]	[0.6,0.2]	[0.4,0.3]
S19.	[0.4,0.3]	[0.6,0.2]	[0.5,0.5]	[0.4,0.3]	[0.3,0.1]
S20.	[0.3,0.1]	[0.5,0.5]	[0.6,0.2]	[0.6,0.2]	[0.4,0.3]
S21.	[0.3,0.1]	[0.4,0.3]	[0.5,0.5]	[0.7,0.3]	[0.3,0.1]
S22.	[0.3,0.1]	[0.4,0.3]	[0.6,0.2]	[0.7,0.3]	[0.4,0.3]
S23.	[0.3,0.1]	[0.4,0.3]	[0.5,0.5]	[0.8,0.2]	[0.4,0.3]
S24.	[0.3,0.1]	[0.5,0.5]	[0.5,0.5]	[0.6,0.2]	[0.4,0.3]
S25.	[0.3,0.1]	[0.5,0.5]	[0.6,0.2]	[0.5,0.5]	[0.3,0.1]
S26.	[0.4,0.3]	[0.8,0.2]	[0.4,0.3]	[0.4,0.3]	[0.3,0.1]
S27.	[0.3,0.1]	[0.6,0.2]	[0.6,0.2]	[0.4,0.3]	[0.3,0.1]
S28.	[0.3,0.1]	[0.7,0.3]	[0.5,0.5]	[0.4,0.3]	[0.3,0.1]
S29.	[0.4,0.3]	[0.6,0.2]	[0.4,0.3]	[0.5,0.5]	[0.3,0.1]
S30.	[0.3,0.1]	[0.6,0.2]	[0.5,0.5]	[0.5,0.5]	[0.3,0.1]
S31.	[0.3,0.1]	[0.7,0.3]	[0.4,0.3]	[0.5,0.5]	[0.3,0.1]
S32.	[0.3,0.1]	[0.5,0.5]	[0.5,0.5]	[0.6,0.2]	[0.3,0.1]
S33.	[0.3,0.1]	[0.6,0.2]	[0.5,0.5]	[0.5,0.5]	[0.3,0.1]

Step2

Score matrix is obtained by converting the decision matrix.

i.e S (α) = $\mu_\alpha - \nu_\alpha$

0.1	0.3	0.1	0.1	0.1
0.2	0.2	0.1	0.3	0.5
0.1	0.3	0.2	0.2	0.1
0.2	0.1	0.1	0.1	0.1
0.1	0.3	0.2	0.1	0.1
0.1	0.3	0.1	0.1	0.1
0.2	0.1	0.1	0.3	0.1
0.3	0.5	0.2	0.1	0.2
0.1	0.5	0.2	0.1	0.2
0.3	0.5	0.2	0.2	0.2
0.1	0.5	0.1	0.1	0.2
0.1	0.5	0.1	0.1	0.2
0.1	01	0.1	0.5	0.2
0.5	0.3	0.2	0.1	0.2
0.1	0.3	0.2	0.1	0.2
0.1	0.5	0.1	0.1	0.2
0.3	0.5	0.2	0.2	0.2
0.2	0.1	0.1	0.3	0.1
0.1	0.3	0.1	0.1	0.2
0.2	0.1	0.3	0.3	0.1
0.2	0.1	0.1	0.5	0.2
0.2	0.1	0.3	0.5	0.1
0.2	0.1	0.1	0.6	0.1
0.2	0.1	0.1	0.3	0.1
0.2	0.1	0.3	0.1	0.2
0.1	0.6	0.1	0.1	0.2
0.2	0.3	0.3	0.1	0.2
0.2	0.5	0.1	0.1	0.2
0.1	0.3	0.1	0.1	0.2
0.2	0.3	0.1	0.1	0.2
0.2	0.5	0.1	0.1	0.2
0.2	0.1	0.1	0.3	0.2
0.2	0.3	0.1	0.1	0.2

Step 3

According to the concept of regret, regret matrix is obtained from the score matrix.

0.4	0.3	0.2	0.5	0.4
0.3	0.4	0.2	0.3	0
0.4	0.3	0.1	0.4	0.4
0.3	0.5	0.2	0.5	0.4
0.4	0.3	0.1	0.5	0.4
0.4	0.3	0.2	0.5	0.4
0.3	0.5	0.2	0.3	0.4
0.2	0.1	0.1	0.5	0.3
0.4	0.1	0.1	0.5	0.4
0.2	0.1	0.1	0.4	0.3
0.4	0.1	0.2	0.5	0.3
0.4	0.1	0.2	0.5	0.3
0.4	0.5	0.2	0.1	0.3
0	0.3	0.1	0.4	0.3
0.4	0.3	0.1	0.5	0.3
0.4	0.1	0.2	0.5	0.3
0.2	0.1	0.1	0.4	0.3
0.3	0.5	0.2	0.3	0.4
0.4	0.3	0.2	0.5	0.3
0.3	0.5	0	0.3	0.4
0.3	0.5	0.2	0.1	0.3
0.3	0.5	0	0.1	0.4
0.3	0.5	0.2	0	0.4
0.3	0.5	0.2	0.3	0.4
0.3	0.5	0	0.5	0.3
0.4	0	0.2	0.5	0.3
0.3	0.3	0	0.5	0.3
0.3	0.1	0.2	0.5	0.3
0.4	0.3	0.2	0.5	0.3
0.3	0.3	0.2	0.5	0.3
0.3	0.1	0.2	0.3	0.3
0.3	0.5	0.2	0.3	0.3
0.3	0.3	0.2	0.5	0.3

Step 4

Determine the weight vector fromthe single objective programming model, solving the model we get the attributive matrix.

Min f(w) = 10.6 w_1 + 10 w_2 +5 w_3+13.2 w_4+10.8 w_{45}

Subject to :

$$0.10 \le w_1 \le 0.15,$$
$$0.15 \le w_2 \le 0.20,$$
$$w_3 \ge w_2,$$
$$0.34 \le w_4 \le 0.40,$$
$$0.18 \le w_5 \le 0.28.$$
$$w_1 + w_2 + w_3 + w_4 = 1,$$
$$0 \le w_j \le 1 \ (j = 1,2,3,4)$$

Solving the model, we get the attribute weights

w_1 = 0.10 ,w_2=0.15 , w_3 =0.23, w_4=0.34 , w_5=0.18

Step 5

Calculate the collective score of each alternative by the following formula:$S_i = W_j S_{ij} i=1,2,....m$

S_1 =0.13, S_2 = 0.265, S_3 =0.187, S_4 =0.11, S_5 =0.153, S_6 = 0.13, S_7 =0.178, S_8 =0.22,

S_9 = 0.20,S_{10} =0.25,S_{11} =0.178, S_{12} =0178, S_{13} =0.27, S_{14} = 0.211, S_{15} = 0.17, S_{16} =0.178,

S_{17} = 0.25, S_{18} =0.178, S_{19} =0.148, S_{20} =0.22, S_{21} =0.264, S_{22} =0.292, S_{23} = 0.28, S_{24} =0.178,

S_{25} =0.174, S_{26} = 0.193, S_{27} = 0.204, S_{28} = 0.188, S_{29} = 0.148, S_{30} = 0.158, S_{31} =0.188,

S_{32} =0.196, S_{33} =0.158.

Step 6

Depend upon the collective score , the alternatives are arranged in the non-increasing order and finally the best one is found.

S22>S23>S13>S2>S21>S10>17>S8>S20>S4>S9>S9>S27>S32>S26>S31>S28>S3>S7>S11>S12 >S15 >S16>S18>S24>S25 >S30>S33>S5>S19>S29>S6>S1>S4

Best alternative: S22

(i.e) This alternative comes under the subscale of Parent- Child Dysfunctional Interaction

Method	Order of factors arranged in the subscales	Best subscale of the factors
Augmented Fuzzy Cognitive Map	2,1,3	2(i.e)Parent-child Dysfunctional Interaction
Minimization of regret with IFS	2>1>3	2(i.e)Parent-child Dysfunctional Interaction

DISCUSSION

Applying the augmented fuzzy cognitive map, it is found that the prolonged burden of care and rearing difficulties, child management problem, parental grieving are influencing the parenting stress of the mentally retarded child among which economical insufficiency and anxiety of future security and guardianship are the most impacting factors which come under the Parent- Child Dysfunctional Interaction. When this result is compared,the best alternative is foundusing Minimization of Regret with Intuitionistic Fuzzy Multiple Attribute Decision making algorithm also comes under the same subscale Parent-Child Dysfunctional Interaction..Hence this study was undertaken to find the most impacting factor among the factors that cause parenting stress using fuzzy cognitive map and to prove the tool applied is appropriate.

CONCLUSION

Deater-Deckard(1998)said that parenting is made difficult by children's diverse characters, the complicated developmental processes and constant demand for care giving. In the course of time there could be transitioned into parenting and less stress also. Kumar (2008) opined that those expectations of the parents about their child to love,be smart, charming, sportive, intellectual and attractive are normal. So the parents of the mentally retarded child mourn over the loss of unfulfilled expectations and face strain on their psychological and economic resources.Through this study too, it is proved that economical insufficiency and anxious about the future of the children to prove the reality of life. Hence we conclude that the tool augmented fuzzy cognitive map aaplied for this study is one of the best method to solve the uncertainity problems.

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