

Identification and prioritizing the effective factors on addiction by use of Fuzzy analytical hierarchy process (F-AHP)

Dr. Moslem Lari Najafi¹, Maryam Nasiri²

¹. Faculty of Pharmacy, Kerman University of Medical Sciences, Kerman, Iran

² Faculty of agriculture, Kerman University of Bahonar, Kerman, Iran

Abstract: The present research aims to prioritizing the effective psychological factors on addiction and development of a model for rating the psychological factors and their indexes. In terms of purpose, it is a practical study and in terms of procedures it is a descriptive-analytical research. Also, since it examines a group of effective factors on addition (psychological) it is a case study. To do the study, different evaluation models of strategic program like Fuzzy analytical hierarchy process (FAHP) was used. To collect the data, the library studies methods by use of documents were adapted. In the first step, the psychological factors influential on addiction were extracted from library sources and after some interview with experts were examined. In the second stage, the evaluated factors were prioritized through survey and interview by use of analytical hierarch process based on the research hypotheses. The final conclusion is, thus, to rate the psychological factors influential on addition , personality factors, mental disorders, sense of experience and affective deficiencies (same rank) and having positive attitude towards drugs.

[Moslem Lari Najafi, Maryam Nasiri. **Identification and prioritizing the effective factors on addiction by use of Fuzzy analytical hierarchy process (F-AHP).** *Life Sci J* 2013;10(9s):209-215] (ISSN: 1097-8135). <http://www.lifesciencesite.com>. 27

Keywords: addiction, psychological factors, F-AHP

1. Introduction

Tendency to drugs, today's, has become a globally serious problem. Etiology of drugs and addiction to them, many several hypotheses have been proposed. But, none of them can independently explicate cause and effect of addiction to drugs. In most of the times, a sequence of factors is influential on incidence of a problem. However, in certain cultural and social contexts and for each individual specific factor plays a more significant role. In words, addiction means dependency to factors or materials that their repeated use in specific quality and time get mandatory by the addict.

That is, continuation of using medical drugs, and unusual drugs. The addict is one who is extremely dependent either physically or mentally to drugs that to satisfy his/her need the addict has to use drugs continuously and in certain intervals. Also, many different personality factors are involved in drug abuse.

Among them, some characteristic act as predictors of addiction probability. generally, they image an individual who deviates from social values and structures like family, school, and religion or is unable to adapt, cope with or express his/her painful feelings of sin, anger and anxiety. These characteristic include lack of acceptance of traditional and common values, resistance against power sources, severe need to independency, anti-social peculiarities, severe aggression, inability in controlling life, low

confidence, inability to resist against others' offensive proposals, and lack of social and adaptive skills.

Since the very first use of drugs usually initiates from social environments, how much an individual has the decision making and communicative skills, he/she would be able to resistance against peer pressure. Considering the causes of appearance and continuation of addiction it can be said that a unique reason is not responsible for addiction. In most of cases, in fact, a series of factors lead to drug abuse. Studies show that three groups of factors are effective in appearance and continuation of addiction such as psychological biological and social factors. In the present paper, the psychological factors are considered and through the AHP model, these factors are rated and their significance are determined respectively.

2. Review of the literature

Addiction is a biological psychological and social disorder. In creation of such diseases many various factors together end to drug abuse and addiction. The influential facts on the individual are known as the environment and all closely related factors. The personal – psychological factors that affect on addiction in the present study are as follows:
Personality characteristics:

These characteristics consist of denying traditional and conventional values, lack of resistance against power sources severe need, inability of

controlling personal life, low confidence, and lack of social and adaptive skills.

- In approximately 70% of cases, addiction accompanies with other psychological disorders. The most prevalent of them are fundamental depression, personality disorder (anti –social), obsessive-compulsive disorder (OCD), panic, mania, and schizophrenia
- Positive attitude toward drugs: Individuals who hold positive or neutral attitude towards drugs will more probably get addicted in comparison of those with negative attitudes. The positive attitudes consist of acquisition of dignity, relieving pain and physical fatigue, attaining mental relaxation, ability to use drugs without any addiction.
- Sense of experience: Experiencing and curiosity stand among the best two human sense that in light of such senses human civilization has reached note standing advances. But, such senses in absence of logic will result to tendency of an unconscious experience. One of the most salient

reasons addicts attribute their addiction is this sense of curiosity.

- Affective deficiencies: A series of mental deceases are identified as mood disorders or affective deficiencies. Roughly speaking, this group of mental disorders are among the most prevailed type of mental disorders can be traced at all ages. These disorders may be varying from mildest form like a simple and transient depression to severe, progressive, long-term and recurrent forms.

2.1 Research Background

During the present study, other previously performed studies on addiction and its effective factors were reviewed. However, no paper was found for rating of the effective psychological factor on addiction by use of quantitative and mathematical methods. Thus, the performed studies on addiction and major factors involved in psychology of addiction are shown in Table 2 as below.

Table 2. Comparative Studies

author	year	subject
Califano, J.	2006	Women under the influence The national center on addiction and substance abuse Columbia University.
DiClemente, C.,	2006	Addiction and change.
Straussner, S., et al.	2002	Women's addiction and treatment through a historical lens.
Stimmel, B.	2002	Alcoholism, drug addiction and the road to recovery.
Bechara, A., et al.	2002	Decision-making and addiction, Part I., Impaired activation of somatic states in substance dependent individuals when pondering decisions with negative future consequences. Decision-making and addiction, Part II., Myopia for the future or hypersensitivity to reward?
Everitt, B.J., et al.	2001	the neuropsychological basis of addictive behavior.
Weiskrantz, L.	1997	Consciousness Lost and Found: A Neuropsychological Exploration.

3. Methodology

This research is a type of practical one and in terms of collecting and analyzing the data it is a descriptive-survey study. Also, since it examines a group of the effective factor on addiction (psychological) is categorized as a case study research as well. To perform the study, some evaluation, models of strategic programs like FHAP model were used. To collect the required data, the library method using documents was adapted. In the first step, the effective psychological factors on addiction were extracted from library sources, and then a number of experts commented on them. In the second step, the obtained factors through questionnaire and interview were rated via analytical hierarchy process (AHP) based on the research hypotheses. To rate by AHP method, (level 1) and sub-indexes (level 2) are presented in form of a conceptual model.

3.1 Five Psychological Criteria

Prioritizing of the major criteria is as personality characteristics, mental disorders, positive

attitudes to drugs, sense of experience and affective deficiencies respectively.

-sub-indexes of five psychological criteria:
The sub-indexes related to personality characteristics include traditional values A1, severe need A2, lack of self-control A3, lack of confidence A4 and lack of social skills A5.

Sub-indexes of mental disorders consist of depression B1, personality disorder B2, and obsessive-compulsive disorder (OCD), B3

Sub-indexes f positive attitude toward drugs include sense of dignity C1, reliving chronic pains, C2, mental relaxation, C4, tendency to drug abuse without addiction, C4

Sub-indexes sense of experience are compromised as tendency to experience once, D1, curiosity, D2, IQ , D3

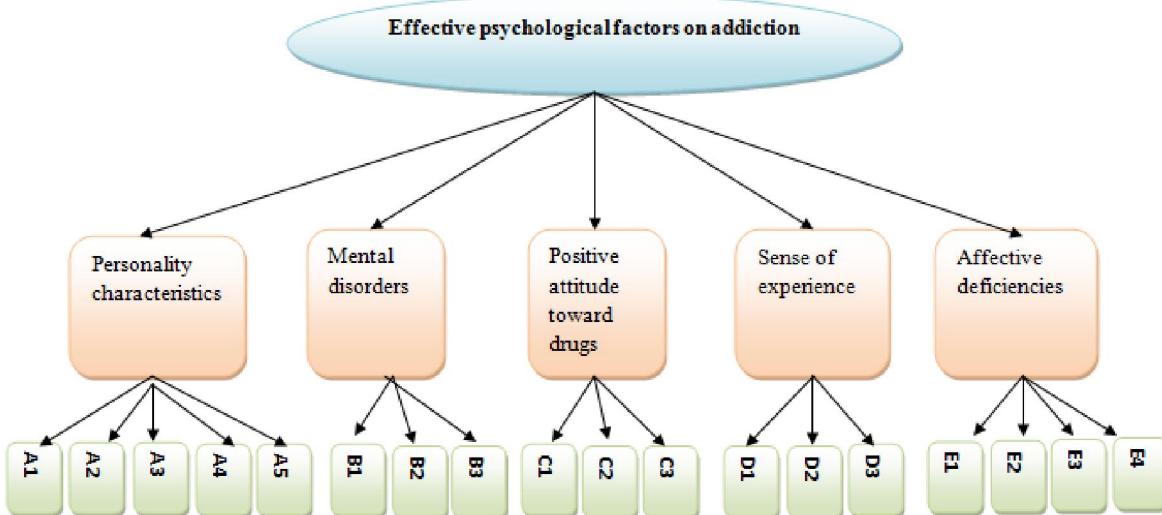
Sub-indexes of affective deficiency are depression, E1, anxiety, E2, aggression, E3, jealousy, E4.

3.2 Conceptual Model

In this model by use of FAHP, the researcher is going to present psychological model of the effective factors on addiction. The relevant criteria and indexes

were introduced above. Fig. 1 shows the conceptual model.

Fig 1. conceptual model



4. Findings

4.1 Rating of the Major Factors

Rating of criteria through paired comparison and giving scores are like the triangular fuzzy numbers and indicate priority or importance of two criteria. Thus, the decision-maker compares the indexes and utilizes triangular fuzzy numbers for

paired-comparisons. Using a 1- 9 item scale, a matrix of paired comparisons can be shaped as triangular fuzzy numbers. That is, the decision-maker expresses his preferences through paired comparison of each level relative to higher levels. The preferred values in FAHP method will be like Table 3.

Table 3. fuzzy number corresponding with preferences in paired comparisons

Verbal statement for determination of preference	Triangular fuzzy numbers
Preference or absolute importance	(3.5, 3, 2.5)
Preference or very stronger importance	(2, 2.5, 3)
Preference or stronger importance	(1.5, 2, 2.5)
Preference or little importance	(1, 1.5, 2)
Preference or relatively equal importance	(0.5, 1, 1.5)
Preference or exactly equal importance	(1, 1, 1)

To get more familiar with FAHP, first weight of options from one of respondents' view point proceeds. Due to existence of 100 respondents, the results are collected by the Expert Choice software. the first respondents filled the table related

to prioritizing the major factors i.e. personality factors (A), mental disorders (B), positive attitude to drugs(C), sense of experience (D) , and affective deficiencies (E) in the questionnaire like Table 4.

Table 4. prioritizing the major factors

Psychological factors	A	B	C	D	E
A	1	3.00	5.00	0.33	5.00
B	0.33	1	3.00	5.00	3.00
C	0.20	0.33	1	3.00	5.00
D	3.00	0.20	0.33	1	3.00
E	0.20	0.33	0.20	0.33	1

In the next stage, numbers and elements of the above matrix became fuzzy numbers based on the fuzzy numbers equivalent to 'preferences' thus, the

matrix of paired comparison of factors from the first respondents' view point in the fuzzy format were provided in Table 5.

Table 5. paired comparison of psychological factors

Psychological factors	A	B	C	D	E
A	(1, 1, 1)	(1, 1.5, 2)	(1.5, 2, 2.5)	(0.5, 0.66, 1)	(1.5, 2, 2.5)
B	(0.5, 1, 1.5)	(1, 1, 1)	(1, 1.5, 2)	(1.5, 2, 2.5)	(1, 1.5, 2)
C	(0.4, 0.5, 0.66)	(0.5, 1, 1.5)	(1, 1, 1)	(1, 1.5, 2)	(1.5, 2, 2.5)
D	(1, 1.5, 2)	(0.4, 0.5, 0.66)	(0.5, 1, 1.5)	(1, 1, 1)	(1, 1.5, 2)
E	(0.4, 0.5, 0.66)	(0.5, 0.66, 1)	(0.4, 0.5, 0.66)	(0.5, 1, 1.5)	(1, 1, 1)

The relative and ultimate weights were computed. There are several different methods to compute them. Of such methods, is a developmental analysis was introduced by Cheung. This method is described in details.

1. For each row of the paired comparison matrix prepared like above, the SK value which is a triangular fuzzy number will be calculated. After the table of respondents' preferences was completed, first, coefficients of each paired comparison matrixes are computed (SK). The value of SK is also a triangular number computed as below.

- 1

$$S_K = \sum_{i=1}^n M_{kj} * \left[\sum_{i=1}^m \sum_{j=1}^n M_{ij} \right]$$

Where,

K represents number of row and i and j are options and criteria respectively. In the EA method, after computation of SKs, degree of their magnitude toward each other must be obtained. Generally speaking, if M1 and M2 are two triangular fuzzy numbers degree of magnitude M1 over M2 is shown by V (M1 ≥ M2) and defines as following.

If $M_1 \geq M_2$, then,

$$V(M_1 \geq M_2) = 1$$

Otherwise,

$$V(M_1 \geq M_2) = hgt(M_1 * M_2)$$

Also,

$$hgt(m_1 \cap m_2) = \frac{u_1 - l_2}{(u_1 - l_2) + (m_2 - m_1)}$$

Degree of magnitude of a fuzzy triangular number from other K triangular fuzzy is achieved by the below relation.

$$v(m_1 \geq m_2 \dots \geq m_k) = mi[v(m_1 \geq m_2) \dots v(m_1 \geq m_k)]$$

In the EA method, for calculation of the weight of indexes in the paired comparison matrixes, we do as below:

$$w'(x_i) = \min\{v(s_i \geq s_k)\}, k = 1, 2, \dots, n, k \neq i$$

Therefore, the vector of index weight will be as follows:

$$w' = [w'(c_1), w'(c_2) \dots w'(cn)]^t$$

That is the vector of non-normalized coefficients of FAHP. The obtained numbers in the previous stage are the non-normalized weight of the table of AHP analysis criteria. Therefore, normalized weights of criteria (indexes) are computed via the following formula:

$$W_j = \frac{W'_j}{\sum W_i}$$

$$w(x, x, x, \dots)^t$$

The achieved weights are the relative significance coefficients of each of indexes based on FAHP (through EA) method that determines the best option of decision making from other decision making criteria. According to what mentioned previously, the general model of ideal investment with considering criteria related are as follows. For final prioritizing the options paired comparisons of whole group (100 subjects) must be accumulated. One of the best approaches is geometric averaging. In other words, for each of respondents in Table 6 is presented. The geometric averaging for a, b, c, ..., n are as :

$$(\text{Geometric averaging} = (n \times \dots \times c \times b \times a)^{1/n})$$

Table 6. row sum of indexes

Psychological factors	row sum of major factors
Personality characteristics	(6.5, 8.6, 10.5)
Mental disorders	(5.4, 7.16, 9.16)
Positive attitude to drugs	(5.4, 5.6, 9.1)
Sense of experience	(3.8, 4.7, 6.2)
Affective deficiencies	(4.4, 5.3, 7.1)
Sum of columns	(31.1, 36.76, 51.16)

In the first step, for every row of the paired comparison matrix, the SK value that is a triangular fuzzy number is computed as follows:

$$S_k = \sum_{j=1}^n M_{kl} \times \left[\sum_{i=1}^m \sum_{j=1}^n M_{ij} \right]^{-1}$$

In the second step, after computation of Sis, degree of magnitude toward each other is calculated by :

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_2}(d)$$

$$= \begin{cases} 1, & \text{if } m_2 \geq m_1, \\ 0, & \text{if } l_1 \geq u_2, \\ \frac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} & \text{otherwise,} \end{cases}$$

That is ,

$$V(M_1 \geq M_2) = 1 \quad \text{if } m_1 \geq m_2$$

$$V(M_1 \geq M_2) = hgt(M_1 \cap M_2) \quad \text{else}$$

$$hgt(M_1 \cap M_2) = \frac{u_1 - l_2}{(u_1 - l_2) + (m_2 - m_1)}$$

In the third step, for computation of the indexes weight in the paired comparisons matrix we according to the step 2 have,

$$W'(xi) = \text{Min} \{V(Si \geq Sk)\}, \quad k=1,2,\dots,n$$

After computation of degree of magnitude for Sis, we measure minimum of fuzzy row is computed. Finally, vector of non-normalized weight of indexes is calculated.

In the fourth step, we normalize the weight vector of step 3 and compute the vector of indexes weight by use of the below relation.

$$w_i' = \frac{w_i}{\sum w'}$$

Finally, the ultimate weight and prioritizing of five factors will be resulted for all samples and through FAHP method as Table 7.

Table 7. prioritizing of psychological factors by use of FAHP method

Psychological factors	weight	priority
Personality characteristics	0.2	1
Mental disorders	0.16	2
Positive attitude to drugs	0.14	4
Sense of experience	0.15	3
Affective deficiencies	0.15	3

The diagram of Expert Choice software on prioritizing of final psychological factors for all respondents is the same as Fig.2.

Fig.2. final prioritizing of five psychological factors

Synthesis with respect to:

Goal: Ranking Criteria



After rating of the major factors, in following indexes relevant to each of these five factors are prioritized. To avoid a prolonged work on the indexes, the computation results are shown in form of Expert Choice output.

Fig. 3. prioritizing sub-indexes of personal characteristics

Synthesis with respect to:

Goal: Ranking Indicators



Personal characteristics: sever need A2, traditional values A1, lack of self-control A3, lack of social skills A5, and lack of confidence A4.

Fig. 4. prioritizing sub-indexes of mental disorders

Synthesis with respect to:

Goal: Ranking Indicators



Mental disorders: obsessive-compulsive B3, depression B1, personality disorder B2.

Fig. 5. prioritizing sub-indexes of positive attitude toward drugs

Synthesis with respect to:

Goal: Ranking Indicators



Positive attitude toward drugs: removing chronicle pains C2, sense of dignity C1, mental relaxation C3, sense of drugs use without addiction C4.

Fig. 6. prioritizing sub-indexes of sense of experience

Synthesis with respect to:

Goal: Ranking Indicators



Sense of experience: tendency to experience once D1, IQ D3, curiosity D2.

Fig. 7. prioritizing sub-indexes of affective deficiencies

Synthesis with respect to:

Goal: Ranking Indicators



Affective deficiencies: aggression E3, depression E1, anxiety E2, jealousy E4

5. Conclusion

The obtained results indicate that ranking of the effective psychological factors on addiction are

as personality characteristics, mental disorders, sense of experience, and affective deficiencies (same rating) and positive attitude toward drugs respectively. As it was mentioned earlier no similar research work has been found so far in order to the

present research findings are compared with previously achieved results. Therefore, official who are involved with drugs abuse in psychological field must allocate their financial sources and human resources to the factors based on the ranking.

Recommendations

In current study was an attempt for providing scientific ranking of effective factors in social researches based on FAHP method. Thus, some recommendations are presented as follows:

1. Establishment of cultural programs and strengthening of traditional and national values by responsible organizations.
2. Strengthening medicinal control
3. Establishment of training programs for learning of self-control skill and increase of confidence from primary school as well as teaching problem solving strategy in higher levels of the society.
4. Teaching social skills in the same level as above.
5. Creation and strengthening of counseling in families like family doctor
6. Doing socio-cultural activities for making a negative attitude toward drug abuse besides audio and visual trainings in mass media
7. Teaching ways of getting mentally relaxed and creation of stress free environment at work and educational centers through legislation of national rules.
8. Continuous training of drug side effects in educational centers, offices, mass media and prevention from tendency to unconscious experiences of drugs
9. development of training family heads in field of child and young adult growth , prevention from chronic diseases, referring to counseling centers in case of personality disorders among family members.

It would also be recommend that future researchers through statistical methods expand the population by including age, sex and level of education as other variables as well as administrate computations in field studies in order to generalize results to the society and analyze the results. Moreover, some other effective biological and social factors are included and the related indexes are investigated.

References

1. Asghar pour, M., (1998), "multivariable decision making", Tehran: Tehran university
2. Ayag, Z., (2005), "A fuzzy AHP-based simulation approach to concept evaluation in a NPD environment," IIE Transactions, vol.37, pp. 827–842.
3. Azar, A., (2000), " operation in research", Tehran: Nashr –e Olum
4. Bechara, A. Damasio, H., (2002), Decision-making and addiction, Part I., Impaired activation of somatic states in substance dependent individuals when pondering decisions with negative future consequences, *Neuropsychological*, 40:1675–89.
5. Bechara, A. Dolan, S. Hindes, A., (2002), Decision-making and addiction, Part II., Myopia for the future or hypersensitivity to reward?, *Neuropsychological*, 40:1690–705
6. Califano, J. (Ed.), (2006), Women under the influence The national center on addiction and substance abuse Columbia University, Baltimore MD: John Hopkins University Press.
7. DiClemente, C., (2006), Addiction and change, New York, NY: The Guilford Press.
8. Erickson, C. K., (2007), Addiction, New York, NY: W.W. Norton & Company.
9. Everitt, B.J. Dickinson, A. Robbins, T.W., (2001), the neuropsychological basis of addictive behavior, *Brain Res.*, Rev. 36, pp.129–38.
10. Ghodsi pour, H., (2000), " analytical hierarchy process", Tehran: Amirkabir university of technology , p.28.
11. Shavandi, H., (2006), " theories of fuzzy series and their applications in industrial engineering and management, development of basic sciences".
12. Stimmel, B., (2002), Alcoholism, drug addiction and the road to recovery, Binghamton NY: Haworth.
13. Straussner, S., Attia, P., (2002), Womens addiction and treatment through a historical lens, *Journal of Studies on Alcohol*, 63, 49-56.
14. Weiskrantz, L., (1997), Consciousness Lost and Found: A Neuropsychological Exploration, New York: Oxford Univ. Press.
15. Zahedi, F., (1986), "The analytic hierarchy process: A survey of the methods and its applications", *Interfaces*, vol.16, No.4, PP. 69-108.