Classification of Some Social and Psychological Factors Affecting Drug Addiction Using the Characteristic Analysis

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Abstract:

Distinguished analysis was used to classify some factors affecting drug addiction into several groups depending on variables with discriminatory characteristics. The study includes drawing a random sample for each group separately. Using the linear characteristic function and then classifying some of the factors affecting drug addiction on the basis of a set of accompanying variables, despite the lack of studies in this field, but it presents some influences on social and psychological factors

It also appeared in the distinctive multivariate application method to distinguish the social and psychological factors that contribute significantly to disparity. It was found that the variable X_6 (escape from problems and frustration) X_{10} (teaching to say no to wrong things) contributed significantly to distinguishing between social and psychological factors affecting drug addiction.

Keywords: Statistical Analysis, Multiple Variables, Vharacteristic Analysis, Linear Characteristic Function.

Introduction :.

The research aims to identify the social and psychological factors that affect the members of society that lead to drug addiction. We use the distinctive analysis, which is one of the methods of multivariate analysis, as it is concerned with studying the impact of a group of factors on the vocabulary of different groups distinct from each other. The benefit of the distinctive analysis is in classifying an individual or a group of vocabulary into a community or a group of communities. This is done by relying on variables that have certain characteristics. Distinguished analysis is also used to identify the variables that contribute to the classification process .

First topic:

The Theoretical Side:

1.1 Characteristic analysis: Discriminant analysis is an important topic in multivariate analysis that studies how to distinguish between two or more groups. The main idea of this analysis is to compare between intertwined societies and have the same characteristics or

characteristics. Distinguished analysis differs from regression analysis, where the dependent variable in the discriminant analysis is a variable with a nominal scale [4]. It is considered a qualitative variable that takes two values (0) and (1) in the case of distinguishing between two groups.
1 = Y if the observation belongs to the first community.
0=Y if the observation belongs to the second population.

1.2 Linear Discriminant Function: This function can be used when the studied population has a multivariate normal distribution with different mean vectors and an equal covariance matrix, and there are two cases. -1 The first case and two groups (combined): If we have a sample drawn from two populations that are normally distributed with mean μ_1, μ_2 and a covariance matrix ∑ for each population, that is:

$x_1 \sim N_P(\mu_1, \Sigma)$…..(1)

$x_2 \sim N_P(\mu_2, \Sigma)$…(2)

The function can be written based on measures of these values, and this function enables the testing of any observation and the identification of the community to which it belongs[6]. The random variable X has a probability density function either f_1 (x,θ_1) or f_2 (x,θ_2) where θ_i stands for any parameter under which the distribution varies. So this means :

$$f_1(x,\mu_i) = \frac{1}{(2\pi)^{\frac{p}{2}}\,(\Sigma)^{\frac{1}{2}}}\, e^{\frac{1}{2}(x-\mu_i)'\Sigma^{-1}(x-\mu_i)} \quad , i = 1,2 \text{ ………(3)}$$

Whereas, the maximum possible ratio is:

$$\exp\left[-\frac{1}{2}\{(x-\mu_1)'\Sigma^{-1}(x-\mu_1) - (x-\mu_2)'\Sigma^{-1}(\mu_1-\mu_2)\}\right] \geq \lambda \text{ ………..(4)}$$

When we decompose this equation by adding and subtracting μ_2^' Σ^(-1) μ_1 we get:

$$\exp\left[x'\Sigma^{-1}(\mu_1-\mu_2) - \frac{1}{2}\{[\mu_1+\mu_2)'^{\Sigma^{-1}}(\mu_1-\mu_2)\}\right] \geq \lambda \text{ … ….(5)}$$

Taking the log of both sides, we get:

$$[x'\Sigma^{-1}(\mu_1-\mu_2) - \frac{1}{2}\{[\mu_1+\mu_2)'^{\Sigma^{-1}}(\mu_1-\mu_2)\} \geq \log\lambda \text{ … ….(6)}$$

When λ = 1 is:

$$\left[x'\Sigma^{-1}(\mu_1-\mu_2) - \frac{1}{2}\{[\mu_1+\mu_2)'^{\Sigma^{-1}}(\mu_1-\mu_2)\}\right] \geq 0 \text{ ….(7)}$$

We use the maximal potentials to Σ, μ_1, μ_2 and substitute them here, we get:

$$w = \left[x'^{s^{-1}}(\overline{x_1}-\overline{x_2}) - \frac{1}{2}(\overline{x_1}+\overline{x_2})'^{s^{-1}(\overline{x_1}-\overline{x_2})}\right] \geq 0 \text{ …..(8)}$$

$$\underline{\overline{x_1}} = \sum_{j=1}^{n_1} \underline{x_{1j}}/n_1$$

Whereas:

$$\underline{\overline{x_2}} = \sum_{j=1}^{n_2} \underline{x_{2j}}/n_2$$

$$S = \sum_{j=1}^{n_1}(\underline{x_{1j}}-\underline{\overline{x_1}})(\underline{x_{1j}}-\underline{\overline{x_1}})' + \sum_{j=1}^{n_2}(\underline{x_{2j}}-\underline{\overline{x_2}})(\underline{x_{2j}}-\underline{\overline{x_2}})']/(n_1+n_2-2) \text{ …..(9)}$$

The two parts of Equation (8) consist of the linear discriminant function:

$) \ y = \underline{x'} \, S^{-1}(\underline{\overline{x_1}} - \underline{\overline{x_2}}$

Highlight point z

$$Z = \frac{1}{2} D^2 = \frac{1}{2}\left(\underline{\overline{x_1}} + \underline{\overline{x_2}}\right)^{'S^{-1}} \left(\underline{\overline{x_1}} - \underline{\overline{x_2}}\right) \ldots..(10)$$

D2 is the Mahlonopes statistic

The discriminant function can be written as the following linear function:

or $\quad y = \underline{c'} \, \underline{x} \; y = \underline{x'} \, \underline{C}$

Where

$c = S^{-1}(\underline{\overline{x_1}} - \underline{\overline{x_1}})$

Here we can summarize the following through the linear discrimination function:

$\overline{y_1} = \underline{\overline{x_1}}' S^{-1}(\underline{\overline{x_1}} - \underline{\overline{x_1}})$

$\overline{y_2} = \underline{\overline{x_2}}' S^{-1}(\underline{\overline{x_1}} - \underline{\overline{x_1}})$

The break point can be expressed as:

$$Z = \frac{\overline{y_1} + \overline{y_2}}{2}$$

If we suppose that (y_2) ¯ (y_1)<, the classification scheme for the new observation y will be:

In the case of y ≤ Z, it belongs to the first group

In the case of y > Z it belongs to the second set

We can use the entire w above to classify the new view x as

In the case of w ≤ 0, it belongs to the first group

And in the case of w > 0 it goes back to the second group

From here, the matrix S will be output as follows (assuming $n = 3$)

$$S = \begin{vmatrix} v_1 & v_{12} & v_{13} \\ & v_{22} & v_{23} \\ & & v_{33} \end{vmatrix}$$

and be

$\ldots\ldots(11) v_{ii} = \frac{s_{ii}(1)+s_{ii}(2)}{n_1+n_2-2} \quad , \quad v_{ij} = \frac{s_{ij}(1)+s_{ij}(2)}{n_1+n_2-2}$

$$S_{ii} = \sum x_i^2 - \frac{(\sum x_i)^2}{n} \qquad , \qquad S_{ij} = \sum x_i x_j - \frac{(\sum x_i)(\sum x_j)}{n} \ \ldots\ldots\ldots(12)$$

The second case is groups (communities): here in this case the issue of distinguishing between (k of totals) between more than two groups is classified by comparison between each two groups, so that several distinct functions y_ij and number $C\_(2)^\wedge k$ can be written in the following form:

$$y_{ij} = \underline{x'} S^1 \left(\underline{\overline{X_i}} - \underline{\overline{X_j}}\right) \ldots\ldots(1)$$

But if we have three groups and there is in each group P of variables P≥2, it is appropriate to calculate:

$$\underline{C_1} = S^{-1}\left(\underline{\overline{X_1}} - \underline{\overline{X_2}}\right)$$

$\underline{C_2} = S^{-1}\left(\overline{\underline{X_1}} - \overline{\underline{X_3}}\right)$

$\underline{C_3} = S^{-1}\left(\overline{\underline{X_2}} - \overline{\underline{X_3}}\right)$

Here we get the following discriminant functions:

$, \quad Y_{13} = x'\underline{C_2} \quad , \quad Y_{23} = x'\underline{C_3}Y_{12} = x'\underline{C_1}$

Then we find the following:

….(2)$w_{12} = [\underline{x'}S^{-1}\left(\overline{\underline{X_1}} - \overline{\underline{X_2}}\right) - \frac{1}{2}\left(\overline{\underline{X_1}} + \overline{\underline{X_2}}\right)'\ S^{-1}\ \left(\overline{\underline{X_1}} - \overline{\underline{X_2}}\right)]$ ...

….(3)$w_{13} = [\underline{x'}S^{-1}\left(\overline{\underline{X_1}} - \overline{\underline{X_3}}\right) - \frac{1}{2}\left(\overline{\underline{X_1}} + \overline{\underline{X_3}}\right)'\ S^{-1}\ \left(\overline{\underline{X_1}} - \overline{\underline{X_3}}\right)]$ ...

….(4)$w_{23} = [\underline{x'}S^{-1}\left(\overline{\underline{X_2}} - \overline{\underline{X_3}}\right) - \frac{1}{2}\left(\overline{\underline{X_2}} + \overline{\underline{X_3}}\right)'\ S^{-1}\ \left(\overline{\underline{X_2}} - \overline{\underline{X_3}}\right)]$ ...

As the relationship between them is as follows:

$w_{23} = w_{13} - w_{12} \dots \dots (5)$

If we have the number of variables P≥2, then the classification rule for each group is as follows:

Where the observation X is classified into one of the following groups:

If $w_{12} > 0\ , w_{13} > 0$ then it is in set (1)

If $w_{13} > 0\ , w_{13} > w_{13}$ then it is in set (2)

If $w_{13} > 0\ ,\ w_{12} > w_{12}$ then it is in set (3)

And in the case if we have one variable for each group $P = 1$ and the means of the sums are arranged for ease as follows

$\overline{X_1} < \overline{X_2} < \overline{X_3}$ Where the classification rules for viewing X are as follows:

If it was $X < \frac{1}{2}\left(\overline{\underline{X_1}} + \overline{\underline{X_2}}\right)$ It is in group (1)

If it was $\frac{1}{2}\left(\overline{\underline{X_1}} + \overline{\underline{X_2}}\right) \le x \le \frac{1}{2}\left(\overline{\underline{X_2}} + \overline{\underline{X_3}}\right)$ It is in group (2)

If it was $x > \frac{1}{2}\left(\overline{\underline{X_1}} + \overline{\underline{X_2}}\right)$ It is in group (3)

In this case, the matrix S will look like this:

$$S = \begin{vmatrix} v_{11} & v_{12} & v_{13} \\ & v_{22} & v_{23} \\ & & v_{33} \end{vmatrix}$$

……..(6) $, \quad s_{ii} = \sum x_1^2 - \frac{(\sum x_i)^2}{n} v_{ii} = \frac{s_{ii}(1)+s_{ii}(2)+s_{ii}(3)}{n_1+n_2+n_3-3}$

$, \quad s_{ii} = \sum x_i x_j - \frac{(\sum x_i \sum x_j}{n} v_{ij} = \frac{s_{ij}(1)+s_{ij}(2)+s_{ij}(3)}{n_1+n_2+n_3-3} \dots \dots (7)$

1.3: The tests used in the discriminant analysis: The linear characteristic function has an efficiency as it is measured according to the percentage of correct classification of the observations according to their original sums. It is possible to predict this efficiency as it increases with the increase in the difference between the means of the groups on the one hand, and the convergence of the values of the covariance and covariance matrices for this group on the other hand. Here we will discuss the appropriate tests in this area. -1To test the significance of the difference between means by means of the hypothesis test[3].

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

Through this test, the F-test is used, which is based on the Hotlink T^2 statistic, where it is:

$$T^2 = \frac{n_1 n_2}{n_1 + n_2} D^2 \dots\dots (1)$$

where D^2 is the Mahlonopes statistic whose formula is

$$D^2 = \left(\underline{\overline{X_1}} - \underline{\overline{X_2}}\right)' S^{-1} \left(\underline{\overline{X_1}} - \underline{\overline{X_2}}\right) \dots\dots (2)$$

Thus, the F test is as follows:

$$\dots\dots(3) F = \frac{n_1+n_2-p-1}{n_1+n_2-2} T^2 \sim f_{p,n_1+n_2-p-1}$$

Where the result of the rejection is highly significant to reflect the increase in the percentage of the correct classification as follows:

n_1 : be the size of the first sample

n_2 : The size of the second sample is

P : number of variables

1- We test the equality of the covariance and covariance matrices of the groups through the hypothesis:

$H_0 = \Sigma_1 = \Sigma_2$

$H_1 = \Sigma_1 \neq \Sigma_2$

Whereas, the test statistic for this hypothesis Q is

$$\dots\dots(4) Q = MC^* \sim X_{(K-1)(P-1)}$$

whereas:

$$\dots\dots(5) M = ln \frac{|s|^{n_1+n_2}}{|s_1|^{n_1} |s_2|^{n_2}}$$

$$\dots\dots(6) s = \frac{A_1+A_2}{n_1+n_2-2}$$

$A_1 = (n_1 - 1)S_1$

$A_2 = (n_2 - 1)S_2$

$$C^* = 1 - \frac{2p^2 + 3p - 1}{6(p+1)(k-1)} \left[\sum \frac{1}{n_i} - \frac{1}{\sum n_i}\right] \dots\dots (7)$$

whereas:

K = number of totals

P = number of variables

This hypothesis, which states that the two matrices of the variance and the common variance between the two groups are equal, is considered one of the most important hypotheses because not achieving it means that we cannot use the linear discrimination function, but rather the quadratic discrimination function.

1.4 .Probability of classification error: It means the probability of classifying a particular observation into the first group while it originally belongs to the second group and vice versa. Suppose we calculate the classification error, as the sample size to be large, we guarantee the distribution of observations is close to the normal distribution, as this error depends on the normal distribution of the sample distribution, this possibility is:

P_{12} = P(classifying x to be from group(1)/x is from group(2))

$= \phi(-D/2)$

Where D^2 is the statistic of the Mahalonops
Where these values are found in the tables of the standard normal distribution. The classification error is an important factor to prove the efficiency of the discriminant function. Which in turn gives us the least classification error, is the most efficient function and is the best among the discriminators.

1.5 Compensation method: The style of this method may depend on that if n_j represents the number of observations that go back to the original group (j) and that n_ij is the number of observations in group (j) and is classified according to the function of the discriminant as returning (i), then the probability estimate Classification error in this case and in general would be [4].

……(1) $p_{ij} = \frac{n_{ij}}{n_j}$

If the two groups in which we are, then the probability of the overall classification error of the discriminant function will be:

……(2) $\hat{p} = \frac{n_{12}+n_{21}}{n_1+n_2}$

The average probability of misclassification would be:

…..(3) $\hat{p} = \frac{\hat{p}_{21}+\hat{p}_{12}}{2}$

1.6: The concept of drugs: (Illegal drugs):

Know that they are drugs that are obtained illegally without resorting to a doctor and without consulting a doctor - and drugs have a different and unpredictable effect that leads to the suffering of their users and has serious health complications, especially for young people. These effects and complications have different factors that depend on the quantity, type and use of the drug, and the number of drugs used at the same time. It also depends on the weight and health status of the person.

1.7: Types of drugs:

Drugs can be classified into three main categories according to their effect on the body. It is worth noting that some types of drugs may be classified within more than one category, and in the following comes the classification of drug types.

1- Stimulants: or what are called stimulants: they work to stimulate the central nervous system in the body .

2- Tranquilizers: They are also called hypnotics, which depress the central nervous system in the body.

3-Hallucinogens: The use of this type of drug leads to a disturbance of the body's senses, and a lack of sense of the surrounding things.

1.8: The concept of drug addiction:

It means a mental or mental disorder of the chronic type, and addiction is the most widespread stage of substance abuse disorder. Drug abuse is characterized by the inability to resist the uprooting of its use despite its health complications. and long-term procedures that affect the brain. There are several similar terms that differ slightly in meaning, such as the misuse of drugs and alcohol consumption for the same reasons.

1.9 :The most dangerous types of drugs to humans:

1- Crystal: It is a type of drug that poses a great danger to human health. It is also called crystal methionine. It was spread during World War II. It described diets and weight loss, as it causes severe insomnia and anxiety at the beginning of the use, and then causes the skin and teeth to melt, and eventually leads to brain and blood vessel damage in the long run.

2- Bath salts: They are the ones that some use to relax when taking a hot bath, but when treating them at home with the presence of some chemicals, they turn into a crystal-type drug. Lead to cannibalism, rapid rise in body temperature, rapid heartbeat) and pushes the person addicted to this type of drug to suicide.

3- Flakka: It is called a zombie drug and is considered a chemical stimulant similar to the substances found in bath salts that cause this type of addiction to:

- An increase in the heart rate.
- The emergence of emotional excitement greatly.
- severe hallucinations.

Long-term appearance of convulsions

4- Wonga: This type is mainly used as an antiviral to treat acquired immunodeficiency syndrome (AIDS). But when it interacts with soap preparations and some toxins, it turns into a deadly drug. Where this drug causes internal bleeding, stomach ulcers and failure in the body's organs quickly, which leads to death.

5- Crocodile drug: It is considered the most dangerous type of drug for the health of the human body and society because it can be easily manufactured at home. It is made of some analgesics, iodine, liquid gas and cleaning materials. And its use leads to rotting of the internal organs of the body. And the most important factor in its spread is its cheap price

Application side

2.1: The second topic:

Data were collected through a questionnaire distributed to a segment of society (200) people, including (doctor, pharmacist, teacher, earner, housewife, employee) of different ages and both sexes. Social, psychological and other phenomena, when it comes to a large number of variables, we resort to a multivariate analysis, and one of the most important methods of this analysis is the method of discriminatory analysis, which in turn works to distinguish and separate people into two main groups (male or female).

1- Search variables:

The research variables are represented in a two-valued qualitative dependent variable (Y), male (1) and female (2).

And a set of social and psychological factors influencing the (independent) variables are:

1- Age (X_1)
2-Academic achievement (X_2).
3- Profession (X_3).
4- Marital status (X_4).
5- Escape from anxiety and depression drives a person to addiction (X_5).
6- Escape from problems and frustration (X_6).
7- Lack of a sense of responsibility (X_7).
8- Curiosity in experimentation to know the effects of drugs (X_8).

9- The correct family upbringing of children (X_9).
10- Teaching saying no to wrong things (X_{10}).
11- Using the method of dialogue with children (X_{11}).
12- Educating children and how to stay away from bad companions (X_{12}).
A set of assumptions must be provided for the use of discriminant analysis.

1- Testing the normal distribution of the data:

Since the sample size is more than 30 items according to the central limit theorem, the data follow a normal distribution.

2- Test for the equivalence of the arithmetic mean of the two groups:

Table (2.1.1) shows the arithmetic mean of the two groups

sig	Groups		Var
	The second group (female)	first group (male)	
	mean	mean	
.147	6.8882	5.8333	X_1
.588	3.6316	3.5208	X_2
.567	4.1776	3.9583	X_3
.423	1.3487	1.4375	X_4
.083	3.4605	3.0625	X_5
.000	3.9474	3.2292	X_6
.197	3.5329	3.2500	X_7
.430	3.0329	2.8542	X_8
.608	4.5000	4.4167	X_9
.001	4.4408	3.7708	X_{10}
.323	4.5658	4.3958	X_{11}
.284	4.7434	4.5833	X_{12}

Through the table ((2.1)), the value of Sig (X_6, X_{10}) is less than 0.05, and the rest of the variables are greater than 0.05. We also note that the averages are higher in the first group for males in both (X_1, X_9, X_{11}, X_{12}). As for the higher averages in the second group (the female) in both (X_1, X_3, X_9, X_{10}, X_{11}, X_{12}).

Through Wilkes-lambda statistic, we get the following:

Table No. (2.2) Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.888	22.716	12	.030

The hypotheses are formulated:

$H_0 \; = \Sigma_1 = \Sigma_2$

$H_1 \; = \Sigma_1 \neq \Sigma_2$

The sig (0.03) is less than 0.05, i.e. rejecting the null hypothesis and accepting the alternative. It indicates a difference between the averages of the two groups. The Wilkes lambda statistic equals .888 indicates that the discriminatory function has the ability to distinguish and classify observations to their real population.

3-Testing the hypothesis of homogeneity of variance between the two groups:

Statistical hypotheses can be formulated as follows:

$H_0 = \Sigma_1 = \Sigma_2$
$H_1 = \Sigma_1 \neq \Sigma_2$
Through the Box's M test, the results are as follows:

Table (2.3) log determinants

Log Determinant	Rank	sex
.350	10	males
3.265	10	female
3.751	10	Pooled within-groups

Table (2. 4)

Box's M		233.197
F	Approx.	3.895
	df1	55
	df2	25982.016
	Sig.	.000

From Table (2.4), we note that the value of (.000) sig is less than .050 and therefore the null hypothesis is accepted. The hypothesis of homogeneity of variance between the two groups is verified.

4-Testing the significance of the influencing factors (independent variables) in the discriminatory model:

All factors affecting the model are tested to find out the importance of each variable and its effectiveness in the process of discrimination and classification, and they were as follows:

Table (2.5)

X	Wilks' Lambda	F	df1	df2	Sig.
X_1	.989	2.121	1	198	.147
X_2	.999	.294	1	198	.588
X_3	.998	.329	1	198	.567
X_4	.997	.645	1	198	.423
X_5	.985	3.039	1	198	.083
X_6	.940	12.585	1	198	.000
X_7	.992	1.676	1	198	.197
X_8	.997	.626	1	198	.430
X_9	.999	.264	1	198	.608
X_{10}	.943	12.010	1	198	.001
X_{11}	.995	.980	1	198	.323
X_{12}	.994	1.152	1	198	.284

We note from Table (2.5) that all the variables have a sig value greater than 0.05. It has no significant effect except for the variable (X_6 , X_{10}) less than 0.05, which have high significance as they have a significant significant effect in the process of distinguishing between the two groups.

After estimating the parameters of the characteristic function, we find their values as in the following table.

Table (2.6) Coefficients of the Linear Distinctive Function

X	Var	F_1
X_6	Escape from problems and frustration	.711
X_{10}	Teaching saying no to the wrong things	.695
X_5	Escape from anxiety and depression leads a person to addiction	.350
X_1	a1	.292
X_7	Not feeling responsible	.260
X_{12}	Educating children and how to stay away from bad companions	.215
X_{11}	Using the method of dialogue with children	.199
X_4	a5	-.161
X_8	Curiosity about experimenting to know the effects of drugs	.159
X_3	a4	.115
X_2	a3	.109
X_9	Correct family upbringing of children	.103

2.3: Conclusions

1- We conclude from our results that there is a sig value of (X_6, X_{10}) less than 0.05. The rest of the variables are greater than 0.05.

2- We note that the highest averages in the group are in the first group for males are in both (X_{12}, X_{11}, X_9, X_1)

3- The higher averages in the second group (the female) in both (X_{12}, X_{11}, X_{10}, X_9, X_3, X_1)

4- In Wilks' Lambda, the sig value is 0.03 less than 0.05, meaning that the null hypothesis is rejected and the alternative is accepted, and this indicates a difference between the means of the two groups.

5- The Wilkes lambda statistic equals 0.888, which indicates that the discriminant function has the ability to distinguish and classify observations into their real population.

6- We note that all the variables have a significant value greater than 0.05 that has no significant effect

7- The two variables (X_6, X_{10}) have a significant value of less than 0.05, which have high significance as they have a significant significant effect in the process of distinguishing between the two groups.

2.4: Recommendations:

1- Using the discriminant analysis method as one of the multivariate methods.

2- Paying attention to statistical analysis and showing its important role.

3- Providing health and psychological centers to treat the phenomenon of drug addiction.

4- Spreading awareness while clarifying the danger of addiction spreading to society through targeted media programmes

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